AQA GCSE Physics | 8463

SPECIFICATION POINT 4.1.1.1

Energy stores and systems

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**134**
Available paper years	**2003–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.1.1.1 Energy stores and systems

Answer 01 · Mark scheme June 2003 | 3451F | Original Q4 | Legacy

The full source mark scheme begins on page 159. Follow original question 4 in that document.

Answer 02 · Mark scheme June 2003 | 3451F | Original Q7 | Legacy

The full source mark scheme begins on page 159. Follow original question 7 in that document.

Answer 03 · Mark scheme June 2003 | 3462F3 | Original Q4 | Legacy

The full source mark scheme begins on page 181. Follow original question 4 in that document.

Answer 04 · Mark scheme June 2003 | 3462F3 | Original Q7 | Legacy

The full source mark scheme begins on page 181. Follow original question 7 in that document.

Answer 05 · Mark scheme June 2004 | 3451F | Original Q3 | Legacy

The full source mark scheme begins on page 198. Follow original question 3 in that document.

4.1.1.1 Energy stores and systems

Answer 06 · Mark scheme June 2004 | 3451F | Original Q11 | Legacy

The full source mark scheme begins on page 198. Follow original question 11 in that document.

Answer 07 · Mark scheme June 2004 | 3462F3 | Original Q3 | Legacy

The full source mark scheme begins on page 219. Follow original question 3 in that document.

Answer 08 · Mark scheme June 2004 | 3462F3 | Original Q9 | Legacy

The full source mark scheme begins on page 219. Follow original question 9 in that document.

Answer 09 · Mark scheme June 2005 | 3451 | Original Q4 | Legacy

The full source mark scheme begins on page 236. Follow original question 4 in that document.

Answer 10 · Mark scheme June 2005 | 3451 | Original Q13 | Legacy

The full source mark scheme begins on page 236. Follow original question 13 in that document.

4.1.1.1 Energy stores and systems

Answer 11 · Mark scheme June 2005 | 3462 | Original Q4 | Legacy

The full source mark scheme begins on page 254. Follow original question 4 in that document.

Answer 12 · Mark scheme June 2005 | 3462 | Original Q11 | Legacy

The full source mark scheme begins on page 254. Follow original question 11 in that document.

Answer 13 · Mark scheme June 2006 | 3451 | Original Q2 | Legacy

The full source mark scheme begins on page 268. Follow original question 2 in that document.

Answer 14 · Mark scheme June 2006 | 3462 | Original Q2 | Legacy

The full source mark scheme begins on page 288. Follow original question 2 in that document.

Answer 15 · Mark scheme November 2006 | PHY1A | Original Q7 | Legacy

Seven	**3**	**2**	**2**	**1**

4.1.1.1 Energy stores and systems

Answer 16 · Mark scheme

Question 5

question	answers	extra information	mark
(a)	kinetic	accept movement	1
(b)(i)	3 (kWh)	allow 1 mark for selecting the correct information	2
(ii)	transfers more energy	accept transform or use for transfer accept electricity for energy allow higher (average) power **and** switched on for more time	1
(iii)	any **one** from: • use the internet • brochures • reading adverts • visiting shops • recommendation from friends / plumbers		1
total			5

4.1.1.1 Energy stores and systems

Answer 17 · Mark scheme March 2007 | PHY1A | Original Q4 | Legacy

Four	**A**	0.9	**4**
	B	10	**1**
	C	30	**2**
	D	360	**3**

Answer 18 · Mark scheme June 2007 | PHY1A | Original Q4 | Legacy

Four	**A**	0.38	**4**
	B	2	**2**
	C	38	**3**
	D	60	**1**

Answer 19 · Mark scheme June 2007 | PHY1A | Original Q5 | Legacy

Five	**A**	decreases	**2**
	B	increases	**1**
	C	is unchanged	**4**
	D	rises	**3**

Answer 20 · Mark scheme June 2007 | PHY1A | Original Q7 | Legacy

Seven	**3**	**1**	**3**	**2**

Answer 21 · Mark scheme November 2007 | PHY1A | Original Q1 | Legacy

One	**A**	chemical energy to heat	**3**
	B	electrical energy to heat	**4**
	C	light energy to electrical energy	**1**
	D	kinetic energy to electrical energy	**2**

Answer 22 · Mark scheme November 2007 | PHY1A | Original Q5 | Legacy

Five	**A**	0.05	**4**
	B	5	**2**
	C	95	**3**
	D	100	**1**

4.1.1.1 Energy stores and systems

Answer 23 · Mark scheme

November 2007 | PHY1A | Original Q6 | Legacy

Six	**A**	gravitational potential energy	**1**
	B	kinetic energy	**2**
	C	light energy	**4**
	D	thermal energy	**3**

	A	B	C	D

4.1.1.1 Energy stores and systems

Answer 24 · Mark scheme

Question 1

question	answers	extra information	mark
(a)	electric drill **C** MP3 player **E** toaster **B**		1 1 1
(b)(i)	2100	no unit required / ignore units accept 2.1 kW must have units for this	1
(ii)	**Y**		1
(iii)	bar drawn with any height greater than **Y**	ignore width of bar	1
(c)(i)	any **one** from: • holds more water • works in other countries • boils faster • has a more powerful element • can filter water	answers must be a comparison do **not** accept 1 litre of water on its own accept a named country accept works at 2 voltages do **not** accept 1 kW element on its own ignore can wash filter	1

Question 1 continued on the next page

4.1.1.1 Energy stores and systems

Answer 24 · Mark scheme

PHY1F

Question 1 continued

(ii)	any **one** from: • it weighs less • smaller to pack • cheaper to use	answers must be a comparison **or** state why the chosen feature is an advantage accept boils enough for one drink	1
total			8

4.1.1.1 Energy stores and systems

Answer 24 · Mark scheme

January 2008 | PHY1F | Original Q1 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 25 · Mark scheme

January 2008 | PHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
(a)	any **two** from: • *(*burning*)* fossil fuels produces greenhouse gases / pollutant gases / acid rain / leads to global warming • nuclear fuels produce dangerous waste • fossil fuels are non-renewable • renewable energy resources produce no pollutant gases • large amounts of energy are available • <u>running</u> costs are low	accept a named fossil fuel accept a named pollutant gas accept radioactive for dangerous accept reference to dangers of nuclear fuels accept running out of fuels accept renewable won't run out accept any reasonable benefit of renewables accept any reasonable drawback of non-renewables do **not** accept better for the environment on its own	2
(b)	**R U S T**	all in correct order allow **2** marks for 2 correct allow **1** mark for one correct	3
total			5

4.1.1.1 Energy stores and systems

Answer 25 · Mark scheme

January 2008 | PHY1F | Original Q5 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 26 · Mark scheme

Question 6

question	answers	extra information	mark
(a)(i)	any **one** from: • coal • oil • (natural) gas	do **not** accept fossil fuels accept diesel accept biofuel or a named biofuel eg wood / straw accept household / industrial waste owtte	1
(ii)	0.3	accept 30% if **2** marks not awarded then: allow **1** mark for 30 (without %) allow **1** mark for 0.3 with a unit or % allow **1** mark for identification of energy input and output eg. 20 sq input and 6 sq output **or** 4 sq input and 1.2 sq output **or** 40 sq input and 12 sq output even if subsequent working incorrect allow **1** mark for correct expression of 1.2 over 4 **or** 12 over 40 **or** 6 over 20 (squares)	2
(iii)	(nuclear) fission	accept fision provided it is **not** fusion	1

Question 6 continues on the next page

PHY1F

Question 6 continued

question	answers	extra information	mark
(b)(i)	small proportion of energy / power is wasted **or** transfers most / more / a lot of energy power usefully	accept little / less energy / power / heat is wasted do **not** accept it wastes no energy / power	1
(ii)	it decreases the current / uses low current **or** *it* increases the voltage / potential difference **or** uses high voltage / potential difference smaller the current the smaller the energy loss	 accept pd for potential difference accept power / heat for energy	1 1
(c)(i)	as a control	accept to make a comparison do **not** accept fair test on its own	1
(c)(ii)	so people know how much data the link was based on **or** people can judge the significance / reliability of the link	accept idea that larger numbers are better do **not** accept significance / reliability on its own ignore reference to accuracy	1

Question 6 continues on the next page

PHY1F

Question 6 continued

question	answers	extra information	mark
(iii)	other possible factors may be responsible **or** have not been investigated		1
	named factor eg environment / genetic		1
(iv)	first box ticked plus reason	acceptable reason such as so people know there may be a risk as soon as possible / so that other scientists can use findings	1
	or		
	second box plus reason	acceptable reason such as no point to worry / confuse / panic people *(*until the research has been confirmed*)* accept idea that it may lead to wrong advice do **not** accept in case they are wrong	
total			12

4.1.1.1 Energy stores and systems

Answer 27 · Mark scheme

January 2008 | PHY2F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
(a)	**B** or bungee cords		1
	C or springs or playground ride		1
		each additional answer loses **1** mark minimum mark zero	
	will go back to original shape/size		1
(b)(i)	newton		1
(ii)	0 – 5 (N) or 5	accept1-5 (N) do **not** accept 4	1
(iii)	16 (cm)		1
(iv)	2.5 (N)	accept answer between 2.4 and 2.6 inclusive	1
total			7

4.1.1.1 Energy stores and systems

Answer 27 · Mark scheme

January 2008 | PHY2F | Original Q1 | Legacy

PHY2F

4.1.1.1 Energy stores and systems

Answer 28 · Mark scheme

Question 2

question	answers	extra information	mark
(a)(i)	mass speed	do **not** accept weight accept velocity answers can be in either order	1 1
(ii)	zero	accept nothing	1
(b)(i)	100	allow **1** mark for correct substitution of data	2
(ii)	conserved		1
total			6

4.1.1.1 Energy stores and systems

Answer 28 · Mark scheme

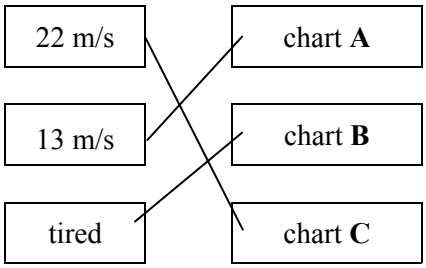
January 2008 | PHY2F | Original Q2 | Legacy

PHY2F

4.1.1.1 Energy stores and systems

Answer 29 · Mark scheme January 2008 | PHY2F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
(a)(i)	constant		1
(ii)	heat		1
(b)(i)	3 links correct  	allow **1** mark for 1 correct link if more than one line is drawn from a condition mark all lines from that condition incorrect	2
(ii)	increased		1
total			5

4.1.1.1 Energy stores and systems

Answer 29 · Mark scheme January 2008 | PHY2F | Original Q3 | Legacy

PHY2F

Answer 30 · Mark scheme March 2008 | PHY1AP | Original Q2 | Legacy

Two	**A**	electrical energy	**3**
	B	thermal energy	**4**
	C	light energy	**1**
	D	kinetic energy	**2**

Answer 31 · Mark scheme March 2008 | PHY1AP | Original Q5 | Legacy

Five	**A**	10	**3**
	B	44	**4**
	C	56	**1**
	D	2000	**2**

Answer 32 · Mark scheme March 2008 | PHY1AP | Original Q7 | Legacy

Seven	**4**	**3**	**3**	**4**

Answer 33 · Mark scheme June 2008 | PHY1AP | Original Q1 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 34 · Mark scheme June 2008 | PHY1AP | Original Q6 | Legacy

No matching mark scheme was available in the supplied archive for this question.

4.1.1.1 Energy stores and systems

Answer 35 · Mark scheme

June 2008 | PHY1AP | Original Q7 | Legacy

No matching mark scheme was available in the supplied archive for this question.

4.1.1.1 Energy stores and systems

Answer 36 · Mark scheme

June 2008 | PHY1F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
(a)	iron	answers can be in any order	1
	hairdryer		1
	kettle		1
(b)	sound		1
(c)	is more efficient than		1
total			5

4.1.1.1 Energy stores and systems

Answer 36 · Mark scheme June 2008 | PHY1F | Original Q1 | Legacy

PHY1F

Answer 37 · Mark scheme November 2008 | PHY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	electrical	**1**
	B	heat	**4**
	C	light	**2**
	D	sound	**3**

Answer 38 · Mark scheme November 2008 | PHY1AP | Original Q5 | Legacy

Five	**A**	0.6	**4**
	B	5	**3**
	C	15	**2**
	D	30	**1**

	A	**B**	**C**	**D**

4.1.1.1 Energy stores and systems

Answer 39 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	light electrical	correct order only	1 1
3(b)(i)	0.2 **or** 1/5	accept 20% for both marks allow **1** mark for correct substitution answer of 0.2% **or** 20 gains **1** mark ignore units	2
3(b)(ii)	wasted	accept transformed to heat / other forms accept transferred to the air / surroundings sound = neutral	1
3(c)(i)	any **one** from: • can fly at night • can stay in the air for longer • can fly in the winter • can fly faster	 accept can fly when it is cloudy accept as a back-up increases power is neutral	1

Question 3 continues on the next page

PHY1F

Question 3 continued

question	answers	extra information	mark
3(c)(ii)	any **one** from: • produces no (pollutant) gases **or** no greenhouse gases • produces no / less noise • less demand for fuels	accept named gas accept no air pollution do **not** accept no pollution accept less global warming accept harmful for pollutant accept produces no carbon do **not** accept environmentally friendly accept any other sensible environmental advantage	1
3(c)(iii)	accept any sensible suggestion eg, map the Earth's surface / weather forecasting / spying / monitoring changes to the Earth's atmosphere, etc	do **not** accept ideas in terms of transporting accept use as a satellite	1
Total			**8**

4.1.1.1 Energy stores and systems

Answer 39 · Mark scheme January 2009 | PHY1F | Original Q3 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 40 · Mark scheme

Question 6

question	answers	extra information	mark
6(a)(i)	silvered surfaces	more than the correct number of ticks in a row negates the mark	1
	radiation		1
	plastic cap conduction convection } both required		

	conduction	convection	radiation
vacuum	✓	✓	
silvered surfaces			✓
plastic cap	✓	✓	

(1)

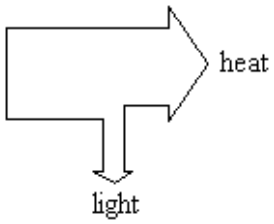
(1)

6(a)(ii)	because there are no particles in a vacuum	any mention of air or any other substance in a vacuum scores zero accept atoms / molecules for particles accept vacuum is empty space accept there is nothing in a vacuum accept there is no air / gas in the vacuum	1
	conduction **and** convection need particles / medium	need reference to both conduction **and** convection accept correct descriptions	1

Question 6 continues on the next page

PHY1F

Question 6 continued

question	answers	extra information	mark
6(b)(i)	less heat lost (to air above the heater) light shiny surfaces are poor emitters (of radiation) **or** dull, matt surfaces are good emitters (of radiation)	do **not** accept **no** heat lost accept radiators for emitters references to reflection are neutral do **not** credit answers which infer reflection from the underside of the hood ignore correct reference to absorption	1 1
6(b)(ii)	correct diagram drawn with one output arrow narrower than the other arrows correctly labelled with energy form eg  	flow charts score zero ignore input	1 1
6(b)(iii)	energy cannot be destroyed	accept (principle of) conservation of energy do **not** accept because energy cannot be lost without clarification	1
Total			**9**

4.1.1.1 Energy stores and systems

Answer 40 · Mark scheme

January 2009 | PHY1F | Original Q6 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 41 · Mark scheme

Question 7

question	answers	extra information	mark
7(a)	9	allow **1** mark for correct substitution (1.8 × 5) an answer of 9000 gains **1** mark an answer of 2 or 15 gains **1** mark	2
7(b)	(3 kW) fan heater	accept 3 kW accept the middle one	1

Question 7 continues on the next page

PHY1F

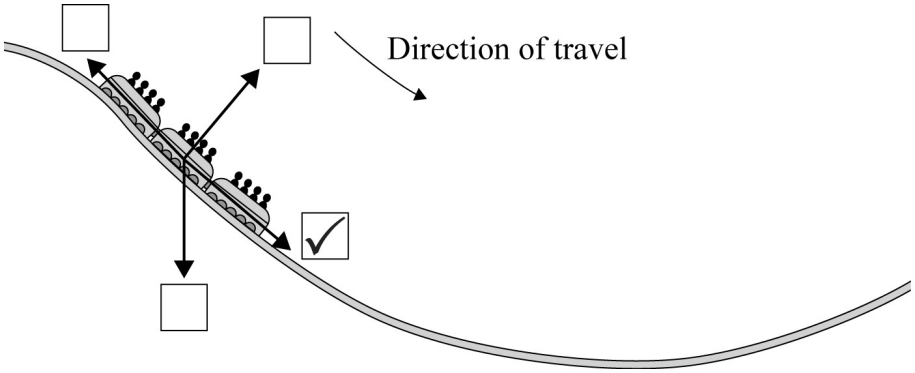
Question 7 continued

7(c)		features common to more than one heater, treat as neutral	
	<u>oil-filled</u>		
	low level heat		1
	cannot be knocked over / space saving / no trailing wires **or** more control over heat output	do **not** accept just wall-mounted do **not** accept just 3 heat settings	
	<u>fan</u>		
	warms (office) rapidly **or** can be used to cool air (in summer)	 accept can be used as a fan accept cool air fan (setting) accept 'it has a cool air setting in case it gets too hot' do **not** accept a specific reference to cooling the heater	1
	<u>ceramic</u>		
	can be switched on for set periods of time **or** can be switched on before office is used / switched off automatically at night	do **not** accept just has a timer	1
Total			**6**

4.1.1.1 Energy stores and systems

Answer 42 · Mark scheme

Question 7

question	answers	extra information	mark
7(a)	correct box ticked 		1
7(b)	each passenger has a different mass	accept weight for mass ignore other irrelevant factors about the person e.g. mass and height do **not** accept a list with incorrect factors e.g. mass and position accept passengers started with different (gravitational) potential energy	1
7(c)(i)	30	ignore added units	1
7(c)(ii)	2400	accept their (c)(i) × 80 correctly calculated for both marks allow **1** mark for correct substitution of their (c)(i) and 80 an answer of 800 gains **1** mark only if answer to (c)(i) is not 10	2
Total			**5**

4.1.1.1 Energy stores and systems

Answer 42 · Mark scheme January 2009 | PHY2F | Original Q7 | Legacy

PHY2F

Answer 43 · Mark scheme March 2009 | PHY1AP | Original Q6 | Legacy

Six	**1**	**3**	**1**	**2**

Answer 44 · Mark scheme March 2009 | PHY1AP | Original Q7 | Legacy

Seven	**3**	**2**	**4**	**1**

Answer 45 · Mark scheme March 2009 | PHY1AP | Original Q9 | Legacy

Nine	**3**	**3**	**2**	**1**

4.1.1.1 Energy stores and systems

Answer 45 · Mark scheme

March 2009 | PHY1AP | Original Q9 | Legacy

SCIENCE A (4461)/PHYSICS (4451)

Objective Test Answer Key

PHY1AP (Energy and Electricity)

March 2009

Higher Tier

Question	Key		
One	**A**	conduction	**1**
	B	convection	**2**
	C	insulation	**4**
	D	radiation	**3**
Two	**A**	generator	**2**
	B	grid	**4**
	C	transformer	**3**
	D	turbine	**1**

	A	B	C	D
Three	**4**	**3**	**1**	**3**
Four	**3**	**3**	**2**	**1**
Five	**1**	**1**	**1**	**4**
Six	**3**	**4**	**3**	**3**
Seven	**4**	**1**	**4**	**1**
Eight	**3**	**1**	**4**	**2**
Nine	**2**	**1**	**4**	**2**

4.1.1.1 Energy stores and systems

Answer 46 · Mark scheme June 2009 | PHY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	fan	**3**
	B	lamp	**2**
	C	oven	**4**
	D	radio	**1**

Answer 47 · Mark scheme June 2009 | PHY1AP | Original Q4 | Legacy

Four	**A**	electrical	**3**
	B	gravitational potential	**1**
	C	heat (thermal energy)	**4**
	D	kinetic	**2**

Answer 48 · Mark scheme June 2009 | PHY1AP | Original Q6 | Legacy

Six	**1**	**3**	**1**	**1**

Answer 49 · Mark scheme June 2009 | PHY1AP | Original Q9 | Legacy

Nine	**3**	**3**	**1**	**2**

Answer 50 · Mark scheme November 2009 | PHY1AP | Original Q5 | Legacy

Five	**A**	0.6	**4**
	B	140	**2**
	C	200	**3**
	D	300	**1**

	A	**B**	**C**	**D**

Answer 51 · Mark scheme March 2010 | PHY1AP | Original Q2 | Legacy

Two	**A**	heat (thermal energy)	**1**
	B	light	**3**
	C	movement (kinetic energy)	**4**
	D	sound	**2**

4.1.1.1 Energy stores and systems

Answer 52 · Mark scheme March 2010 | PHY1AP | Original Q3 | Legacy

Three	**A**	electric kettle	**2**
	B	electric oven	**4**
	C	electric shower	**1**
	D	flat-screen television	**3**

Answer 53 · Mark scheme March 2010 | PHY1AP | Original Q5 | Legacy

Five	**A**	0.25	**4**
	B	60	**3**
	C	100	**1**
	D	240	**2**

	A	**B**	**C**	**D**

Answer 54 · Mark scheme June 2010 | PHY1AP | Original Q1 | Legacy

Question	***Key***		
One	**A**	chemical energy	**4**
	B	electrical energy	**3**
	C	heat (thermal energy)	**2**
	D	kinetic energy	**1**

Answer 55 · Mark scheme June 2010 | PHY1AP | Original Q6 | Legacy

Six	2	2	3	2

Answer 56 · Mark scheme June 2010 | PHY1AP | Original Q7 | Legacy

Seven	2	3	1	2

4.1.1.1 Energy stores and systems

Answer 57 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)(i)	2(.0)	accept 2000 W or 2000 watt(s) accept answer given in table do **not** accept 2000	1
3(a)(ii)	4.5	 allow **1** mark for correct substitution ie 1.5 × 3 allow **1** mark for the answers 1.5 or 6(.0)	2
3(a)(iii)	54 **or** their (a)(ii) × 12 correctly calculated	 allow **1** mark for correct substitution ie 4.5 × 12 **or** their (a)(ii) × 12 allow **1** mark if correct answer is given in pounds eg £54	2

Question 3 continues on the next page . . .

PHY1F

Question 3 continued . . .

question	answers	extra information	mark
3(b)(i)	6 pm temperature starts to rise faster **or** graph (line) is steeper / steepest	 only scores if 6 pm given it refers to graph gradient or temperature accept answers in terms of relative temperature rise eg 5 to 6 pm 2 °C rise, 6 to 7 pm 6 °C rise accept temperature rises sharply / rapidly / quickly do **not** accept temperature starts to rise	1 1
3(b)(ii)	middle box ticked		1
Total			**8**

4.1.1.1 Energy stores and systems

Answer 57 · Mark scheme June 2010 | PHY1F | Original Q3 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 58 · Mark scheme

June 2010 | PHY2F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	75 000 newtons / N	accept correct substitution for **1** mark ie 7500 × 10 do **not** accept n full credit for using g = 9.8 **or** 9.81	2 1
6(a)(ii)	60 000 000	accept for both marks their (a)(i) × 800 correctly calculated accept correct substitution for **1** mark ie their (a)(i) × 800	2
6(b)(i)	arrow drawn parallel (to) **and** down (the) slope	accept arrow drawn anywhere on the diagram	1
6(b)(ii)	increases GPE transformed to KE **or** speed increasing	 accept is accelerating however 'speed increasing' only scores if correctly linked to increasing kinetic energy	1 1
6(c)	so more likely to wear one **or** they know wearing a helmet is likely to / will reduce (risk) head injury **or** so can make an (informed) choice (about wearing one)		1
Total			**9**

4.1.1.1 Energy stores and systems

Answer 58 · Mark scheme June 2010 | PHY2F | Original Q6 | Legacy

PHY2F

Answer 59 · Mark scheme November 2010 | PHY1AP | Original Q3 | Legacy

Three	**A**	chemical	**1**
	B	electrical	**3**
	C	heat	**4**
	D	kinetic	**2**

Answer 60 · Mark scheme November 2010 | PHY1AP | Original Q5 | Legacy

Five	**A**	electric drill	**1**
	B	desk lamp	**3**
	C	hair dryer	**2**
	D	television	**4**

	A	**B**	**C**	**D**

Answer 61 · Mark scheme November 2010 | PHY1AP | Original Q6 | Legacy

Six	**2**	**4**	**2**	**1**

4.1.1.1 Energy stores and systems

Answer 62 · Mark scheme

Question 2

question	answers	extra information	mark
2(a)	45(p)	accept £0.45 for both marks allow **1** mark for correct substitution ie 3 × 15 do **not** award any marks if 45 is used in a subsequent calculation to obtain a final answer	2
2(b)	straight line drawn from origin passing through (1,1)	line must reach 1,1 but does not need to continue beyond	1
Total			**3**

4.1.1.1 Energy stores and systems

Answer 62 · Mark scheme January 2011 | PHY1F | Original Q2 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 63 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)	kinetic		1
5(b)	**Z**		1
5(c)(i)	generates a lot more energy / electricity / power **or** can supply (energy / electricity / power) to more homes	need fewer conventional large-scale hydroelectric power stations is neutral	1
5(c)(ii)	Large areas of land are flooded.		1
5(d)(i)	National Grid	this answer only	1
5(d)(ii)	less energy / heat loss (from the cables)	accept wasted for loss accept answers in terms of fewer transformers needed do **not** accept less electricity lost / wasted do **not** accept no energy lost	1

Question 5 continues on the next page . . .

PHY1F

Question 5 continued . . .

question	answers	extra information	mark
5(e)	any **one** from: • fewer rivers (suitable for generators) • less mountainous (so rivers fall smaller distances)	accept answers in terms of difficulty linking villages and towns to grid (in Nepal) accept answers in terms of more isolated communities accept answers in terms of UK having more resources for large-scale power stations	1
Total			**7**

4.1.1.1 Energy stores and systems

Answer 63 · Mark scheme January 2011 | PHY1F | Original Q5 | Legacy

PHY1F

Answer 64 · Mark scheme June 2011 | PHY1AP | Original Q5 | Legacy

Five	**A** 10%	**2**
	B 20%	**3**
	C 40%	**4**
	D 50%	**1**

	A	**B**	**C**	**D**

Answer 65 · Mark scheme June 2011 | PHY1AP | Original Q7 | Legacy

Seven	**2**	**2**	**3**	**2**

4.1.1.1 Energy stores and systems

Answer 66 · Mark scheme

June 2011 | PHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	radio gives out sound **or** others give out heat / thermal energy	radio must be chosen for reason to score inclusion of other forms of energy negates mark	1 1
5(b)	Kettle	accept 2.5 (kW)	1
5(c)	60 (p)	accept £0.6(0) allow **1** mark for correct substitution ie 4 × 15 substitution only scores if no subsequent step shown £60 scores **1** mark	2
5(d)	(bigger volume) takes more time (to boil) (so) more energy transferred (and) this costs more money	accept explanation using data from graph do **not** accept electricity for energy ignore references to cost of water	1 1 1
Total			**8**

4.1.1.1 Energy stores and systems

Answer 66 · Mark scheme June 2011 | PHY1F | Original Q5 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 67 · Mark scheme

June 2011 | PHY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	heat / thermal **or / and** sound	do **not** accept noise other forms of energy eg light negates answer	1
6(b)	0.4 **or** 40 %	allow **1** mark for $\frac{2000}{5000}$ **or** equivalent fraction an answer 0.4 % gains **1** mark answers 0.4 or 40 given with any unit gains **1** mark 40 without % gains **1** mark	2
Total			**3**

4.1.1.1 Energy stores and systems

Answer 67 · Mark scheme June 2011 | PHY1F | Original Q6 | Legacy

PHY1F

4.1.1.1 Energy stores and systems

Answer 68 · Mark scheme

June 2011 | PHY2F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	lorry greatest mass	reason only scores if lorry chosen accept weight for mass accept heaviest accept correct calculations for all 3 vehicles the biggest is insufficient	1 1
3(a)(ii)	2450	allow **1** mark for correct substitution ie 175 × 14	2
3(b)(i)	increases	accept any clear indication of the correct answer	1
3(b)(ii)	speed increases	accept velocity for speed accept gets faster do **not** accept it accelerates on its own moves more is insufficient	1
3(b)(iii)	straight line going to 6, 20 horizontal line from 6,20 to 8,20	allow **1** mark for a curve going to 6,20 **or** a straight line diagonally upwards but missing 6,20 allow a horizontal line from where their **diagonal** meets 20m/s to 8,20	2 1
Total			**9**

4.1.1.1 Energy stores and systems

Answer 68 · Mark scheme June 2011 | PHY2F | Original Q3 | Legacy

PHY2F

Answer 69 · Mark scheme November 2011 | PHY1AP | Original Q3 | Legacy

Three	**A**	conduction	**2**
	B	convection	**3**
	C	radiation	**1**
	D	reflection	**4**

Answer 70 · Mark scheme November 2011 | PHY1AP | Original Q7 | Legacy

Seven	**4**	**3**	**3**	**3**

4.1.1.1 Energy stores and systems

Answer 71 · Mark scheme

June 2012 | PH1FP | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	fan drill washing machine	four circled including correct three scores **1** mark five circled scores zero	1 1 1
1(b)	Appliances only transfer part of the energy usefully The energy transferred by appliances makes the surroundings warmer		1 1
Total			**5**

4.1.1.1 Energy stores and systems

Answer 71 · Mark scheme June 2012 | PH1FP | Original Q1 | Legacy

PH1FP

4.1.1.1 Energy stores and systems

Answer 72 · Mark scheme

June 2012 | PH1FP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	A		1
4(a)(ii)	bar drawn with correct height	ignore width of bar	1
4(b)(i)	2.4	$E = P \times t$ allow **1** mark for correct substitution ie 1.2×2 provided no subsequent step shown	2
4(b)(ii)	36 or their (b)(i) $\times$ 15 correctly calculated **or** their (b)(i) $\times$ 0.15 correctly calculated with an answer given in £	allow **1** mark for correct substitution ie 2.4×15 **or** their (b)(i) $\times$ 15 allow **1** mark for correct substitution provided no subsequent step shown an answer £0.36 gains both marks	2
Total			**6**

4.1.1.1 Energy stores and systems

Answer 72 · Mark scheme June 2012 | PH1FP | Original Q4 | Legacy

PH1FP

4.1.1.1 Energy stores and systems

Answer 73 · Mark scheme

June 2012 | PH1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	any **two** from: • black is a good emitter of (infrared radiation) • large surface (area) • matt surfaces are better emitters (than shiny surfaces)	accept heat for radiation ignore reference to absorbing radiation accept matt surfaces are good emitters ignore reference to good conductor	2
7(b)	90 % or 0.9(0)	efficiency = useful energy out / total energy in (×100%) allow **1** mark for correct substitution ie 13.5 / 15 provided no subsequent step shown an answer of 90 scores **1** mark an answer of 90 / 0.90 with a unit scores **1** mark	2
7(c)	(producing) light	allow (producing) sound	1

Question 7 continues on the next page

PH1FP

Question 7 continued

question	answers	extra information	mark
7(d)	any **two** from: • wood is renewable • (using wood) conserves fossil fuels • wood is carbon neutral	 accept wood grows again / quickly accept wood can be replanted accept doesn't use fossil fuels accept a description cheaper / saves money is insufficient	2
7(e)	2 550 000 joules /J	$E = m \times c \times \theta$ allow **1** mark for correct substitution ie $100 \times 510 \times 50$ provided no subsequent step shown answers of 1 020 000, 3 570 000 gain **1** mark accept kJ / MJ do **not** accept j for full credit the unit and numerical answer must be consistent	2 1
Total			**10**

4.1.1.1 Energy stores and systems

Answer 73 · Mark scheme

June 2012 | PH1FP | Original Q7 | Legacy

PH1FP

4.1.1.1 Energy stores and systems

Answer 74 · Mark scheme

Question 9

question	answers	extra information	mark
9(a)(i)	5(.0)		1
9(a)(ii)	35 **or** their (a)(i) × 7 correctly calculated	allow **1** mark for correct substitution, ie 5 **or** their (a)(i) × 7 provided no subsequent step shown	2
9(a)(iii)	525(p) **or** (£) 5.25 **or** their (a)(ii) × 15 correctly calculated	if unit p or £ given they must be consistent with the numerical answer	1
9(a)(iv)	decreases temperature difference (between inside and outside) decreases	 accept gradient (of line) decreases do **not** accept temperature (inside) decreases do **not** accept graph goes down	1 1
9(b)(i)	air (bubbles are) trapped (in the foam) (and so the) air cannot circulate / move / form convection current	do **not** accept air traps heat foam has air pockets is insufficient air is a good insulator is insufficient no convection current is insufficient answers in term of warm air from the room being trapped are incorrect and score no marks	1 1

Question 9 continues on the next page . . .

PH1FP

Question 9 continued . . .

question	answers	extra information	mark
9(b)(ii)	how effective / good a material is as an insulator / at keeping energy in	accept heat for energy accept the lower the U-value the better the insulator accept the lower the U-value the lower the rate of energy / heat transfer	1
9(c)	it will increase because the glass is not (such) a good insulator (as the wall)	room will be cooler is insufficient the U-value has increased is insufficient	1 1
Total			**11**

UMS Conversion Calculator: www.aqa.org.uk/umsconversion

4.1.1.1 Energy stores and systems

Answer 75 · Mark scheme

January 2013 | PH2FP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	50 (Hz)		1
4(a)(ii)	2760 (W)		1
4(b)	12 amps	allow **1** mark for correct substitution, ie 2400/200 **or** allow **1** mark for 2760/230 provided no subsequent step shown	2 1
4(c)	the charge is directly proportional to the time switched on for	accept for **1** mark the longer time (to boil), the greater amount of charge **or** positive correlation **or** they are proportional	2
Total			**7**

4.1.1.1 Energy stores and systems

Answer 75 · Mark scheme

January 2013 | PH2FP | Original Q4 | Legacy

PH2FP

4.1.1.1 Energy stores and systems

Answer 76 · Mark scheme

June 2013 | PH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	temperature (increase) and time switched on are <u>directly proportional</u>	accept the idea of equal increases in time giving equal increases in temperature answers such as: • as time increases, temperature increases • positive correlation • linear relationship • temperature and time are proportional score **1** mark	2
6(a)(ii)	any **one** from: • energy transfer (from the block) to the surroundings • (some) energy used to warm the heater / thermometer (itself) • (metal) block is not insulated	"it" refers to the metal block accept lost for transfer accept air for surroundings accept takes time for heater to warm up	1
6(a)(iii)	15 000	allow **1** mark for correct substitution, ie 50 × 300 provided no subsequent step shown	2
6(b)	lead needs least energy to raise temperature by 1°C	reason only scores if lead is chosen accept needs less energy to heat it (by the same amount) lowest specific heat capacity is insufficient	1 1

Question 6 continues on the next page . . .

Answer 76 · Mark scheme

PH1FP

Question 6 continued . . .

question	answers	extra information	mark
6(c)(i)	convection conduction	correct order only	1 1
6(c)(ii)	¾ (year) **or** 0.75 **or** 9 months **or** 274 days	allow **1** mark for correct method, ie $\frac{12}{16}$ shown	2
Total			**11**

4.1.1.1 Energy stores and systems

Answer 76 · Mark scheme

June 2013 | PH1FP | Original Q6 | Legacy

PH1FP

4.1.1.1 Energy stores and systems

Answer 77 · Mark scheme

June 2013 | PH1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	warms it	do **not** accept answers in terms of waste gases **or** pollution	1
7(b)	80% **or** 0.8	answers of 80 **or** 0.8 plus a unit gain **1** mark **only** **or** allow **1** mark for a correct substitution, ie $\frac{16}{20}$ an answer of 35% **or** 0.35 gains **1** mark answers of 85%, 75%, 0.85 **or** 0.75 gain **1** mark	2
7(c)	some of the energy that would be wasted (by a coal-burning power station) is usefully used (to heat homes etc)	accept less waste energy accept energy used to heat homes etc	1 1
7(d)(i)	A system of cables and transformers		1
7(d)(ii)	less energy / power loss / wasted (in shorter cables)	accept no energy / power loss / wasted (in shorter cables) accept energy is lost when transmitted through cables do **not** accept electricity for energy	1
Total			**7**

4.1.1.1 Energy stores and systems

Answer 77 · Mark scheme

June 2013 | PH1FP | Original Q7 | Legacy

PH1FP

4.1.1.1 Energy stores and systems

Answer 78 · Mark scheme

June 2013 | PH1FP | Original Q9 | Legacy

Question 9

question	answers	extra information	mark
9(a)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5.		6

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	There is a basic explanation of **one** feature **or** a simple statement relating reduction in energy transfer to **one** feature.	There is a clear explanation of **one** feature **or** a simple statement relating reduction in energy transfer to **two** features.	There is a detailed explanation of at least **two** features **or** a simple statement relating reduction in energy transfer to all **four** features.

examples of the points made in response	extra information
plastic cap: • plastic is a poor conductor • stops convection currents forming at the top of the flask so stopping energy transfer by convection • molecules / particles evaporating from the (hot) liquid cannot move into the (surrounding) air so stops energy transfer by evaporation • plastic cap reduces / stops energy transfer by conduction / convection / evaporation glass container: • glass is a poor conductor so reducing energy transfer by conduction • glass reduces / stops energy transfer by conduction	accept throughout: heat for energy loss for transfer accept insulator for poor conductor

Question 9 continues on the next page . . .

PH1FP

Question 9 continued . . .

question	answers	extra information	mark
	vacuum: • both conduction and convection require a medium / particles • so stops energy transfer between the two walls by conduction and convection • vacuum stops energy transfer by conduction / convection silvered surfaces: • silvered surfaces reflect infrared radiation • silvered surfaces are poor emitters of infrared radiation • infrared radiation (partly) reflected back (towards hot liquid) • silvered surfaces reduce / stop energy transfer by radiation	accept heat for infrared	
9(b)	(the ears have a) small <u>surface area</u> so reducing energy radiated / transferred (from the fox)	ears are small is insufficient accept heat lost for energy radiated do **not** accept stops heat loss	1 1
Total			**8**

UMS Conversion Calculator: www.aqa.org.uk/umsconversion

4.1.1.1 Energy stores and systems

Answer 79 · Mark scheme

June 2013 | PH2FP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	potential		1
4(b)(i)	13 200	allow **1** mark for correct substitution, ie 660 × 20 provided no subsequent step shown	2
4(b)(ii)	16.5 **or** $\frac{\text{their (b)(i)}}{800}$ correctly calculated	allow **1** mark for correct substitution, ie $\frac{13\,200}{800}$ **or** $\frac{\text{their (b)(i)}}{800}$ provided no subsequent step shown	2
Total			**5**

4.1.1.1 Energy stores and systems

Answer 79 · Mark scheme

June 2013 | PH2FP | Original Q4 | Legacy

PH2FP

4.1.1.1 Energy stores and systems

Answer 80 · Mark scheme

Question	Answers	Extra information	Mark	AO spec ref
5(a)(i)	any **two** from: • mass (of block) • starting temperature • final / increase in temperature • voltage / p.d. • power (supplied to each block) • type / thickness of insulation	accept weight for mass temperature is insufficient same power supply insufficient same insulation insufficient	2	AO2 4.3.2a
5(a)(ii)	one of variables is categoric **or** (type of) material is categoric	accept the data is categoric accept a description of categoric do **not** accept temp rise is categoric	1	AO3 4.4.2c
5(a)(iii)	concrete (heater on for) longest / longer time	reason only scores if concrete chosen a long time or quoting a time is insufficient do **not** accept it is the highest bar	1 1	AO2 AO3 1.3.1c
5(a)(iv)	4500 (J)	allow **1** mark for correct substitution ie 2 × 450 × 5 provided no subsequent step shown	2	AO2 1.1.4d

Question 5 continues on the next page . . .

Question 5 continued . . .

Question	Answers	Extra information	Mark	AO spec ref
5(b)(i)	point at 10 minutes identified		1	AO3 1.1.4
5(b)(ii)	line through all points except anomalous	line must go from at least first to last point	1	AO2 1.1.4
5(b)(iii)	20 (°C)	if 20^0C is given, award the mark. If an answer other than 20^0C is given, look at the graph. If the graph shows a correct extrapolation of the candidate's best-fit line and the intercept value has been correctly stated, allow 1 mark.	1	AO3 1.1.4
5(b)(iv)	2 (minutes)		1	AO3 1.1.4
Total			**11**	

4.1.1.1 Energy stores and systems

Answer 81 · Mark scheme June 2014 | PH2FP | Original Q7 | Legacy

7(a)	450	allow **1** mark for correct substitution, ie 18 × 10 × 2.5 provided no subsequent step shown	2	AO2 2.2.1f
7(b)(i)	friction between child ('s clothing) and slide causes electron / charge transfer (between child and slide)	accept friction between two insulators accept child rubs against the slide accept when two insulators rub (together) accept specific reference, eg electrons move onto / off the child / slide reference to positive electrons / protons / positive charge / atoms transfer negates this mark answers in terms of the slide being initially charged score zero	1 1	AO1 2.3.1a
7(b)(ii)	all the charges (on the hair) are the same (polarity) charges / hairs are repelling	accept (all) the charge/hair is negative / positive accept it is positive/negative both parts should be marked together	1 1	AO3 2.3.1d
7(b)(iii)	charge would pass through the metal (to earth)	accept metal is a conductor accept metal is not an insulator accept there is no charge / electron transfer accept the slide is earthed accept metals contain free electrons	1	AO1 2.3.1e
Total			**7**	

4.1.1.1 Energy stores and systems

Answer 81 · Mark scheme

June 2014 | PH2FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO spec ref

4.1.1.1 Energy stores and systems

Answer 82 · Mark scheme

8(a)(i)	friction		1	AO1 2.1.3a

8(a)(ii)	air resistance	accept drag friction is insufficient	1	AO1 2.1.3a

8(a)(iii)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.		**Mark** **6**	**AO spec ref**
0 marks	**Level 1 (1–2 marks)**	**Level 2 (3–4 marks)**	**Level 3 (5–6 marks)**	AO2 AO3 2.1.4c
No relevant content.	There is an attempt to explain in terms of forces A and B why the velocity of the cyclist changes between any two points **or** a description of how the velocity changes between any two points.	There is an explanation in terms of forces A and B of how the velocity changes between X and Y and between Y and Z **or** a complete description of how the velocity changes from X to Z. **or** an explanation and description of velocity change for either X to Y or Y to Z	There is a clear explanation in terms of forces A and B of how the velocity changes between X and Z **and** a description of the change in velocity between X and Z.	

Answer 82 · Mark scheme

examples of the points made in the response	extra information
X to Y • at X force A is greater than force B • cyclist accelerates • and velocity increases • as cyclist moves toward Y, force B (air resistance) increases (with increasing velocity) • resultant force decreases • cyclist continues to accelerate but at a smaller value • so velocity continues to increase but at a lower rate **Y to Z** • from Y to Z force B (air resistance) increases • acceleration decreases • force B becomes equal to force A • resultant force is now zero • acceleration becomes zero • velocity increases until… • cyclist travels at constant / terminal velocity	accept speed for velocity throughout

Question	Answers	Extra information	Mark	AO spec ref
8(b)(i)	3360	allow **1** mark for correct substitution, ie 140 × 24 provided no subsequent step accept 3400 for **2** marks if correct substitution is shown	2	AO1 AO2 2.2.1b
	joule / J	do **not** accept j do **not** accept Nm	1	
8(b)(ii)	decreases	accept an alternative word / description for decrease do not accept slows down	1	AO1 2.1.3e
	temperature	accept thermal energy accept heat	1	
Total			**13**	

4.1.1.1 Energy stores and systems

Answer 83 · Mark scheme June 2015 | PH1FP | Original Q2 | Legacy

The full source mark scheme begins on page 302. Follow original question 2 in that document.

Answer 84 · Mark scheme June 2015 | PH1FP | Original Q3 | Legacy

The full source mark scheme begins on page 302. Follow original question 3 in that document.

Answer 85 · Mark scheme June 2015 | PH1FP | Original Q4 | Legacy

The full source mark scheme begins on page 302. Follow original question 4 in that document.

Answer 86 · Mark scheme June 2015 | PH2FP | Original Q3 | Legacy

The full source mark scheme begins on page 318. Follow original question 3 in that document.

Answer 87 · Mark scheme June 2015 | PH2FP | Original Q5 | Legacy

The full source mark scheme begins on page 318. Follow original question 5 in that document.

4.1.1.1 Energy stores and systems

Answer 88 · Mark scheme June 2016 | PH1FP | Original Q1 | Legacy

The full source mark scheme begins on page 333. Follow original question 1 in that document.

Answer 89 · Mark scheme June 2016 | PH1FP | Original Q2 | Legacy

The full source mark scheme begins on page 333. Follow original question 2 in that document.

Answer 90 · Mark scheme June 2016 | PH1FP | Original Q5 | Legacy

The full source mark scheme begins on page 333. Follow original question 5 in that document.

4.1.1.1 Energy stores and systems

Answer 91 · Mark scheme June 2016 | PH2FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	gravity	accept weight for gravity air resistance is insufficient	1	AO1 2.2.1f
6(b)(i)	800	allow **1** mark for correct substitution ie $P = \frac{2240}{2.8}$ provided no subsequent step	2	AO2 2.2.1e
6(b)(ii)	2240 J		1	AO1 2.2.1f
6(c)(i)	(vertical) height	accept (height of) stairs	1	AO3 2.2.1f
6(c)(ii)	a fast / short time (for a lighter student) may give the greatest power **or** a slow / long time (for a heavy student) may give the least power	accept time is a factor fitness is insufficient	1	AO3 2.2.1e
Total			**6**	

4.1.1.1 Energy stores and systems

Answer 91 · Mark scheme

June 2016 | PH2FP | Original Q6 | Legacy



4.1.1.1 Energy stores and systems

Answer 92 · Mark scheme

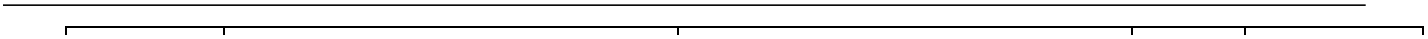
June 2017 | PH1FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	radiation conduction		1 1	AO2 1.1.3a 1.1.3c
1(b)	biofuel		1	AO1 1.4.1a
1(c)	83 600 000 (J)	accept 83600 kJ or 83.6 MJ allow **1** mark for correct substitution provided no subsequent step ie E = 250 x 880 x 380	2	AO2 1.1.4d
Total			**5**	

4.1.1.1 Energy stores and systems

Answer 92 · Mark scheme

June 2017 | PH1FP | Original Q1 | Legacy



4.1.1.1 Energy stores and systems

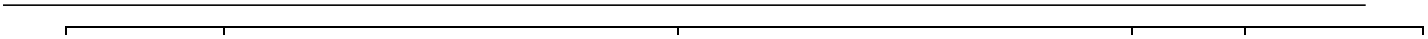
Answer 93 · Mark scheme June 2017 | PH1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	expands	accept rises	1	AO1 1.1.3a
	dense		1	
	rises	accept moves	1	
	current		1	
		an answer of rises scores only once for either the first or third blank		
5(b)	any **two** from: • shape • surface area • room temperature • (surface) colour • thickness of material • how good an insulator it is	ignore temperature of water ignore size accept if it has a cover	2	AO1 AO3 1.1.3c
Total			**6**	

4.1.1.1 Energy stores and systems

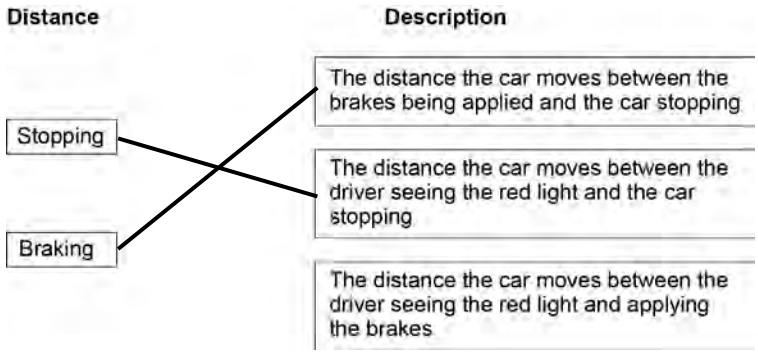
Answer 93 · Mark scheme

June 2017 | PH1FP | Original Q5 | Legacy



4.1.1.1 Energy stores and systems

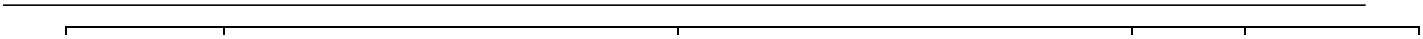
Answer 94 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	 If more than one line goes from a 'distance' box, all those lines are incorrect		2	AO1 2.1.3c
2(b)(i)	0.8s		1	AO2 2.1.3c
2(b)(ii)	increases thinking distance so increases (overall) stopping distance	 takes longer to stop more likely to have an accident is insufficient	1 1	AO1 2.1.3c, d
2(b)(iii)	$\frac{1}{2} \times 750 \times 8^2$		1	AO2 2.2.1g
2(b)(iv)	decrease(s) increase(s)	correct order only	1 1	AO1 2.1.3e
Total			8	

4.1.1.1 Energy stores and systems

Answer 94 · Mark scheme

June 2017 | PH2FP | Original Q2 | Legacy



4.1.1.1 Energy stores and systems

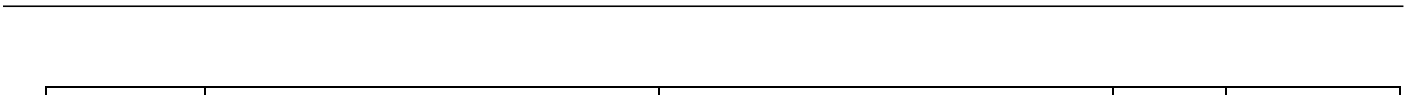
Answer 95 · Mark scheme June 2018 | 8463/1F | Original Q1

Question	Answers	Extra information	Mark	AO/ Spec. Ref
01.1	chemical kinetic	in this order only	1 1	AO1 4.1.1.1
01.2	$E_k = 0.5 \times 80 \times 12^2$ $E_k = 5760$ (J)	an answer of 5760 (J) scores **2** marks	1 1	AO2 4.1.1.2
01.3	E = 0.040 × 480 × 50 E = 960 (J)	an answer of 960 (J) scores **2** marks	1 1	AO2 4.1.1.3
01.4	increased		1	AO1 4.3.2.1
Total			**7**	

4.1.1.1 Energy stores and systems

Answer 95 · Mark scheme

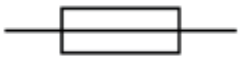
June 2018 | 8463/1F | Original Q1



4.1.1.1 Energy stores and systems

Answer 96 · Mark scheme

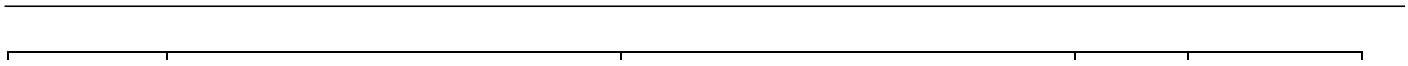
June 2018 | 8463/1F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1			1	AO1 4.2.1.1
07.2	E = 13 × 230 E = 2990 (J)	an answer 2990 (J) scores **2** marks	1 1	AO2 4.2.4.2
07.3	charge flow = current x time	allow Q = It	1	AO1 4.2.1.2
07.4	1.52 = I × 0.40 $I = \frac{1.52}{0.40}$ I = 3.8 (A)	an answer of 3.8 (A) scores **3** marks	1 1 1	AO2 4.2.1.2
07.5	E = 0.00175 × 205 000 E = 359 (J)	an answer of 359 (J) scores **2** marks allow an answer that rounds to 360 (J) for **2** marks	1 1	AO2 4.3.2.3
Total			**9**	

4.1.1.1 Energy stores and systems

Answer 96 · Mark scheme

June 2018 | 8463/1F | Original Q7



4.1.1.1 Energy stores and systems

Answer 97 · Mark scheme

June 2018 | 8463/1F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	higher		1	AO2 4.1.2.1
08.2	low(er) hot(ter)	 allow warm(er)	1 1	AO1 4.1.2.1
08.3	advantage: • water heated continuously (by the Sun) **one** disadvantage from: • temperature of water is lower (for most of the time than water heated by immersion heater) • water may not be hot enough • it takes longer to heat the water	 allow less control over water temperature	 1 1	AO3 4.1.3
08.4	$\frac{4\ 030\ 000}{4\ 070\ 000}$ 0.99	an answer of 0.99 scores **2** marks allow an answer that rounds to 0.99 for **2** marks an answer of 99% scores **2** marks an answer of 99 or 0.99% scores **1** mark	 1 1	AO2 4.1.2.2
08.5	power = energy transferred / time	allow P = E / t	1	AO1 4.1.1.4

4.1.1.1 Energy stores and systems

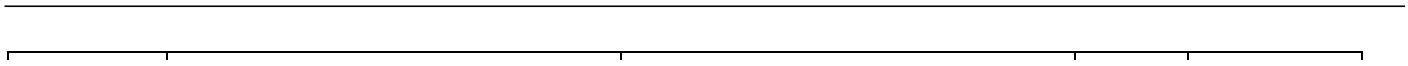
Answer 97 · Mark scheme June 2018 | 8463/1F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6		an answer of 814 seconds scores **4** marks an answer of 13.57 minutes scores **4** marks		
	$5000 = \frac{4\ 070\ 000}{t}$		1	AO2 4.1.1.4
	$t = \frac{4\ 070\ 000}{5000}$		1	AO2 4.1.1.4
	t = 814		1	AO2 4.1.1.4
	seconds	other units of time must be consistent with numerical value	1	AO1 4.1.1.4
Total			**12**	

4.1.1.1 Energy stores and systems

Answer 97 · Mark scheme

June 2018 | 8463/1F | Original Q8



4.1.1.1 Energy stores and systems

Answer 98 · Mark scheme

June 2018 | 8463/1F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	$P = \frac{120\ 000}{8.0}$ $P = 15\ 000$ (W)	an answer of 15 000 (W) scores **2** marks	1 1	AO2 4.1.1.4
09.2	energy is transferred in heating the surroundings friction causes energy to be transferred in non-useful ways		1 1	AO2 4.1.2.1
09.3	the switches are in parallel (so) closing either switch completes the circuit		1 1	AO2 4.2.1.1
09.4	gravitational potential energy = mass × gravitational field strength × height	allow E_p = m g h	1	AO1 4.1.1.2
09.5	$E_p = 280 \times 9.8 \times 14$ $E_p = 38\ 416$ (J) $E_p = 38\ 000$ (J)	an answer of 38 000 scores **3** marks an answer that rounds to 38 000 scores **2** marks	1 1 1	AO2 4.1.1.2
Total			**10**	

4.1.1.1 Energy stores and systems

Answer 99 · Mark scheme

June 2018 | 8463/2F | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	uniform acceleration	allow constant / steady acceleration allow velocity / speed increasing at a constant rate ignore reference to direction acceleration scores **1** mark **or** velocity / speed is increasing scores **1** mark do **not** accept acceleration increases	2	AO1 4.5.6.1.5
10.2	up(wards)		1	AO1 4.5.6.1.5
10.3	a group of objects that interact		1	AO1 4.1.1.1
10.4	velocity just after bounce is less than just before bounce **or** the height at the top of the bounce is less than the height from which it was dropped	allow velocity is less / decreases allow speed for velocity velocity decreases to zero – on its own scores zero	1	AO3 4.5.6.1.5
	so the ball has lost energy		1	AO1 4.1.1.2
	correct reference to (loss of) ke or (reduced) gpe		1	AO1 4.1.2.1
	total energy of ball and Earth / ground is constant	allow 'a system' for ball and Earth allow energy is conserved	1	AO1 4.1.2.1
Total			**8**	

4.1.1.1 Energy stores and systems

Answer 100 · Mark scheme

June 2019 | 8463/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1.1	greater than less than	in this order only	1 1	4.3.1.1 AO1
1.2	boiling temperature is constant	ignore evaporation allow temperature remains the same	1 1	4.3.2.3 AO1
1.3	E = 0.063 × 2 260 000 E = 140 000 (J)	a correct answer that rounds to 140 000 (J) scores **2** marks allow 142 380 (J)	1 1	4.3.2.3 AO2
1.4	density = $\frac{0.063}{0.105}$ density = 0.6 kg / m^3	an answer of 0.6 scores **2** marks	1 1 1	4.3.1.1 AO2
Total			**9**	

4.1.1.1 Energy stores and systems

Answer 101 · Mark scheme

June 2019 | 8463/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3.1	use a tape measure one person holding the top and another person holding the bottom **or** use a set square to ensure tape measure is vertical **or** take repeat readings and calculate a mean	allow use a metre rule allow use a laser measure allow use a plumb-line to ensure tape measure is vertical	1 1	4.1.1.2 AO3/3a
3.2	$E_p = 45 \times 9.8 \times 2.0$ $E_p = 880$ (J)	an answer of 880 (J) or 882 (J) scores **2** marks	1 1	4.1.1.2 AO2
3.3	any **3** from: • change in vertical height • mass / weight • speed / velocity • air resistance or drag • friction (between zip line and pulley) • gradient / angle (of the zip wire) • length of zip wire	 allow body position allow wind ignore gravitational field strength	3	4.1.1.1 AO1
Total			**7**	

4.1.1.1 Energy stores and systems

Answer 102 · Mark scheme

June 2019 | 8463/1F | Original Q6

Question 6

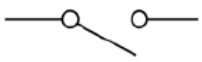
Question	Answers	Extra information	Mark	AO / Spec. Ref.
6.1	(the diesel car has a) higher range (the diesel car) power source has a lower mass	allow less frequent refuelling needed allow the power source has a lower weight the diesel car has a lower mass is insufficient	1 1	4.1.3 AO3
6.2	% of total mass = $\frac{420}{1610}$ (×100) % of total mass = 26 (%)	a correct answer that rounds to 26 (%) scores **2** marks allow **1** mark for an answer of 0.26	1 1	4.1.3 AO2
6.3	any **2** from: • increase the range of electric cars • increase the time between recharges • decrease the (total) mass of the electric car • greater acceleration		2	4.1.3 AO3
6.4	energy transferred = power × time **or** $E = Pt$		1	4.1.1.4 AO1
6.5	420 000 = 7000 × t t = 420 000 / 7000 t = 60 (s)	an answer of 60 (s) scores **3** marks	1 1 1	4.1.1.4 AO2
Total			**10**	

4.1.1.1 Energy stores and systems

Answer 103 · Mark scheme

June 2019 | 8463/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7.1	M		1	4.2.2 AO1
7.2	 **or** 		1	4.2.1.1 AO1
7.3	current $= \frac{24}{30}$ current = 0.80 (A)	an answer of 0.8 (A) scores **2** marks	1 1	4.2.1.2 AO2
7.4	E = 60 × 3.6 E = 216 (J)	an answer of 216 (J) scores **2** marks	1 1	4.2.4.2 AO2
7.5	The reading in **Y** would be lower		1	4.2.2 AO1
7.6	The total resistance of **Y** is greater		1	4.2.2 AO1
7.7	potential difference = current × resistance **or** $V = IR$		1	4.2.1.3 AO1
7.8	3.6 = 0.80 × R $R = \frac{3.6}{0.80}$ R = 4.5 (Ω)	an answer of 4.5 (Ω) scores **3** marks	1 1 1	4.2.1.3 AO2
Total			**12**	

4.1.1.1 Energy stores and systems

Answer 104 · Mark scheme

June 2019 | 8463/1F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8.1	To reduce energy transfer to the surroundings		1	4.1.1.3 RP1 AO1
8.2	scald / burn (to skin)	ignore risk of electric shock	1	4.1.1.3 RP1 AO3
8.3	1 °C		1	4.1.1.3 RP1 AO3
8.4	0.06 kg		1	4.1.1.3 RP1 AO1
8.5	$26\,400 = 0.20 \times c \times 30$ $c = \frac{26\,400}{(0.20 \times 30)}$ **or** $c = \frac{26\,400}{6}$ $c = 4400$ J / kg °C	a numerical answer of 4400 scores **3** marks	1 1 1 1	4.1.1.3 RP1 AO2 AO1
Total			**8**	

4.1.1.1 Energy stores and systems

Answer 105 · Mark scheme

June 2019 | 8463/1F | Original Q11

Question 11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
11.1	$41 = \frac{9.8 \times h}{0.12}$ $h = \frac{41 \times 0.12}{9.8}$ h = 0.50 (m)	an answer of 0.50 scores **3** marks allow a correct answer that rounds to 0.50 for **3** marks	1 1 1	4.1.1.2 AO2
11.2	kinetic energy = 0.5 × mass × (speed)^2 ***or*** $E_k = ½ mv^2$		1	4.1.1.2 AO1
11.3	$270 = ½ \times m \times 3^2$ $m = \frac{270}{(½ \times 3^2)}$ **or** $m = \frac{270}{4.5}$ m = 60 (kg)	an answer of 60 (kg) scores **3** marks	1 1 1	4.1.1.2 AO2

4.1.1.1 Energy stores and systems

Answer 105 · Mark scheme

June 2019 | 8463/1F | Original Q11

11.4	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear.		3–4	WS3.5 4.1.1.2 AO3
	Level 1: Relevant features are identified and differences noted.		1–2	
	No relevant content		0	
	Indicative content • males have a greater muscle power than females for most of their lives • males have a greater muscle power than females above 9/10 years old • males have a lower muscle power than females below 9/10 years old • there is a similar pattern for males and females as age increases • males have a peak muscle power at 25 years old whereas females have a peak muscle power at 20/21 years old • at 9/10 years old males have the same muscle power as females • peak muscle power for males (47 W/kg) is greater than peak muscle power for females (37 W/kg) • the rate of increase of muscle power is greater for males than females (between 5 and 25 years old) • the rate of decrease of muscle power is greater for males than females. Ignore comments relating to strength			
11.5	any **1** from: • maximum height reached is a better indicator of maximum muscle power • maximum / peak muscle power was being investigated, not mean / average muscle power • volunteer may not use maximum effort on the first try • performance may improve with practise • performance may get worse with tiredness	allow maximum time in the air for maximum height reached / jumped	1	WS3.7 4.1.1.4 AO3
Total			**12**	

4.1.1.1 Energy stores and systems

Answer 106 · Mark scheme

November 2020 | 8463/1F | Original Q2

Question 2

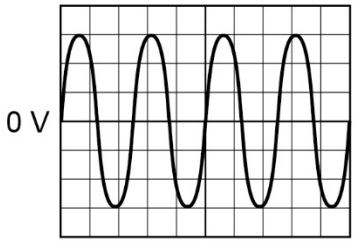
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	the friction is decreased		1	AO1 4.1.2.1
02.2	$E_p = 62.5 \times 9.8 \times 16.0$ $E_p = 9800$ (J)		1 1	AO2 4.1.1.2
02.3	$E_k = 0.5 \times 62.5 \times 12^2$ $E_k = 4500$ (J)		1 1	AO2 4.1.1.2
02.4	Any **two** from: • speed (at bottom of slide) • friction *(*between sled and ground*)* • air resistance	allow mass/weight of rider (and sled) allow surface type	2	AO1 4.1.1.1
Total			**7**	

4.1.1.1 Energy stores and systems

Answer 107 · Mark scheme

November 2020 | 8463/1F | Original Q3

Question 3

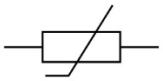
Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	50 Hz		1	AO1 4.2.3.1
03.2			1	AO1 4.2.3.1
03.3	P = 0.020 × 230 P = 4.6 (W)		1 1	AO2 4.2.4.1
03.4	E = 180 × 230 E = 41 400 (J)		1 1	AO2 4.2.4.2
03.5	Hazard: live wire **or** high potential difference Risk: electric shock **or** electrocution	ignore current in his body allow (electrical) burn allow death (by electric shock) allow 1 mark for hazard and risk in incorrect order	1 1	AO3 4.2.3.2
Total			**8**	

4.1.1.1 Energy stores and systems

Answer 108 · Mark scheme

November 2020 | 8463/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	kg °C	allow kilogram allow degrees Celsius	1 1	AO1 4.1.1.3 RPA 1
07.2			1	AO1 4.2.1.1 RPA 1
07.3	$P = 12^2 \times 15$ P = 2160 (W)		1 1	AO2 4.2.4.1 RPA 1
07.4	The heating element in the kettle takes time to heat up		1	AO1 4.1.1.1 RPA 1
07.5	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO1 4.1.1.1 RPA 1
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced		3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content: • measure the mass of water using a balance **or** measure the volume of water using a measuring cylinder • measure the initial temperature of the water • pour the water into the kettle • put temperature probe in the water **or** put a thermometer in the water • switch kettle on • record temperature • measure time with a stopclock • use an interval of 5 seconds			

4.1.1.1 Energy stores and systems

Answer 108 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	ΔΘ = 80 (°C)		1	AO2 4.1.1.3 RPA 1
	E = 0.50 × 4200 × 80	allow E = 0.50 × 4200 × their value of ΔΘ	1	
	E = 168 000 (J)	allow an answer consistent with their value of ΔΘ	1	
07.7	m = 0.005 (kg)		1	AO2 4.3.2.3
	E = 0.005 × 2 260 000	this mark may score if m is not/incorrectly converted	1	
	E = 11 300 (J)	allow an answer consistent with their value of m	1	
Total			**18**	

4.1.1.1 Energy stores and systems

Answer 109 · Mark scheme

November 2020 | 8463/1F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	density = $\frac{\text{mass}}{\text{volume}}$ **or** $\rho = \frac{m}{V}$		1	AO1 4.3.1.1
10.2	$998 = \frac{\text{m}}{6\,500\,000}$ m = 998 × 6 500 000 m = 6 487 000 000 m = 6.487×10^9 (kg)	 allow a correct conversion of their calculated value of mass into standard form	1 1 1 1	AO2 4.3.1.1
10.3	energy transferred = power × time **or** $E = Pt$		1	AO1 4.2.4.2
10.4	t = 18 000 (s) **or** t = 5 × 60 × 60 E = $1.5 \times 10^9 \times 18\,000$ E = 2.7×10^{13} (J)	 allow a correct substitution using an incorrectly/not converted value of t allow a correct calculation using an incorrectly/not converted value of t	1 1 1	AO2 4.2.4.2
10.5	the variation in demand is (much) greater than 1.5×10^9 W demand remains high for longer than 5 hours	allow the increase in demand is greater than the (power) output of the (hydroelectric) power station allow 04:00 to 16:00 is 12 hours allow 04:00 to 16:00 is greater than 5 hours	1 1	AO3 4.1.3
Total			**11**	

4.1.1.1 Energy stores and systems

Answer 110 · Mark scheme

November 2020 | 8463/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(the north pole of the floating magnet is) repelled from the north pole (of the fixed magnet) and attracted to the south pole (of the fixed magnet)	allow following a magnetic field line for **1 mark** if no other marks scored	1 1	AO3 4.7.1.1 4.7.1.2
05.2	it was attracted (to the fixed magnet)	allow it sticks / joins to the (fixed) magnet allow it becomes an induced magnet allow it becomes magnetised	1	AO1 4.7.1.2
05.3	**Level 2:** The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		3–4	AO1 4.7.1.2
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content: • mark where the compass points on the paper • move the compass to the marked point • repeat until you go back to the magnet • join up the points • add an arrow pointing from the north pole to the south pole • repeat for positions (above and below the bar magnet)			
05.4	C B A	allow **1** mark for one letter in the correct box	2	AO2 4.7.2.1
05.5	$E_e = 0.5 \times 200 \times 0.040^2$ $E_e = 0.16$ (J)		1 1	AO2 4.5.3
Total			**11**	

4.1.1.1 Energy stores and systems

Answer 111 · Mark scheme

November 2021 | 8463/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	A: transmission / power cables B: step-down transformer	allow transmission / power lines allow cables ignore wires	1 1	AO1 4.2.4.3
02.2	less thermal energy is transferred to the surroundings.		1	AO1 4.2.4.3
02.3	charge flow = $\frac{500\,000\,000}{25\,000}$ charge flow = 20 000 (C)		1 1	AO2 4.2.4.2
02.4	total current = 7.20 (A) P = 230 × 7.20 P = 1656 (W)	 allow a correct substitution of an incorrect total current allow a correct calculation using an incorrect total current	1 1 1	AO2 4.2.4.1
02.5	dishwasher has the largest current **or** has the largest power (input)		1 1	AO3 4.2.4.1 4.2.4.2
02.6	E = 600 × 32 000 000 E = 19 200 000 000 (J) **or** E = 1.92 × 10^{10} (J)		1 1	AO2 4.1.1.4
Total			**12**	

4.1.1.1 Energy stores and systems

Answer 112 · Mark scheme

November 2021 | 8463/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	gravitational potential kinetic	this order only	1 1	AO1 4.1.1.2 4.1.1.1
07.2	kinetic energy = 0.5 × mass × speed^2 **or** $E_k = ½mv^2$		1	AO1 4.1.1.2
07.3	$5040 = 0.5 \times m \times 12^2$ $m = \frac{5040}{0.5 \times 12^2}$ m = 70 (kg)		1 1 1	AO2 4.1.1.2
07.4	the thermal energy increases.		1	AO1 4.1.1.1
Total			**7**	

4.1.1.1 Energy stores and systems

Answer 113 · Mark scheme

November 2021 | 8463/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	the polarity (of the supply) does not change	allow potential difference in one direction (only)	1	AO1 4.2.3.1
09.2	energy transferred = power × time		1	AO1 4.1.1.4 4.2.4.2
09.3	162 000 000 = 7200 × t $t = \frac{162\,000\,000}{7200}$ t = 22 500 (s)		1 1 1	AO2 4.1.1.4 4.2.4.2
09.4	$V = I \times R$		1	AO1 4.2.1.3
09.5	480 = 15 × R $R = \frac{480}{15}$ R = 32 (Ω)		1 1 1	AO2 4.2.1.3
09.6	time taken using system **A** is double the time of system **B**		1	AO3 4.2.4.1
Total			**10**	

4.1.1.1 Energy stores and systems

Answer 114 · Mark scheme

November 2021 | 8463/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO/ Spec. Ref
09.1	will return to its original shape/length when the force is removed	 allow (when) the child gets off the second mark is dependent on scoring the first mark	1 1	AO2 4.5.3

09.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.5.3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • set up a clamp stand with a clamp • hang the spring from the clamp • use a second clamp and boss to fix a (half) metre rule alongside the spring • record the ruler reading that is level with the bottom of the spring • hang a 1 N / a known weight from the bottom of the spring • record the new position of the bottom of the spring • calculate the extension of the spring • measure the extension of the spring • add further weights to the spring so the force increases 1 N at a time up to 5 N • for each new force record the position of the bottom of the spring and calculate / measure the extension Indicative content continues on the next page…		

Answer 114 · Mark scheme

November 2021 | 8463/2F | Original Q9

	Risk Assessment Hazard: Clamp (stand, boss and masses) might fall off desk Risk: injury to feet Precaution: Use clamp to fix apparatus to the bench **or** Ensure that the slotted masses hang over the base/foot of the stand **or** Ensure that the boss is screwed tightly into the stand and clamp **or** Put (heavy) masses on the base/foot of the stand **or** Stand up so that you can move out of the way Hazard: Spring could break / come loose Risk: damage eye Precaution: Wear safety goggles If a risk assessment / hazard is not given, the answer can still reach level 3, but not full marks. Full marks may be awarded for alternative feasible methods.			

09.3	force = spring constant × extension		1	AO1 4.5.3

09.4	5.00 0.125 $k = \frac{5.00}{0.125}$ k = 40 (N/m)	allow any correct pair of values from the graph allow a misread value(s) from the graph allow a correct calculation using their incorrect value(s)	1 1 1	AO2 4.5.3

09.5	the line is straight and passes through the origin	allow the line does not curve allow a constant gradient	1 1	AO3 4.5.3

4.1.1.1 Energy stores and systems

Answer 114 · Mark scheme

09.6	e = 0.20 m $E_e = 0.5 \times 13 \times 0.20^2$ E_e = 0.26 (J)	 allow an incorrectly / not converted value of e use of two incorrectly/not converted values scores a máximum of 1 mark	1 1 1	AO2 4.5.3

Total			**17**

4.1.1.1 Energy stores and systems

Answer 115 · Mark scheme

June 2022 | 8463/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	gravitational potential kinetic	this order only	1 1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	$E_e = 0.5 \times 120\,000 \times 0.015^2$ $E_e = 13.5$ (J)		1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	$E = 540$ (J)	allow their answer from question **01.2** x 40	1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	$E_k = 0.45 \times 600$ $E_k = 270$ (J)		1 1	AO2 4.1.2.2

4.1.1.1 Energy stores and systems

Answer 115 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	energy is transferred to the surroundings		1	AO2 4.1.1.1

Total Question 1		**8**

4.1.1.1 Energy stores and systems

Answer 116 · Mark scheme

June 2022 | 8463/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	tape measure **or** metre rule	allow ruler ignore metre stick	1	AO3 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	$E_p = 50 \times 9.8 \times 1.7$ $E_p = 833$ (J)		1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	$P = \frac{1800}{1.44}$ $P = 1250$ (W)		1 1	AO2 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	stop-clock C		1	AO3 4.1.1.4

4.1.1.1 Energy stores and systems

Answer 116 · Mark scheme

June 2022 | 8463/1F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	$E_k = 0.5 \times 70 \times 2.0^2$ $E_k = 140$ (J)		1 1	AO2 4.1.2.1

Total Question 2		**8**

4.1.1.1 Energy stores and systems

Answer 117 · Mark scheme

June 2022 | 8463/1F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	parallel		1	AO1 4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	S_1		1	AO1 4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	S_1, S_2 and S_3		1	AO2 4.2.2

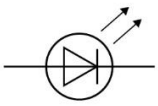
Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	energy transferred = power × time **or** $E = P \times t$		1	AO1 4.2.4.2

4.1.1.1 Energy stores and systems

Answer 117 · Mark scheme

June 2022 | 8463/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	$3600 = 1200 \times t$ $t = \frac{3600}{1200}$ $t = 3$ (s)		1 1 1	AO2 4.2.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6			1	AO1 4.2.1.1

Total Question 6		**8**

4.1.1.1 Energy stores and systems

Answer 118 · Mark scheme

June 2022 | 8463/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	wavelength frequency	this order only	1 1	AO1 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	parallel		1	AO1 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	8000 Hz		1	AO2 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	period = $\frac{1}{8000}$ 0.000125 (s)	allow ecf from question **07.3**	1 1	AO2 4.6.1.2

4.1.1.1 Energy stores and systems

Answer 118 · Mark scheme

June 2022 | 8463/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	$\lambda = \frac{330}{6600}$		1	AO2
	$\lambda = 0.050$	allow 0.05	1	AO2
	m		1	AO1 4.5.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	distance (travelled) = speed × time **or** $s = vt$	allow any correct rearrangement	1	AO2 4.5.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	$13.2 = 330 \times t$		1	AO2 4.5.6.1.2
	$t = \frac{13.2}{330}$		1	
	$t = 0.04$ (s)	allow 0.040 (s)	1	

4.1.1.1 Energy stores and systems

Answer 118 · Mark scheme

June 2022 | 8463/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.8	loudspeaker **B** is further from the technician (than speaker **A**) so the sound would take more time to travel (to the technician) so the sound from each speaker arrives at the technician at the same time	'it' means speaker **B**	1 1 1	AO3 4.6.1.2

Total Question 7		**16**

4.1.1.1 Energy stores and systems

Answer 119 · Mark scheme

June 2023 | 8463/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	other energy resources = 95 (%) hydroelectric = 5 (%)		1 1	AO2 4.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	E_p = 2 500 000 × 9.8 × 15 E_p = 367 500 000 (J) **or** E_p = 3.675 × 10^8 (J)	 allow 370 000 000 (J) **or** E_p = 3.7 × 10^8 (J)	1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	energy = power × time **or** $E = P \times t$		1	AO1 4.2.4.2 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	t = 3600 (s) E = 3000 × 3600 E = 10 800 000 (J) **or** E = 1.08 × 10^7 (J)	 allow a correct substitution using an incorrectly/not converted value for t allow an answer consistent with their incorrectly/not converted value for t allow a correct answer given to 2 s.f.	1 1 1	AO2 4.2.4.2 4.1.1.4

4.1.1.1 Energy stores and systems

Answer 119 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	the level of the water in the river varies **or** the amount of rainfall varies		1	AO3 4.1.3
	and is lower in the summer months	allow specified months or range of months eg April to September MP2 dependent on scoring MP1	1	

Total Question 4	**10**

4.1.1.1 Energy stores and systems

Answer 120 · Mark scheme

June 2023 | 8463/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	using the funnel was a safety precaution		1	AO3 4.1.2.1 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	bottle **A** was the control		1	AO3 4.1.2.1 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	stopclock / stopwatch	allow clock / watch ignore timer	1	AO3 4.1.2.1 RPA2

4.1.1.1 Energy stores and systems

Answer 120 · Mark scheme

June 2023 | 8463/1F | Original Q5

Question	Answers	Mark	AO / Spec. Ref.
05.4	**Level 2:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO3 4.1.2.1 RPA2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content • use the same (start) temperature for each experiment • use the same number of layers of insulation **or** use the same thickness of insulation • so that temperature difference can be compared • use the same volume of water • so (total thermal) energy of water is the same (each time) **or** so the same area of the bottle surface is heated by the water • use a lid for each bottle • so evaporation is reduced / stopped **or** so energy loss from the water (surface) is reduced / stopped • repeat the investigation and calculate mean values • so anomalous results can be identified **or** so the effect of random errors is reduced		

4.1.1.1 Energy stores and systems

Answer 120 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	bar (chart / graph) (type of) insulation is not numerical values **or** (type of) insulation is labels / categories	 allow one variable is not numerical values allow one variable is not continuous allow (type of) insulation is not continuous allow one variable is labels / categories allow one variable is categoric allow (type of) insulation is categoric MP2 dependent on scoring MP1	1 1	AO2 4.1.2.1 RPA2

Total Question 5	**9**

4.1.1.1 Energy stores and systems

Answer 121 · Mark scheme

June 2023 | 8463/1F | Original Q6

Question 6

Question	Answers	Mark	AO / Spec. Ref.
06.1	<table><tr><th>Energy store</th><th>Less than at A</th><th>The same as at A</th><th>More than at A</th></tr><tr><td>The student's gravitational potential energy</td><td>✓</td><td></td><td></td></tr><tr><td>The student's kinetic energy</td><td></td><td></td><td>✓</td></tr><tr><td>The bungee cord's elastic potential energy</td><td></td><td></td><td>✓</td></tr></table> additional tick in a row negates the mark for that row	1 1 1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	$E_e = 0.5 \times 78.4 \times 25^2$ $E_e = 24\ 500$ (J)		1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	greatest spring constant	allow needs largest force (per metre) to stretch the cord	1	AO3 4.1.1.2

4.1.1.1 Energy stores and systems

Answer 121 · Mark scheme June 2023 | 8463/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	A greatest extension before snapping	 MP2 dependent on scoring MP1	1 1	AO3 4.1.1.2

Total Question 6	**8**

4.1.1.1 Energy stores and systems

Answer 122 · Mark scheme

June 2023 | 8463/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	so the thermometer temperature was the same as the temperature of the iron block		1	AO3 4.1.1.3 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	$\Delta\theta = (54 - 28) = 26$ (°C) $26\,000 = 2.0 \times c \times 26$ $c = \frac{26\,000}{2.0 \times 26}$ $c = 500$ (J/kg °C)	 allow a correct substitution using an incorrect value of $\Delta\theta$ obtained from the graph allow a correct rearrangement using an incorrect value of $\Delta\theta$ obtained from the graph allow an answer consistent with their value of $\Delta\theta$ obtained from the graph	1 1 1 1	AO2 4.1.1.3 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	the calculated specific heat capacity will be more accurate the iron block will transfer thermal energy to the surroundings at a lower rate		1 1	AO3 4.1.1.3 RPA1

Total Question 9	**7**

4.1.1.1 Energy stores and systems

Answer 123 · Mark scheme

June 2023 | 8463/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	kinetic thermal	this order only	1 1	AO1 4.5.6.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(minimum braking) distance increases with increasing speed	allow positive correlation	1	AO2 4.5.6.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	increases		1	AO1 4.5.6.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	12.5 – 5.0 = 7.5 (m/s) $t = \frac{7.5}{0.25}$ t = 30 (s)	 this mark may be awarded if the change in velocity is incorrectly calculated allow a correctly calculated answer using a change in velocity incorrectly calculated	1 1 1	AO2 4.5.6.1.5

Answer 123 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	*F* = 1600 × 0.25 *F* = 400 (N)		1 1	AO2 4.5.6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	initial height of the ruler above the person's hand		1	AO3 4.5.6.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	there will be more variation in distances	allow reaction times for distances allow the three students tested are not typical	1	AO3 4.5.6.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	carry out the experiment listening to music then not listening to music (and compare the results)	 allow compare with original results	1 1	AO3 4.5.6.3.2

Total Question 2	**13**

4.1.1.1 Energy stores and systems

Answer 124 · Mark scheme

June 2023 | 8463/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	perpendicular		1	AO1 4.6.1.1

Question	Answers	Mark	AO / Spec. Ref.
09.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5-6	AO3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3-4	AO1
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1-2	AO1
	No relevant content	0	
	Indicative content **Method:** • heat the water / kettle • add an equal volume of (hot) water to each flask • insert a thermometer into each flask • record the initial temperature from both flasks OR • place an IR detector near each flask • the distance between the IR detector and the flask should be the same each time • record initial reading from IR detectors • (and) start a stop clock • record the temperatures / readings after 10 minutes from both flasks • calculate the change in temperatures / readings during the 10 minutes • compare the results to test the hypothesis to access level 3 the method must allow the correct consideration of a temperature decrease for both flasks or the correct comparison of IR detected from both flasks		4.6.2.2

4.1.1.1 Energy stores and systems

Answer 124 · Mark scheme

June 2023 | 8463/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	during the 1st minute there is the greatest temperature difference (between the hot water and the surroundings)	 allow highest temperature or hottest MP 2 dependent on scoring MP1	1 1	AO2 AO1 4.6.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	the temperature (increase / change after 10 minutes)	allow the final temperature do not allow temperature decrease	1	AO1 4.6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	black surfaces absorb more (infrared than white surfaces) matt surfaces absorb more (infrared) than shiny surfaces of the same colour	allow black surfaces have a greater temperature increase (than white surfaces) allow matt surfaces have a greater temperature increase than shiny surfaces of the same colour if no other marks scored, allow 1 mark for matt black surface is the best absorber and shiny white surface is the worst absorber if no other marks scored, allow 1 mark for matt black has the greatest temperature increase and shiny white has the smallest temperature increase	1 1	AO3 4.6.2.2 4.6.3.1

Answer 124 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	pressure = $\frac{\text{force}}{\text{area}}$		1	AO1 4.5.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	area of base = 0.0144 (m^2)	do not allow this or subsequent marks unless base area is used	1	AO2 4.5.5.1.1
	$1500 = \frac{F}{0.0144}$	this mark may be awarded if base area is incorrectly calculated	1	
	$F = 1500 \times 0.0144$	this mark may be awarded if base area is incorrectly calculated	1	
	$F = 21.6$ (N)	this mark may be awarded if base area is incorrectly calculated allow 22 (N)	1	

Total Question 9	**17**

4.1.1.1 Energy stores and systems

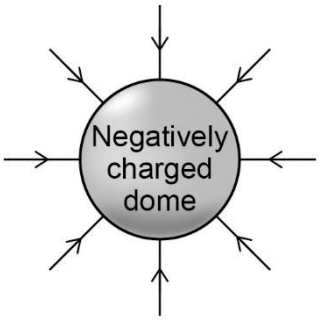
Answer 125 · Mark scheme

June 2024 | 8463/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	negative		1	AO1 4.2.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	repulsion		1	AO1 4.2.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3			1	AO1 4.2.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	resistance		1	AO1 4.2.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	ionised		1	AO1 4.2.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	electrons		1	AO1 4.2.5.2

4.1.1.1 Energy stores and systems

Answer 125 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	energy transferred = 0.000 002 × 300 000 energy transferred = 0.6 (J)		1 1	AO2 4.2.4.2

Total Question 1	**8**

Answer 126 · Mark scheme

June 2024 | 8463/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	stretched length – original length		1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	$E_e = 0.5 \times 800 \times 7.5^2$ $E_e = 22\,500$ (J)		1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	kinetic energy = $0.5 \times 240 \times 15^2$ kinetic energy = 27 000 (J)		1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	$E_p = m \times g \times h$		1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	$24\,000 = 240 \times 9.8 \times h$ $h = \frac{24\,000}{(240 \times 9.8)}$ $h = 10.2$ (m)	 allow 10 (m) allow a correct answer given to more than 3 s.f.	1 1 1	AO2 4.1.1.2

4.1.1.1 Energy stores and systems

Answer 126 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	energy is transferred to the surroundings work is done against air resistance		1 1	AO1 4.1.2.1

Total Question 3	**11**

Answer 127 · Mark scheme

June 2024 | 8463/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	the volume decreased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	the distance decreased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	the frequency of collisions increased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	the air pressure increased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	the mean speed of the particles increases		1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	$0.0130 = 2.60\times10^{-8} \times 1010 \times \Delta\theta$ $\Delta\theta = \dfrac{0.0130}{(2.60 \times 10^{-8} \times 1010)}$ $\Delta\theta = 495$ (°C)	 allow a correct answer given to more than 3 s.f.	1 1 1	AO2 4.1.1.3 4.3.2.2

Total Question 5	8

4.1.1.1 Energy stores and systems

Answer 128 · Mark scheme

June 2024 | 8463/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	thermal / internal (energy) **or** kinetic (energy of the water particles)	ignore heat allow E_k	1	AO1 4.1.1.1 4.3.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	gravitational potential (energy)	allow E_p / GPE allow kinetic / E_k	1	AO1 4.1.1.1

Question	Answers	Mark	AO / Spec. Ref.
09.3	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3–4	AO3 4.1.1.1 4.3.2.1 4.1.1.2 4.1.2.2 4.1.3
	Level 1: Relevant features are identified and differences noted.	1–2	
	No relevant content	0	
	Indicative content **Method A:** • heated water needs insulating (to maintain high temperature) • energy stored by heating water is much greater (per 100 kg) • useful energy from heating 100 kg of water = 20 160 (kJ) • energy wasted (per 100 kg) = 13 440 (kJ) • efficiency = 60 % **Method B:** • suitable location needed to pump water uphill • pumping water efficiency is higher • useful energy from pumping 100 kg of water = 367.5 (kJ) • energy wasted (per 100kg) = 122.5 (kJ) • efficiency = 75 % A level 2 answer should use the data in a relevant calculation that compares the two methods.		

4.1.1.1 Energy stores and systems

Answer 128 · Mark scheme

June 2024 | 8463/1F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	**Transport examples:** don't use (petrol / diesel) cars (for transport) **or** don't burn petrol / diesel (for transport) (instead) use electric cars **or** (instead) use hydrogen-fuelled cars **or** (instead) use a bicycle **or** (instead) use public transport **or** (instead) walk **Generating Electricity examples:** don't use coal / oil / gas (to generate electricity) (instead) use renewable methods **or** (instead) use nuclear power **OR** don't use (electrical) appliances when not needed to reduce the demand for electricity (generated) using coal / oil / gas	allow don't use other transport methods e.g. (diesel) buses allow fossil fuels for petrol / diesel allow fossil fuels for coal / oil / gas allow specific examples of renewable energy resources allow specific examples e.g. lights allow fossil fuels for coal / oil / gas accept other reasonable changes with valid alternative for 2 marks each	1 1 1 1	AO3 4.1.3

Total Question 9	10

4.1.1.1 Energy stores and systems

Answer 129 · Mark scheme

June 2025 | 8463/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	x-axis labelled: (type of) metal 4 bars correctly drawn	 allow a tolerance of ± ½ a small square allow **1** mark for 2 or 3 bars drawn correctly	1 2	AO2 4.1.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	copper least time for drawing pin to fall **or** least time for wax to melt	 dependent on MP1 allow less for least allow pin fell off quicker allow quickest time to melt the wax	1 1	AO3 4.1.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	$c = \frac{132}{(0.015 \times 20)}$ c = 440 (J/kg °C)		1 1	AO2 4.1.1.3 4.3.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	power = $\frac{\text{energy transferred}}{\text{time}}$ **Or** $P = \frac{E}{t}$		1	AO1 4.2.4.2 4.1.1.4

4.1.1.1 Energy stores and systems

Answer 129 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	$0.33 = \frac{132}{t}$ $t = \frac{132}{0.33}$ $t = 400$ (s)		1 1 1	AO2 4.2.4.2 4.1.1.4

Total Question 2	11

4.1.1.1 Energy stores and systems

Answer 130 · Mark scheme

June 2025 | 8463/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	the speed increased		1	AO1 4.3.3.1

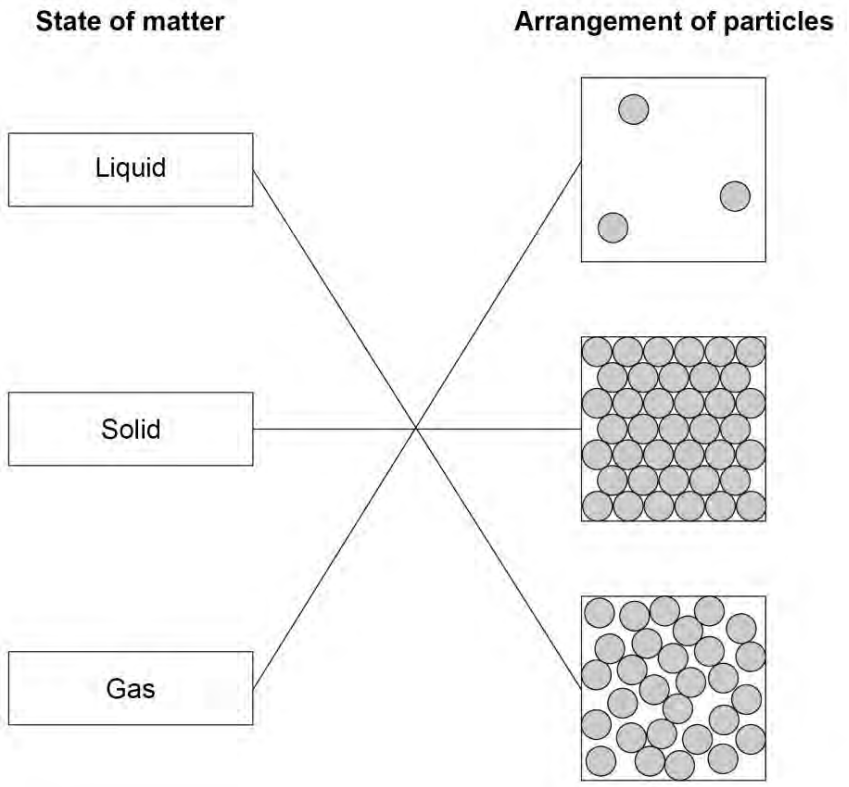
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	the kinetic energy increased		1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	the number of collisions each second increased		1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	the force exerted increased		1	AO1 4.3.3.1

4.1.1.1 Energy stores and systems

Answer 130 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
04.5	 do **not** accept more than one line from a box on the left allow **1** mark for 1 or 2 correct lines	2	AO1 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	liquid		1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	solid		1	AO3 4.3.1.2

4.1.1.1 Energy stores and systems

Answer 130 · Mark scheme

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>04.8</td><td>
<table>
<tr><th></th><th>Decreases</th><th>Stays the same</th><th>Increases</th></tr>
<tr><td>Kinetic energy of particles</td><td></td><td>✓</td><td></td></tr>
<tr><td>Potential energy of particles</td><td></td><td></td><td>✓</td></tr>
</table>
do not accept more than one tick in each row
</td><td>1
1</td><td>AO1
4.3.2.1</td></tr>
</table>

Total Question 4	**10**

Answer 131 · Mark scheme

June 2025 | 8463/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(earth wire) green and yellow (live wire) brown (neutral wire) blue		1 1 1	AO1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2			1	AO1 4.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	potential difference = $\frac{2420}{11.0}$ potential difference = 220 (V)		1 1	AO2 4.2.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	resistance = $\frac{2420}{11^2}$ resistance = 20 (Ω)		1 1	AO2 4.2.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	a greater percentage of energy is usefully transferred by kettle **A** kettle **A** takes less time to boil the same volume of water		1 1	AO3 4.1.1.4 4.1.2.2

Total Question 5	10

4.1.1.1 Energy stores and systems

Answer 132 · Mark scheme

June 2025 | 8463/1F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	$E_e = 0.5 \times 5.6 \times 0.35^2$ $E_e = 0.343$ (J)	 allow 0.34 (J)	1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	$E_p = mgh$		1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	$0.294 = m \times 9.8 \times 0.60$ $m = \frac{0.294}{9.8 \times 0.60}$ $m = 0.050$ (kg)		1 1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	elastic potential energy decreases		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	kinetic energy decreases		1	AO1 4.1.1.1

4.1.1.1 Energy stores and systems

Answer 132 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	gravitational potential energy increases		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	air resistance opposes the motion of the toy energy is transferred to the surroundings		1 1	AO2 4.1.1.1 4.1.2.1

Total Question 6	**11**

4.1.1.1 Energy stores and systems

Answer 133 · Mark scheme

June 2025 | 8463/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	current = $\frac{6.0}{12}$ current = 0.50 (A)		1 1	AO2 4.2.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	energy transferred = 6.0 × 8.0 energy transferred = 48 (J)		1 1	AO2 4.2.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$		1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	$0.70 = \frac{1.96}{\text{total input energy transfer}}$ total input energy transfer = $\frac{1.96}{0.70}$ total input energy transfer = 2.8 (J)		1 1 1	AO2 4.1.2.2

4.1.1.1 Energy stores and systems

Answer 133 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	0.74 to 0.78 inclusive		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	the line is curved **or** the line does not pass through the origin	allow the line is not straight allow the line is not linear	1	AO2 4.1.2.2

Total Question 7	**10**

4.1.1.1 Energy stores and systems

Answer 134 · Mark scheme

June 2025 | 8463/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	hot water / beaker **or** heater	ignore descriptions of risk allow spilt water allow broken glass / beaker	1	AO3 4.1.1.3 4.3.2.2 RPA1

Question	Answers	Mark	AO / Spec. Ref.
09.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.1.1.3 4.3.2.2 RPA1
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • measure the mass of the empty beaker on the balance • fill the beaker with water and measure the total mass of beaker and water • mass of water = total mass – mass of beaker • turn power supply on so heater increases the temperature of the water • measure temperature change / increase with thermometer • use joulemeter to measure energy transferred to water • calculate SHC using E = mcΔθ a level 3 answer must have a clear method of how the mass of water is determined		

Answer 134 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	insulate the beaker of water **or** add a lid	allow named insulation allow use an insulating cup eg plastic cup	1	AO3 4.1.1.3 4.3.2.2 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	difference = 4410 – 4200 **or** difference = 210 **or** % difference = $\frac{(4410 - 4200)}{4200} \times 100$		1	AO2 4.1.1.3 4.3.2.2 RPA1
	% difference = 5 (%)	do **not** accept 4.76 (%)	1	

Total Question 9	10

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCSE

Physics

3451

Foundation

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Kathleen Tattersall: *Director General*

4.1.1.1 Energy stores and systems

INFORMATION FOR EXAMINERS

1. General

The mark scheme for each question shows:

- the marks available for each part of the question;
- the total marks available for the question;
- the typical answer or answers which are expected;
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:
where consequential marking needs to be considered in a calculation;
or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of Quality of Written Communication

Examiners are reminded of the need to assess QoWC by the following statement appearing in the appropriate parts of the mark scheme:

The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.

The maximum marks available to a candidate whose answer is not well expressed will be (the number of marks available –1).

3.2 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.3 Use of chemical symbols/formulae

If a candidate writes a chemical symbol/formula instead of a required chemical name, full credit can be given if the symbol/formula is correct and if, in the context of the question, such action is appropriate.

3.4 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.5 Marking procedure for calculations

3.5.1 Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown. However, if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column.

3.5.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.6 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.7 Errors carried forward

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

(a) A candidate who calculates average speed using speed = time/distance **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.

(b) A candidate who incorrectly calculates average speed using speed = distance/time and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.8 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.9 Brackets

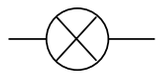
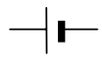
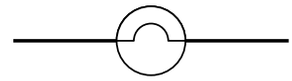
(…..) is used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.10 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.1.1.1 Energy stores and systems

3451/F Q1

question	answers	extra information	mark
(a)	circuit symbol for a lamp correct   circuit symbol for a cell correct	accept  accept any standard of drawing providing circuit would work	1 1
	2 lamps drawn in parallel with 3 cells	polarity of cells must be correct (+ to –) but cells may be either way around	1
(b)	4.5		1
(c)	the same as	accept any clear indication of the correct answer	1
total			5

4.1.1.1 Energy stores and systems

3451/F Q2

question	answers	extra information	mark
(a)	gas		1
(b)	fuel burning stations produce electricity at any time / all the time	accept fuel available all the time	1
	wind generator can only produce when the wind is strong enough	accept it's not always windy	1
(c)	no fuel is burnt **or** no fuel is used **or** uses only energy from wind **or** does not emit harmful gases / soot / smoke	do **not** accept wind is natural / environmentally friendly / renewable answer must be in terms of wind, **not** negative of fuel burning specific examples of gases CO_2, SO_2, acid rain and greenhouse gases can be accepted ozone negates credit	1
total			4

4.1.1.1 Energy stores and systems

3451/F Q3

question	answers	extra information	mark
(a)(i)	microwaves		1
(ii)	infra red		1
(iii)	ultrasonic		1
(b)(i)	B		1
(ii)	A		1
(c)	disturbance / vibration / movement direction	accept motion / force do **not** accept energy	1 1
(d)	sound wave	accept any clear indication of the correct answer	1
total			8

4.1.1.1 Energy stores and systems

3451/F Q4

question	answers	extra information	mark
(a)(i)	heat		1
(ii)	temperature increases **or** (cause) convection (currents)	accept gets warmer accept gets hotter	1
(iii)	60% **or** 0.6	60 without % scores **1** mark 0.6 with a unit scores **1** mark 60 with incorrect unit scores **1** mark **or** correct substitution $\frac{120}{200}$ for **1** mark	2
(b)	street more (energy transferred as) light **or** less (energy transferred as) heat **or** useful energy output the highest	 can only score this mark if first mark scored all efficiencies calculated correctly score 2nd mark point	1 1
total			6

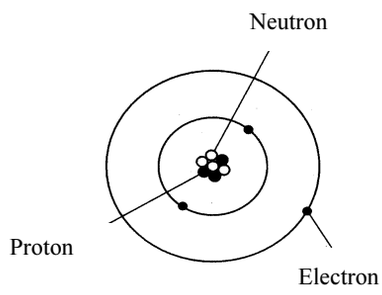
4.1.1.1 Energy stores and systems

3451/F Q5

question	answers	extra information	mark
(a)	MN	accept 5.8, 8 seconds must include unit	1
(b)	LM	accept 0.8, 5.8 seconds must include unit	1
(c)(i)	0.8		1
(ii)	drinking alcohol		1
(d)	straight (by eye) line starting at 0.8 seconds line drawn steeper than LM starting before L	 ignore lines going beyond 2 seconds but line must exceed 2.5 metres per second before terminating	1 1
total			6

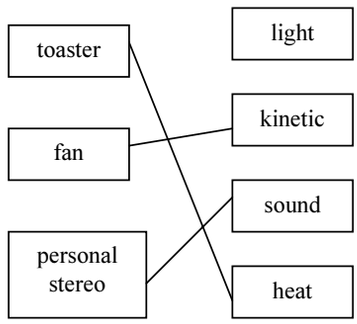
4.1.1.1 Energy stores and systems

3451/F Q6

question	answers	extra information	mark
(a)(i)	each correct label scores 1 mark  		3
(ii)	neutron		1
(iii)	7 number of protons and neutrons **or** number of nucleons **or** number of particles in the nucleus	 accept number of particles in the centre only if first answer = 7	1 1
(b)(i)	50 ± 5		1
(ii)	50 ± 5	accept their (b)(i)	1
(iii)	less	accept any way of indicating the correct answer	1
total			9

4.1.1.1 Energy stores and systems

3451/F Q7

question	answers	extra information	mark
(a)	each correct line scores 1 mark  	if more than 3 lines are drawn mark incorrect ones first, to a maximum of 3 lines	3
(b)	toaster	accept 1.2 kW	1
(c)(i)	400		1
(ii)	£24 **or** 2400p	full credit for their (c)(i) × 6p for full credit the correct numerical answer must have the correct unit an answer of 24 or 2400 with no unit or the incorrect unit scores **1** mark (c)(i) × 6 incorrectly evaluated scores **1** mark	2
(d)	6	allow 6000 for **1** mark allow 3 × 2 for **1** mark	2
total			9

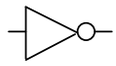
4.1.1.1 Energy stores and systems

3451/F Q8

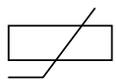
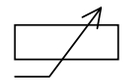
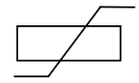
question	answers	extra information	mark
(a)(i)	point where the rays cross	do not credit if ambiguous	1
(ii)	converging (lens)	do **not** accept convex	1
(b)(i)	point where the rays appear to diverge from	this should appear to be within 10mm in front of the back of the arrows on the approximate centre line need not be accurately constructed using a ruler	1
(ii)	diverging (lens)	do **not** accept concave	1
(c)	converging film smaller than nearer to	accept any clear indication of the correct response e.g. ticking, ringing, writing in after a mistake	1 1 1 1
(d)(i)	(image) bigger than object / enlarge	accept just 'made bigger'	1
(ii)	it / real image can be put on a screen **or** real image on the opposite side of the lens to the object	accept 'not an imaginary or virtual image' assume 'it' refers to a real image do **not** credit 'it can be seen'	1
(e)	**either** (the converging lens is) thick in the middle thin(ner) at the edge **or** (both) sides bend outwards (1) in the middle (1) **or** one side bends in the middle (1) more than the other side bends inwards (in the middle) (1)	thickest in the middle gains **2** marks convex gains **2** marks suitable diagrams gains **2** marks	1 1
total			12

4.1.1.1 Energy stores and systems

3451/F Q9

question	answers	extra information	mark
(a)(i)	off off on	all correct	1
(ii)	AND (gate)	accept and (gate)	1
(iii)	on on on	all correct	1
(iv)	OR (gate)	accept or (gate)	1
(b)(i)	1 0 **or** 0 1 0 1 1 0	do **not** credit on / off responses	1
(ii)		accept mirror image accept  accept with either or both parts shaded accept line through as shading	1
(c)		accept off for 0 and on for 1 throughout	
	0 0	both correct	1
	0 1	both correct	1
	1 1	both correct	1
	1 1	both correct	1

3451/F Q9 continued

(d)(i)		accept mirror image **or** inverted do **not** credit  **or**  or similar	1
(ii)	resistance decreases / increases / changes current (through it) increases / decreases / changes **or** temperature changes / increases / decreases (1) resistance changes / decreases / increases (1) (NTC thermistor) both marks independent but must be compatible to score **2** marks accept 'voltage across it decreases' for **2** marks but only if it is made clear that this refers to a thermistor in series		1 1
total			13

4.1.1.1 Energy stores and systems

3451/F Q10

question	answers	extra information	mark
(a)(i)	friction	accept any way of indicating the correct answer	1
(ii)	gravity	accept any way of indicating the correct answer	1
(b)(i)	accelerates **or** speed / velocity increases	accept faster and faster (**1** mark) do **not** accept faster pace / falls faster or suggestions of a greater but constant speed	1
	downwards / falls	accept towards the Earth / ground this may score in part (b)(ii) if it does not score here and there is no contradiction between the two parts	1
(ii)	constant speed / velocity **or** terminal velocity / speed **or** zero acceleration	stays in the same place negates credit	1
total			5

4.1.1.1 Energy stores and systems

3451/F Q11

question	answers	extra information	mark
(a)(i)	X – mantle		1
	Y – inner core	do **not** accept solid core	1
(ii)	different to the crust **or** contains a lot of (heavy) metals	accept iron and nickel for metals	1
	higher (average) density **or** denser	density higher than 5500 (kg/m^3) gets **2** marks	1
(b)	animals were able to move from one continent to the other		1
	(when bridge broke) animals evolved differently	accept animals adapted differently	1
(c)(i)	earthquakes occur at the boundary between plates **or** earthquakes occur where plates push against each other		1
	there are no plate boundaries running through Britain	accept Britain is not near the edge of a plate	1
(ii)	convection currents (in the mantle) **or** heat released by (natural) radioactive processes		1
total			9

4.1.1.1 Energy stores and systems

3451/F Q12

question	answers	extra information	mark
(a)(i)	outside the Earth **or** not from the Earth	accept alien accept life from / on another planet / space accept our planet for Earth	1
(ii)	radio telescope(s)	do **not** accept telescopes do **not** accept satellite dishes do **not** accept radio receivers **or** transmitters	1
(b)(i)	galaxies	do **not** accept stars	1
(ii)	any **one** from: the pulses were regular pulses from space are usually random (scientists) thought technology had been used to produce the pulses neutron stars were unknown signals from a single point	 accept signals / beats for pulses accept noise for random pulses idea of regular but not continuous	1
(iii)	neutron star is (the matter / mass) left behind after a star / red giant explodes (as a super nova)	 accept after a super nova (explosion) neutron star causing super nova gets no credit	1 1
(c)(i)	carried on the balloon / equipment	accept carried by a rocket / aircraft / satellite birds negates credit	1
(ii)	on comets or meteors	accept meteorites / shooting stars accept returning space craft accept solar wind ignore asteroids accept ufo do **not** accept solar flares do **not** accept satellites	1
total			8

4.1.1.1 Energy stores and systems

3451/F Q13

question	answers	extra information	mark
(a)	silver is a (good) reflector of <u>heat</u> (radiation) **or** silver reflects the heat (radiation)	fact heat = infra red ignore references to light accept shiny for silver good radiator negates the mark ignore references to good conductor do **not** accept bounce back	1
	less heat is lost through the board **or** more heat is retained by the shirt	explanation accept both sides of shirt heated reflects heat back up gets **1** mark only ignore mention of friction	1
(b)	metal soleplate	accept soleplate / bottom / metal do **not** accept outside / case	1
(c)	plastic **or** rubber	accept any named plastic do **not** accept wood	1
	it is a (good) insulator **or** it is a poor conductor	ignore mention of heat if in conjunction with electricity	1
(d)	**Quality of written communication** *The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.*	*Maximum of **2** marks if ideas not well expressed.*	
	pulls iron bolt down **or** attracts the iron bolt **or** moves bolt out of plunger	answers in terms of charges attracting or repelling gain no credit	1
	plunger pushed / moved to the right (by spring) **or** plunger released		1
	push switch opens / goes to off / goes to right	accept circuit is broken for maximum credit the points must follow a logical sequence 3 correct points but incorrect sequence scores **2** marks only ignore reset action	1
total			8

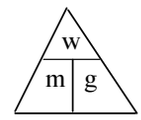
4.1.1.1 Energy stores and systems

3451/F Q14

question	answers	extra information	mark
(a)(i)	any **one** from: the ground the air radon (gas) building materials buildings rocks / granite food cosmic rays **or** solar rays X-rays nuclear weapons testing nuclear power stations / accidents	 do **not** accept mobile phones accept from outer space accept sun but **not** sunlight accept medical uses	1
(ii)	2	allow $\frac{1200}{60\times10}$ **or** $\frac{1200}{600}$ **or** 120 for **1** mark	2
(b)	 alpha: the count rate is (greatly) reduced by the card **or** the card absorbs alphas but not betas beta: the count rate is (greatly) reduced by the metal **or** the thin metal absorbs alphas and betas **or** the thin metal absorbs all of the radiation (from the source) gamma: would pass through the thin metal but count rate is background **or** no radiation passing through **or** a higher reading would be recorded **or** to reduce the count to 2 would require much more than 3 mm of metal	answers must be comparative accept converse answers throughout accept paper for the card accept aluminium for the metal accept aluminium for the metal accept lead / aluminium for the metal	 1 1 1
total			6

4.1.1.1 Energy stores and systems

3451/F Q15

question	answers	extra information	mark
(a)(i)	weight = mass × g.f.s.	accept w = m × g accept gravity for gfs accept  provided subsequent use of Δ correct do **not** accept N = kg × N/kg	1
(ii)	675	75 × 9 for **1** mark	2
(iii)	g.(f.s.) is higher (on Earth than Venus)	accept gravity for g.f.s. do **not** accept g.f.s. is lower unless answer states on Venus	1
(iv)	orbit time for Jupiter is <u>longer</u> / longest (than for the other planets)	do **not** give any credit for an answer that includes a comparison of diameter **or** a comparison of g.f.s.	1
(b)	**Quality of written communication** *The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.* any **two** from: dust <u>and</u> gas **or** remnants of a super nova pulled together by (force of) <u>gravity</u> nuclear fusion starts	*Maximum of **1** mark if ideas not well expressed.* accept hydrogen for dust and gas do **not** accept hydrogen burns although candidates may include more detail these points are essential to score the credit	2
total			7

4.1.1.1 Energy stores and systems

3451/F Q16

question	answers	extra information	mark
(a)(i)	upright with the contacts at the bottom and still in place and unbent	no need for labels but incorrect label(s) cancel the mark accept a freehand drawing no need for details such as correct dimensions	1
	one blob of mercury touching <u>both</u> contacts	do **not** award mark if contacts bent to touch	1
(b)(i)	(X is a) battery	do **not** credit cell accept (set of) cells accept power supply do **not** accept power pack	1
	(Y is a) LED	**or** light emitting diode	1
(ii)	longer (time)	do **not** accept 'slower time'	1
(iii)	any **two** from: current less (so) rate of flow of charge less **or** less coulombs per second (so) discharge is slower	 do **not** accept current slower accept capacitor has charge for longer **or** charge lasts longer **or** (so total of) electrons take longer to travel round circuit	2
(c)	4200	 translation correct (= 4000) but percentage addition incorrect gains **1** mark translation incorrect but 5% addition is correct gains **1** mark accept 422.1 **or** 42.2 **or** 6.3 for **1** mark	2
	ohms **or** Ω	 4.2 kilohms **or** 4.2 kΩ gains all **3** marks	1
total			10

4.1.1.1 Energy stores and systems

3451/F Q17

question	answers	extra information	mark
(a)	point at which its mass (seems to) act **or** point at which gravity (seems to) act	accept …its weight acts accept correct statements if the intent is clear e.g. … if suspended, the centre of gravity will be directly under the point of suspension e.g. … (if the object is symmetrical), the centre of gravity is on the **or** an axis (of symmetry) do **not** credit just 'it is a point'	1
(b)	**Quality of written communication** *The answer to this question requires good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.* any **five** from: clamp (steel) rod (horizontally) hang plastic / sheet by rod through (one) hole hang plumb line from rod mark ends of plumb line on the sheet and use the ruler to draw a straight line repeat with other hole centre of mass is where the lines cross check by balancing at this point	*maximum of **4** marks if ideas not well expressed* **no** marks if method quite unworkable maximum of **3** marks if no 'repeat with other hole'	5
(c)(i)	(turning) effect **or** moment force distance	all three correct accept weight accept length	1
(ii)	17.6 Nm **or** newton metre(s)	allow 44 × 0.4 **or** 0.4 × 44 for **1** mark do **not** accept N/m **or** N/cm 1760 Ncm gains all **3** marks	2 1
total			10

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCSE

Science: Double Award Co-ordinated

3462

Paper 3F

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Kathleen Tattersall: *Director General*

4.1.1.1 Energy stores and systems

INFORMATION FOR EXAMINERS

1. General

The mark scheme for each question shows:

- the marks available for each part of the question;
- the total marks available for the question;
- the typical answer or answers which are expected;
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:
where consequential marking needs to be considered in a calculation;
or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of Quality of Written Communication

Examiners are reminded of the need to assess QoWC by the following statement appearing in the appropriate parts of the mark scheme:

The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.

The maximum marks available to a candidate whose answer is not well expressed will be (the number of marks available –1).

3.2 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.3 Use of chemical symbols/formulae

If a candidate writes a chemical symbol/formula instead of a required chemical name, full credit can be given if the symbol/formula is correct and if, in the context of the question, such action is appropriate.

3.4 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.5 Marking procedure for calculations

3.5.1 Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown. However, if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column.

3.5.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.6 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.7 Errors carried forward

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

(a) A candidate who calculates average speed using speed = time/distance **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.

(b) A candidate who incorrectly calculates average speed using speed = distance/time and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.8 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.9 Brackets

(…..) is used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

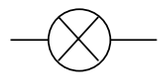
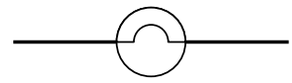
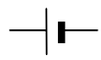
3.10 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.1.1.1 Energy stores and systems

Double Award
Foundation Tier 3462/3F

3462/3F Q1

question	answers	extra information	mark
(a)	circuit symbol for a lamp correct 	accept  accept any standard of drawing providing circuit would work	1
	circuit symbol for a cell correct 		1
	2 lamps drawn in parallel with 3 cells	polarity of cells must be correct (+ to –) but cells may be either way around	1
(b)	4.5		1
(c)	the same as	accept any clear indication of the correct answer	1
total			5

4.1.1.1 Energy stores and systems

3462/3F Q2

question	answers	extra information	mark
(a)	gas		1
(b)	fuel burning stations produce electricity at any time / all the time	accept fuel available all the time	1
	wind generator can only produce when the wind is strong enough	accept it's not always windy	1
(c)	no fuel is burnt **or** no fuel is used **or** uses only energy from wind **or** does not emit harmful gases / soot / smoke	do **not** accept wind is natural / environmentally friendly / renewable answer must be in terms of wind, **not** negative of fuel burning specific examples of gases CO_2, SO_2, acid rain and greenhouse gases can be accepted ozone negates credit	1
total			4

4.1.1.1 Energy stores and systems

3462/3F Q3

question	answers	extra information	mark
(a)(i)	microwaves		1
(ii)	infra red		1
(iii)	ultrasonic		1
(b)(i)	B		1
(ii)	A		1
(c)	disturbance / vibration / movement direction	accept motion / force do **not** accept energy	1 1
(d)	sound wave	accept any clear indication of the correct answer	1
total			8

4.1.1.1 Energy stores and systems

3462/3F Q4

question	answers	extra information	mark
(a)(i)	heat		1
(ii)	temperature increases **or** (cause) convection (currents)	accept gets warmer accept gets hotter	1
(iii)	60% **or** 0.6	60 without % scores **1** mark 0.6 with a unit scores **1** mark 60 with incorrect unit scores **1** mark **or** correct substitution $\frac{120}{200}$ for **1** mark	2
(b)	street more (energy transferred as) light **or** less (energy transferred as) heat **or** useful energy output the highest	 can only score this mark if first mark scored all efficiencies calculated correctly score 2nd mark point	1 1
total			6

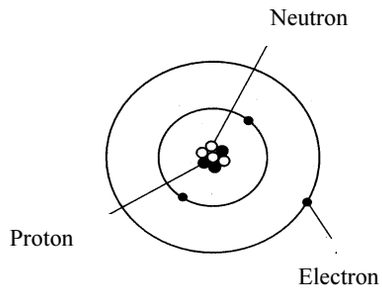
4.1.1.1 Energy stores and systems

3462/3F Q5

question	answers	extra information	mark
(a)	MN	accept 5.8, 8 seconds must include unit	1
(b)	LM	accept 0.8, 5.8 seconds must include unit	1
(c)(i)	0.8		1
(ii)	drinking alcohol		1
(d)	straight (by eye) line starting at 0.8 seconds line drawn steeper than LM starting before L	 ignore lines going beyond 2 seconds but line must exceed 2.5 metres per second before terminating	1 1
total			6

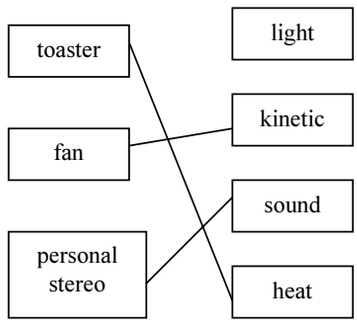
4.1.1.1 Energy stores and systems

3462/3F Q6

question	answers	extra information	mark
(a)(i)	each correct label scores 1 mark  		3
(ii)	neutron		1
(iii)	7 number of protons and neutrons **or** number of nucleons **or** number of particles in the nucleus	 accept number of particles in the centre only if first answer = 7	1 1
(b)(i)	50 ± 5		1
(ii)	50 ± 5	accept their (b)(i)	1
(iii)	less	accept any way of indicating the correct answer	1
total			9

4.1.1.1 Energy stores and systems

3462/3F Q7

question	answers	extra information	mark
(a)	each correct line scores 1 mark  	if more than 3 lines are drawn mark incorrect ones first, to a maximum of 3 lines	3
(b)	toaster	accept 1.2 kW	1
(c)(i)	400		1
(ii)	£24 **or** 2400p	full credit for their (c)(i) × 6p for full credit the correct numerical answer must have the correct unit an answer of 24 or 2400 with no unit or the incorrect unit scores **1** mark (c)(i) × 6 incorrectly evaluated scores **1** mark	2
(d)	6	allow 6000 for **1** mark allow 3 × 2 for **1** mark	2
total			9

4.1.1.1 Energy stores and systems

3462/3F Q8

question	answers	extra information	mark
(a)(i)	friction	accept any way of indicating the correct answer	1
(ii)	gravity	accept any way of indicating the correct answer	1
(b)(i)	accelerates **or** speed / velocity increases	accept faster and faster (**1** mark) do **not** accept faster pace / falls faster or suggestions of a greater but constant speed	1
	downwards / falls	accept towards the Earth / ground this may score in part (b)(ii) if it does not score here and there is no contradiction between the two parts	1
(ii)	constant speed / velocity **or** terminal velocity / speed **or** zero acceleration	stays in the same place negates credit	1
total			5

4.1.1.1 Energy stores and systems

3462/3F Q9

question	answers	extra information	mark
(a)(i)	X – mantle		1
	Y – inner core	do **not** accept solid core	1
(ii)	different to the crust **or** contains a lot of (heavy) metals	accept iron and nickel for metals	1
	higher (average) density **or** denser	density higher than 5500 (kg/m^3) gets **2** marks	1
(b)	animals were able to move from one continent to the other		1
	(when bridge broke) animals evolved differently	accept animals adapted differently	1
(c)(i)	earthquakes occur at the boundary between plates **or** earthquakes occur where plates push against each other		1
	there are no plate boundaries running through Britain	accept Britain is not near the edge of a plate	1
(ii)	convection currents (in the mantle) **or** heat released by (natural) radioactive processes		1
total			9

4.1.1.1 Energy stores and systems

3462/3F Q10

question	answers	extra information	mark
(a)(i)	outside the Earth **or** not from the Earth	accept alien accept life from / on another planet / space accept our planet for Earth	1
(ii)	radio telescope(s)	do **not** accept telescopes do **not** accept satellite dishes do **not** accept radio receivers **or** transmitters	1
(b)(i)	galaxies	do **not** accept stars	1
(ii)	any **one** from: the pulses were regular pulses from space are usually random (scientists) thought technology had been used to produce the pulses neutron stars were unknown signals from a single point	 accept signals / beats for pulses accept noise for random pulses idea of regular but not continuous	1
(iii)	neutron star is (the matter / mass) left behind after a star / red giant explodes (as a super nova)	 accept after a super nova (explosion) neutron star causing super nova gets no credit	1 1
(c)(i)	carried on the balloon / equipment	accept carried by a rocket / aircraft / satellite birds negates credit	1
(ii)	on comets or meteors	accept meteorites / shooting stars accept returning space craft accept solar wind ignore asteroids accept ufo do **not** accept solar flares do **not** accept satellites	1
total			8

4.1.1.1 Energy stores and systems

3462/3F Q11

question	answers	extra information	mark
(a)	silver is a (good) reflector of <u>heat</u> (radiation) **or** silver reflects the heat (radiation)	fact heat = infra red ignore references to light accept shiny for silver good radiator negates the mark ignore references to good conductor do **not** accept bounce back	1
	less heat is lost through the board **or** more heat is retained by the shirt	explanation accept both sides of shirt heated reflects heat back up gets **1** mark only ignore mention of friction	1
(b)	metal soleplate	accept soleplate / bottom / metal do **not** accept outside / case	1
(c)	plastic **or** rubber	accept any named plastic do **not** accept wood	1
	it is a (good) insulator **or** it is a poor conductor	ignore mention of heat if in conjunction with electricity	1
(d)	**Quality of written communication** *The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.*	*Maximum of **2** marks if ideas not well expressed.*	
	pulls iron bolt down **or** attracts the iron bolt **or** moves bolt out of plunger	answers in terms of charges attracting or repelling gain no credit	1
	plunger pushed / moved to the right (by spring) **or** plunger released		1
	push switch opens / goes to off / goes to right	accept circuit is broken for maximum credit the points must follow a logical sequence 3 correct points but incorrect sequence scores **2** marks only ignore reset action	1
total			8

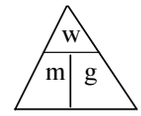
4.1.1.1 Energy stores and systems

3462/3F Q12

question	answers	extra information	mark
(a)(i)	any **one** from: the ground the air radon (gas) building materials buildings rocks / granite food cosmic rays **or** solar rays X-rays nuclear weapons testing nuclear power stations / accidents	 do **not** accept mobile phones accept from outer space accept sun but **not** sunlight accept medical uses	1
(ii)	2	allow $\frac{1200}{60\times10}$ **or** $\frac{1200}{600}$ **or** 120 for **1** mark	2
(b)	 alpha: the count rate is (greatly) reduced by the card **or** the card absorbs alphas but not betas beta: the count rate is (greatly) reduced by the metal **or** the thin metal absorbs alphas and betas **or** the thin metal absorbs all of the radiation (from the source) gamma: would pass through the thin metal but count rate is background **or** no radiation passing through **or** a higher reading would be recorded **or** to reduce the count to 2 would require much more than 3 mm of metal	answers must be comparative accept converse answers throughout accept paper for the card accept aluminium for the metal accept aluminium for the metal accept lead / aluminium for the metal	 1 1 1
total			6

4.1.1.1 Energy stores and systems

3462/3F Q13

question	answers	extra information	mark
(a)(i)	weight = mass × g.f.s.	accept w = m × g accept gravity for gfs accept  provided subsequent use of Δ correct do **not** accept N = kg × N/kg	1
(ii)	675	75 × 9 for **1** mark	2
(iii)	g.(f.s.) is higher (on Earth than Venus)	accept gravity for g.f.s. do **not** accept g.f.s. is lower unless answer states on Venus	1
(iv)	orbit time for Jupiter is <u>longer</u> / longest (than for the other planets)	do **not** give any credit for an answer that includes a comparison of diameter **or** a comparison of g.f.s.	1
(b)	**Quality of written communication** *The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.* any **two** from: dust <u>and</u> gas **or** remnants of a super nova pulled together by (force of) <u>gravity</u> nuclear fusion starts	*Maximum of **1** mark if ideas not well expressed.* accept hydrogen for dust and gas do **not** accept hydrogen burns although candidates may include more detail these points are essential to score the credit	2
total			7

GCSE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Physics Specification B
3451/F

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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4.1.1.1 Energy stores and systems

Further copies of this Mark Scheme are available from:

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4.1.1.1 Energy stores and systems

GCSE PHYSICS

INFORMATION FOR EXAMINERS

1. General

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- the total marks available for the question;
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The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:
where consequential marking needs to be considered in a calculation;
or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of Quality of Written Communication

Where *Quality of written communication* appears in the mark scheme, one mark is to be awarded for either of the following points:

- Using correct scientific terms
- Correct sequencing or linking of ideas or points

The mark scheme will specify which of the points is to be awarded in a particular question. A QoWC mark can be awarded for a scientific answer, even if it is not accurate. It cannot be awarded for a nonsensical or non-scientific answer.
On the script, the QoWC tick should be identified by a 'q' written next to it.

3.2 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

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Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.3 Use of chemical symbols/formulae

If a candidate writes a chemical symbol/formula instead of a required chemical name, full credit can be given if the symbol/formula is correct and if, in the context of the question, such action is appropriate.

3.4 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.5 Marking procedure for calculations

3.5.1 Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.
However:

- if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

3.5.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.6 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

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3.7 Errors carried forward

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

(a) A candidate who calculates average speed using speed = time/distance **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.

(b) A candidate who incorrectly calculates average speed using speed = distance/time and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.8 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.9 Brackets

(…..) is used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.10 Interpretation of marginal points

There will be times when the answer is almost, but not quite, correct. Some examiners would award a mark while others would not. In any one script, an attempt should be made to balance these nearly correct answers by giving the mark on some occasions but not on others. If this is not done, the marking would end up being too lenient or too harsh.

3.11 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

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4.1.1.1 Energy stores and systems

GCSE Physics
Foundation Tier 3451/F

3451F Q1

question	answers	extra information	mark
(a)	comet	correct order only	1
	elliptical		1
	Milky Way		1
	Universe		1
(b)(i)	D A C B	allow **2** marks for two letters in the correct place allow **1** mark for one letter in the correct place	3
(ii)	A		1
total			8

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4.1.1.1 Energy stores and systems

3451F Q2

question	answers	extra information	mark
(a)	95		1
(b)	alpha	accept correct symbol	1
(c)	any **two** from: • radiation is outside the body • radiation will not reach (living) cells • radiation absorbed by the air	 accept detector is on ceiling or high up the wall accept radiation cannot pass through the body / skin accept cannot pass through the plastic casing do **not** accept because it is alpha radiation – unless qualified do **not** accept does not give off harmful substance do **not** accept cannot pass through building materials etc.	2
(d)	less (than)		1
total			5

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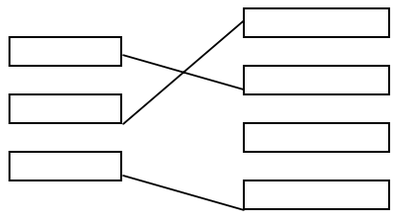
4.1.1.1 Energy stores and systems

3451F Q3

question	answers	extra information	mark
(a)	generator	accept dynamo accept alternator	1
(b)(i)	1400	ignore units	1
(ii)	0.3 or 30%	any incorrect unit penalise **1** mark allow **1** mark for the correct use of 600 **or** 0.3% **or** 30	2
(c)	**1** mark for each correct link 	if more than 3 lines are drawn, mark only 3 lines starting with those that are incorrect	3
(d)(i)	110	no tolerance	1
(ii)	12	no tolerance	1
(iii)	wind speed may be too low to operate the generator	accept wind may not always blow accept power depends on wind speed accept does not generate if wind speed is too high accept does not generate if wind speed is above 12 (m/s) accept does not generate if wind speed is below 1.6 (m/s) accept it is unreliable do **not** accept answers referring to cost only	1
total			10

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4.1.1.1 Energy stores and systems

3451F Q4

question	answers	extra information	mark
(a)	B E A D	allow **1** mark for each letter in the correct place, to a maximum of **3** marks	3
(b)	(a spark) may cause the (petrol vapour) to explode / ignite	accept petrol for (petrol vapour) accept catch fire for explode	1
	connect tanker to earth with a (conducting) wire / chain **or** earth the tanker	accept ground for earth	1
(c)	**Quality of written communication**	for a logical sequence	1
	any **two** from:		2
	• when current greater than fuse rating / value	accept when current too great for appliance do **not** accept 'if there is too much current' do **not** accept voltage or electricity	
	• fuse (becomes hot and) melts / burns out	accept fuse blows / breaks	
	• circuit is broken	accept circuit switched off this cannot score credit on its own	
total			8

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4.1.1.1 Energy stores and systems

3451F Q5

question	answers	extra information	mark
(a)(i)	crust		1
(ii)	inner core is <u>solid</u> outer core is liquid	do **not** accept just rock inner core is denser / hotter than outer core gets **2** marks accept one is solid and one is liquid for **1** mark accept they are different densities for **1** mark wrong way round = **0** marks	1 1
(b)	seismograph		1
(c)	difficult to measure (slow) movement (1) of plates (1) dependent mark **or** difficult to measure friction / forces (1) between plates (1) dependent mark		1 1
(d)	geothermal		1
(e)(i)	5000		1
(ii)	2500		1
total			9

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4.1.1.1 Energy stores and systems

3451F Q6

	answers	extra information	mark
(a)	converging image object image object shorter		1 1 1 1 1 1
(b)(i)	(Earth's) gravity	accept centripetal accept minor misspellings, however, do **not** credit any response which could be 'centrifugal'	1
(ii)	to(wards) (the centre of the) Earth	allow inwards do **not** accept downwards	1
(c)(i)	**either** friction (force) **or** centripetal force between the tyres / wheels and (the surface of) the road	 allow grip allow on the tyres / wheels **or** towards the centre of the bend / arc / circle	 1 1
(ii)	mass **or** speed **or** momentum radius / diameter	allow weight allow velocity do **not** credit 'curvature' or 'circumference'	1 1
(d)	centripetal	accept minor misspellings (see above)	1
total			13

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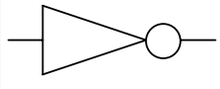
4.1.1.1 Energy stores and systems

3451F Q7

	answers	extra information	mark
(a)(i)	two switches in series **and** circuit complete	ignore small imperfections	1
(ii)	two switches in parallel **and** circuit complete	ignore small imperfections	1
(iii)	one switch in parallel with the cell / lamp (but **not** both)	ignore small imperfections	1
(iv)	(i) AND (ii) OR (iii) NOT	accept 'and' accept 'or' accept 'not'	1 1 1
(b)(i)	when it is light the sensor sends on / high / 1 signal to the gate off / low / 0 sent to the lamp **or** when it is dark the sensor sends off / low / 0 signal to the gate (1) on / high / 1 sent to the lamp (1)		1 1
(ii)	any suitable application	e.g. to switch a security light on (and off) e.g. to switch a light on when it is dark do **not** credit just '… to switch a light on / off'	1
(c)(i)		accept shading-in of either or both parts end connections are not required accept any orientation	1
(ii)	1 0 **or** 0 1 0 1 1 0	all correct	1
(iii)	truth (table)		1
total			12

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4.1.1.1 Energy stores and systems

3451F Q8

question	answers	extra information	mark
(a)	60		1
(b)	$5\frac{1}{2}$ hours	must include unit	1
(c)	30		1
(d)	30 minutes or $\frac{1}{2}$ hour	must include unit	1
(e)	D **and** E least steep part of the graph	accept finish for E accept correct numbers from axes with units accept covers smallest distance in a set time accept only moves 5 km in $1\frac{1}{2}$ hours (accept anything between 5 and 6) ignore horse is tired	1 1
total			6

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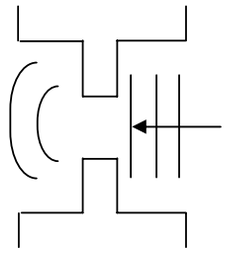
4.1.1.1 Energy stores and systems

3451F Q9

question	answers	extra information	mark
(a)(i)	any **one** from: • (doctors) to see inside a patients body **or** endoscope • telephone cables • optical fibre / fibre optic lamps **or** (artificial) Christmas trees • data transfer **or** internet connection	 accept keyhole surgery do **not** accept flex **or** wires for cable accept decorative / ornamental lighting accept any feasible practical suggestion for taking light to a difficult to access place do **not** accept lighting unqualified do **not** accept lamp unqualified do **not** accept communications unless clarified	1
(ii)	(incident) ray angle greater than critical angle total internal reflection occurs	either order accept (incident) ray greater than 42° accept TIR do **not** accept just description of TIR	1 1
(b)(i)	waves shown diffracting in the correct direction 	ignore wavelength	1
(ii)	diffraction	accept diffract / diffracted	1
total			5

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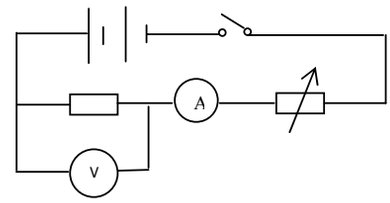
4.1.1.1 Energy stores and systems

3451F Q10

question	answers	extra information	mark
(a)	all symbols correct	 accept push switch symbol switch may be open or closed any lines through symbols = **0** marks	1
	correct circuit drawn voltmeter must be across resistor only	polarity of cells not relevant provided they are joined correctly two cells are required in the diagram ignore the order of the components allow small gaps in circuit omission of any component = **0** marks	1
(b)(i)	potential difference = current × resistance	accept voltage or p.d. for potential difference accept $V = I \times R$ accept  provided subsequent use correct do **not** accept C for current	1
(ii)	2	 allow **1** mark for correct substitution wrong working loses both marks	2
(iii)	straight line drawn <u>through the origin</u> straight line passes through $I = 0.4, V =$ their (b)(ii) / 2 **and** 0.0	judge by eye this mark may be awarded if all points shown including these points are correct even if no line is drawn N.B. a curve scores **0** marks	1 1 dep
(c)	temperature <u>increases</u>	accept filament lamp / it gets <u>hotter</u> allow heat for temperature	1
total			8

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4.1.1.1 Energy stores and systems

3451F Q11

question	answers	extra information	mark
(a)(i)	gamma rays	accept gamma accept correct symbol	1
(ii)	infra red	accept IR	1
(b)	ultraviolet <u>absorbed</u> by ink (energy) given out as light	 accept glows / luminous accept for **both** marks the ink is fluorescent do **not** accept answers in terms of uv being reflected	1 1
(c)	any **two** from: • UV can damage / kill / ionise / alter (normal) cells • change DNA structure **or** mutate • (normal) cells may become cancerous	 do **not** accept attacks cells **or** burns skin accept may cause (skin) cancer accept abnormal cell multiplication	2
(d)(i)	microwaves **and** infra red	both answers needed in either order do **not** accept heat for IR	1
(ii)	0.9	allow **1** mark for the <u>correct</u> use of 1.8 (kW) $(1.8 \times \frac{1}{2}$ or $1.8 \times 30)$ i.e. adding the correct 2 power values	2
total			9

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4.1.1.1 Energy stores and systems

3451F Q12

question	answers	extra information	mark
(a)(i)	accelerating	accept getting faster accept speed / velocity increasing	1
(ii)	acceleration increases	accept velocity / speed increases more rapidly do **not** accept velocity / speed increases	1
(b)(i)	$\text{acceleration} = \frac{\text{change in velocity}}{\text{time (taken)}}$	accept $a = \frac{v - u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$ do **not** accept velocity for change in velocity do **not** accept change in speed do **not** accept $a = \frac{v}{t}$	1
(ii)	15	allow **1** mark for an answer of 900 **or** for correct use of 540 seconds	2
(iii)	velocity includes direction	accept velocity is a vector (quantity) accept converse answer	1
(c)	force of gravity (between shuttle and Earth) plus correct orbital speed (makes shuttle move in a curve)	accept gravitational pull if used correctly accept forward motion **or** constant speed for orbital speed accept it is travelling fast enough accept for **2** marks the force of gravity provides the centripetal force	1 1
(d)	black is a good emitter of radiation **or** to limit the temperature rise inside the shuttle	accept heat for radiation accept the tiles are good insulation do **not** accept black absorbs heat on its own do **not** accept tiles are heat proof	1
total			9

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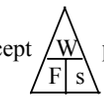
4.1.1.1 Energy stores and systems

3451F Q13

question	answers	extra information	mark
(a)(i)	work (done) = force (applied) × distance (moved)	accept W = F × s or W = F × d accept  provided subsequent method is correct	1
(ii)	240 000 joules	allow **1** mark for correct substitution **or** correct use of 1200 (N) accept J do **not** accept j / Nm	2 1
(b)	800 (watts)	accept 0.8 kW accept their (a)(ii) ÷ 300 correctly evaluated for **2** marks allow **1** mark for correct substitution (a)(ii) ÷ 5 correctly evaluated for **1** mark	2
(c)(i)	any **one** from: • needs to raise the chair / lift • lifting more than one chair • energy transfer to the surroundings correctly qualified	 allow lifting more than 2 people implication of a heavier weight accept loss for transfer do **not** accept motor inefficient do **not** accept motor gets hot do **not** accept friction unless the location is specified as external to the motor	1
(ii)	electrical potential	accept electric **both** answers required for the mark	1
total			8

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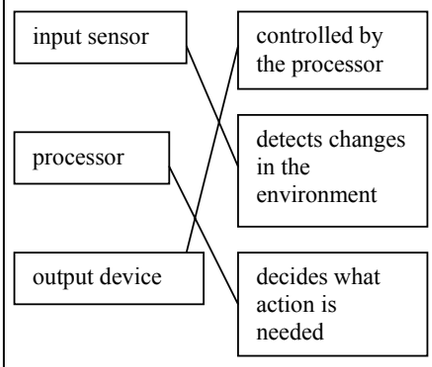
4.1.1.1 Energy stores and systems

3451F Q14

	answers	extra information	mark
(a)(i)	current		1
(ii)	resistance decreases	 accept 'the flow of electrons / current (through it) increases' for **1** mark do **not** credit just '… it will get warmer'	1 1
(b)		all pairs correct one pair correct for **1** mark	2
(c)(i)	potential divider	accept voltage divider	1
(ii)	4 (volts)	$6 \times \frac{30}{45}$ for **1** mark	2
(iii)	across the new resistor…(will) increase across R_2 … (will) decrease	 N.B. independent marks	1 1
total			10

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4.1.1.1 Energy stores and systems

3451F Q15

	answers	extra information	mark
(a)	relay (normally open) (switch)	each mark is independent	1
	… switch on a (larger) current (in another circuit) **or** switch on a higher voltage circuit	do **not** accept switch on another circuit **or** smaller / equal current	1
	light emitting diode / LED	do **not** credit LDR	1
	… in one / direct / certain direction **or** from left to right	**or** when the cathode is connected to the negative terminal / side **or** when the left-hand side is connected to the positive terminal / side do **not** credit just '… is big enough' do **not** accept 'positive direction'	1
	AND gate	accept 'and' gate do **not** accept numerical values unless expanded	1
	… (both) inputs are on / high / 1 **or** current flows in both inputs		1
(b)	**Quality of written communication**	If in a sensible order which clearly indicates advantages or disadvantages, including answers in the form of a table **or** as bullet points Q ✓ Q X	1
	any **three** from: • advantage of mobile phones • drawback of mobile phones • benefit of the Internet • drawback of the Internet	 e.g. more convenient for service engineers e.g. calls can be received away from base e.g. privacy can be more easily invaded e.g. drivers can be distracted e.g. microwaves / radio waves can / may cause damage to the brain e.g. access to educational material e.g. some material is salacious e.g. spam (on external e-mail) these are examples candidates may be credited for a variety of responses	3
total			10

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4.1.1.1 Energy stores and systems

3451F Q16

question	answers	extra information	mark
(a)	**Y** and **Z**		1
	they have the same number of protons **or** same atomic number	accept they have the same number of electrons **or** same number of protons **and** electrons allow only different in number of neutrons N.B. independent marks	1
(b)	**Quality of written communication**	for correct use of terms underlined in B **or** C Q ✓ Q X	1
	A – alpha particle passes straight through the empty space of the atom **or** it is a long way from the nucleus B – alpha particle <u>deflected</u> / <u>repelled</u> / <u>repulsed</u> by the (positive) <u>nucleus</u>	describes 3 tracks correctly for **2** marks describes 2 or 1 track correctly for **1** mark	max 2
	C – alpha particle heading straight for the <u>nucleus</u> is <u>deflected</u> / <u>repelled</u> / <u>repulsed</u> backwards	do **not** accept hits the nucleus do **not** accept answers referring to refraction do **not** accept answers in terms of reflected backwards unless qualified in terms of repulsion mention of difference in charge on nucleus negates that track	
total			5

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GCSE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Science: Double Award
Specification B (Co-ordinated)
3462/3F

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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4.1.1.1 Energy stores and systems

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4.1.1.1 Energy stores and systems

SCIENCE: DOUBLE AWARD CO-ORDINATED

INFORMATION FOR EXAMINERS

1. General

The mark scheme for each question shows:

- the marks available for each part of the question;
- the total marks available for the question;
- the typical answer or answers which are expected;
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:
where consequential marking needs to be considered in a calculation;
or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of Quality of Written Communication

Where *Quality of written communication* appears in the mark scheme, one mark is to be awarded for either of the following points:

- Using correct scientific terms
- Correct sequencing or linking of ideas or points

The mark scheme will specify which of the points is to be awarded in a particular question. A QoWC mark can be awarded for a scientific answer, even if it is not accurate. It cannot be awarded for a nonsensical or non-scientific answer.
On the script, the QoWC tick should be identified by a 'q' written next to it.

3.2 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

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Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.3 Use of chemical symbols/formulae

If a candidate writes a chemical symbol/formula instead of a required chemical name, full credit can be given if the symbol/formula is correct and if, in the context of the question, such action is appropriate.

3.4 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.5 Marking procedure for calculations

3.5.1 Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.
However:

- if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

3.5.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.6 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

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4.1.1.1 Energy stores and systems

3.7 Errors carried forward

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

(a) A candidate who calculates average speed using speed = time/distance **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.

(b) A candidate who incorrectly calculates average speed using speed = distance/time and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

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The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

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4.1.1.1 Energy stores and systems

Double Award
Foundation Tier 3462/3F

3462/3F Q1

question	answers	extra information	mark
(a)	comet	correct order only	1
	elliptical		1
	Milky Way		1
	Universe		1
(b)(i)	D A C B	allow **2** marks for two letters in the correct place allow **1** mark for one letter in the correct place	3
(ii)	A		1
total			8

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4.1.1.1 Energy stores and systems

3462/3F Q2

question	answers	extra information	mark
(a)	95		1
(b)	alpha	accept correct symbol	1
(c)	any **two** from: • radiation is outside the body • radiation will not reach (living) cells • radiation absorbed by the air	 accept detector is on ceiling or high up the wall accept radiation cannot pass through the body / skin accept cannot pass through the plastic casing do **not** accept because it is alpha radiation – unless qualified do **not** accept does not give off harmful substance do **not** accept cannot pass through building materials etc.	2
(d)	less (than)		1
total			5

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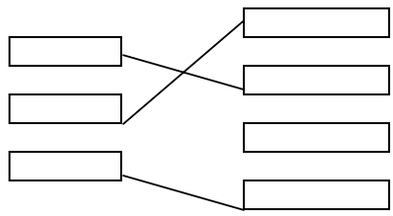
4.1.1.1 Energy stores and systems

3462/3F Q3

question	answers	extra information	mark
(a)	generator	accept dynamo accept alternator	1
(b)(i)	1400	ignore units	1
(ii)	0.3 or 30%	any incorrect unit penalise **1** mark allow **1** mark for the correct use of 600 **or** 0.3% **or** 30	2
(c)	**1** mark for each correct link 	if more than 3 lines are drawn, mark only 3 lines starting with those that are incorrect	3
(d)(i)	110	no tolerance	1
(ii)	12	no tolerance	1
(iii)	wind speed may be too low to operate the generator	accept wind may not always blow accept power depends on wind speed accept does not generate if wind speed is too high accept does not generate if wind speed is above 12 (m/s) accept does not generate if wind speed is below 1.6 (m/s) accept it is unreliable do **not** accept answers referring to cost only	1
total			10

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4.1.1.1 Energy stores and systems

3462/3F Q4

question	answers	extra information	mark
(a)	B E A D	allow **1** mark for each letter in the correct place, to a maximum of **3** marks	3
(b)	(a spark) may cause the (petrol vapour) to explode / ignite	accept petrol for (petrol vapour) accept catch fire for explode	1
	connect tanker to earth with a (conducting) wire / chain **or** earth the tanker	accept ground for earth	1
(c)	**Quality of written communication**	for a logical sequence	1
	any **two** from:		2
	• when current greater than fuse rating / value	accept when current too great for appliance do **not** accept 'if there is too much current' do **not** accept voltage or electricity	
	• fuse (becomes hot and) melts / burns out	accept fuse blows / breaks	
	• circuit is broken	accept circuit switched off this cannot score credit on its own	
total			8

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4.1.1.1 Energy stores and systems

3462/3F Q5

question	answers	extra information	mark
(a)(i)	crust		1
(ii)	inner core is <u>solid</u> outer core is liquid	do **not** accept just rock inner core is denser / hotter than outer core gets **2** marks accept one is solid and one is liquid for **1** mark accept they are different densities for **1** mark wrong way round = **0** marks	1 1
(b)	seismograph		1
(c)	difficult to measure (slow) movement (1) of plates (1) dependent mark **or** difficult to measure friction / forces (1) between plates (1) dependent mark		1 1
(d)	geothermal		1
(e)(i)	5000		1
(ii)	2500		1
total			9

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4.1.1.1 Energy stores and systems

3462/3F Q6

question	answers	extra information	mark
(a)	60		1
(b)	$5\frac{1}{2}$ hours	must include unit	1
(c)	30		1
(d)	30 minutes or $\frac{1}{2}$ hour	must include unit	1
(e)	D **and** E least steep part of the graph	accept finish for E accept correct numbers from axes with units accept covers smallest distance in a set time accept only moves 5 km in $1\frac{1}{2}$ hours (accept anything between 5 and 6) ignore horse is tired	1 1
total			6

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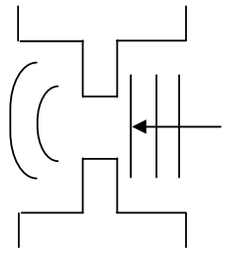
4.1.1.1 Energy stores and systems

3462/3F Q7

question	answers	extra information	mark
(a)(i)	any **one** from: • (doctors) to see inside a patients body **or** endoscope • telephone cables • optical fibre / fibre optic lamps **or** (artificial) Christmas trees • data transfer **or** internet connection	 accept keyhole surgery do **not** accept flex **or** wires for cable accept decorative / ornamental lighting accept any feasible practical suggestion for taking light to a difficult to access place do **not** accept lighting unqualified do **not** accept lamp unqualified do **not** accept communications unless clarified	1
(ii)	(incident) ray angle greater than critical angle total internal reflection occurs	either order accept (incident) ray greater than 42° accept TIR do **not** accept just description of TIR	1 1
(b)(i)	waves shown diffracting in the correct direction 	ignore wavelength	1
(ii)	diffraction	accept diffract / diffracted	1
total			5

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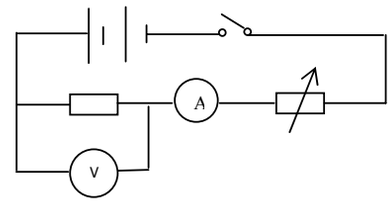
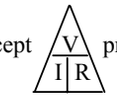
4.1.1.1 Energy stores and systems

3462/3F Q8

question	answers	extra information	mark
(a)	all symbols correct	 accept push switch symbol switch may be open or closed any lines through symbols = **0** marks	1
	correct circuit drawn voltmeter must be across resistor only	polarity of cells not relevant provided they are joined correctly two cells are required in the diagram ignore the order of the components allow small gaps in circuit omission of any component = **0** marks	1
(b)(i)	potential difference = current × resistance	accept voltage or p.d. for potential difference accept $V = I \times R$ accept  provided subsequent use correct do **not** accept C for current	1
(ii)	2	 allow **1** mark for correct substitution wrong working loses both marks	2
(iii)	straight line drawn <u>through the origin</u> straight line passes through $I = 0.4, V =$ their (b)(ii) / 2 **and** 0.0	judge by eye this mark may be awarded if all points shown including these points are correct even if no line is drawn N.B. a curve scores **0** marks	1 1 dep
(c)	temperature <u>increases</u>	accept filament lamp / it gets <u>hotter</u> allow heat for temperature	1
total			8

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4.1.1.1 Energy stores and systems

3462/3F Q9

question	answers	extra information	mark
(a)(i)	gamma rays	accept gamma accept correct symbol	1
(ii)	infra red	accept IR	1
(b)	ultraviolet <u>absorbed</u> by ink (energy) given out as light	 accept glows / luminous accept for **both** marks the ink is fluorescent do **not** accept answers in terms of uv being reflected	1 1
(c)	any **two** from: • UV can damage / kill / ionise / alter (normal) cells • change DNA structure **or** mutate • (normal) cells may become cancerous	 do **not** accept attacks cells **or** burns skin accept may cause (skin) cancer accept abnormal cell multiplication	2
(d)(i)	microwaves **and** infra red	both answers needed in either order do **not** accept heat for IR	1
(ii)	0.9	 allow **1** mark for the <u>correct</u> use of 1.8 (kW) $(1.8 \times \frac{1}{2}$ or $1.8 \times 30)$ i.e. adding the correct 2 power values	2
total			9

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4.1.1.1 Energy stores and systems

3462/3F Q10

question	answers	extra information	mark
(a)(i)	accelerating	accept getting faster accept speed / velocity increasing	1
(ii)	acceleration increases	accept velocity / speed increases more rapidly do **not** accept velocity / speed increases	1
(b)(i)	$\text{acceleration} = \frac{\text{change in velocity}}{\text{time (taken)}}$	accept $a = \frac{v - u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$ do **not** accept velocity for change in velocity do **not** accept change in speed do **not** accept $a = \frac{v}{t}$	1
(ii)	15	allow **1** mark for an answer of 900 **or** for correct use of 540 seconds	2
(iii)	velocity includes direction	accept velocity is a vector (quantity) accept converse answer	1
(c)	force of gravity (between shuttle and Earth) plus correct orbital speed (makes shuttle move in a curve)	accept gravitational pull if used correctly accept forward motion **or** constant speed for orbital speed accept it is travelling fast enough accept for **2** marks the force of gravity provides the centripetal force	1 1
(d)	black is a good emitter of radiation **or** to limit the temperature rise inside the shuttle	accept heat for radiation accept the tiles are good insulation do **not** accept black absorbs heat on its own do **not** accept tiles are heat proof	1
total			9

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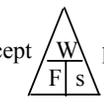
4.1.1.1 Energy stores and systems

3462/3F Q11

question	answers	extra information	mark
(a)(i)	work (done) = force (applied) × distance (moved)	accept W = F × s or W = F × d accept  provided subsequent method is correct	1
(ii)	240 000 joules	allow **1** mark for correct substitution **or** correct use of 1200 (N) accept J do **not** accept j / Nm	2 1
(b)	800 (watts)	accept 0.8 kW accept their (a)(ii) ÷ 300 correctly evaluated for **2** marks allow **1** mark for correct substitution (a)(ii) ÷ 5 correctly evaluated for **1** mark	2
(c)(i)	any **one** from: • needs to raise the chair / lift • lifting more than one chair • energy transfer to the surroundings correctly qualified	 allow lifting more than 2 people implication of a heavier weight accept loss for transfer do **not** accept motor inefficient do **not** accept motor gets hot do **not** accept friction unless the location is specified as external to the motor	1
(ii)	electrical potential	accept electric **both** answers required for the mark	1
total			8

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4.1.1.1 Energy stores and systems

3462/3F Q12

question	answers	extra information	mark
(a)	**Y** and **Z**		1
	they have the same number of protons **or** same atomic number	accept they have the same number of electrons **or** same number of protons **and** electrons allow only different in number of neutrons N.B. independent marks	1
(b)	**Quality of written communication**	for correct use of terms underlined in B **or** C Q ✓ Q X	1
	A – alpha particle passes straight through the empty space of the atom **or** it is a long way from the nucleus B – alpha particle deflected / repelled / repulsed by the (positive) nucleus C – alpha particle heading straight for the nucleus is deflected / repelled / repulsed backwards	describes 3 tracks correctly for **2** marks describes 2 or 1 track correctly for **1** mark do **not** accept hits the nucleus do **not** accept answers referring to refraction do **not** accept answers in terms of reflected backwards unless qualified in terms of repulsion mention of difference in charge on nucleus negates that track	max 2
total			5

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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Physics 3451/F
Specification B

Mark Scheme

2005 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Physics (Specification B)
Foundation Tier 3451/F

3451/F Q1

question	answers	extra information	mark
(a)(i)	less than	accept any correct indication	1
(ii)	more than	accept any correct indication	1
(b)	any **two** from: stays above the same place above the equator one orbit takes 24 hours	 do **not** accept stays in the same place do **not** accept goes around equator unless qualified do **not** accept orbit at same speed as Earth do **not** accept orbit at a constant speed accept has same angular speed / velocity as Earth	2
total			4

3451/F Q2

question	answers	extra information	mark
(a)	comet		1
(b)	large group / number / collection of stars	ignore reference to planets accept millions of stars do **not** accept thousands of stars do **not** accept loads of stars	1
(c)	giant supernova neutron		1 1 1
total			5

4.1.1.1 Energy stores and systems

3451/F Q3

question	answers	extra information	mark
(a)(i)	radio		1
(ii)	gamma	accept microwave accept infrared	1
(iii)	ultra violet		1
(iv)	microwaves		1
(b)	the same as		1
(c)	X-rays do not go through lead	references to gamma rays are incorrect accept lead protects them from the X-rays accept not exposed to X-rays	1
	lead stops / reduces risk of X-rays harming / damaging / killing (persons) <u>cells</u>	accept X-rays (may) cause cancer accept organs for cell do **not** accept references to electric shock do **not** accept stops bones of people showing on X-ray answers involving the horse wearing an apron are incorrect	1
	Quality of written communication	award for a sensible sequence of **two** points	1
total			8

Physics B – AQA GCSE Mark Scheme, 2005 June series

3451/F Q4

question	answers	extra information	mark
(a)	light electrical		1 1
(b)	15% **or** 0.15	correct substitution gains **1** mark only an answer of 15 with no unit **or** an incorrect unit gains **1** mark an answer of 0.15 given with a unit gains **1** mark	2
(c)	the ticket machine is a long way from other electricity supplies		1
(d)	any figure between 5 and 10 inclusive	unit not required but if given must match numerical answer	1
total			6

3451/F Q5

question	answers	extra information	mark
(a)(i)	radon (gas)	do **not** accept gas	1
(ii)	background		1
(b)	bigger	accept any word which means bigger	1
(c)	**Z** alpha will not pass through aluminium or lead	if Z is not given, the reason does not score accept alpha cannot go through metals / dense material accept there is nothing to stop the radiation accept alpha will not pass through aluminium do **not** accept alpha will not pass through lead do **not** accept alpha stopped by air	1 1
total			5

4.1.1.1 Energy stores and systems

3451/F Q6

question	answers	extra information	mark
(a)	loses negative charge / electrons	do **not** accept positive charge transfers to the comb do **not** accept friction	1
(b)	**A** attract		1
	B repel		1
	C attract		1
(c)	**F A D E**	allow **2** marks for 2 letters in the correct place allow **1** mark for 1 letter in the correct place	3
total			7

4.1.1.1 Energy stores and systems

3451/F Q7

question	answers	extra information	mark
(a)	all points correctly plotted	tolerance ± $\frac{1}{2}$ square on y axis only allow **1** mark for 3 correctly plotted points	2
	attempt made to draw a smooth curve	do **not** accept dot-to-dot line	1
(b)(i)	3 days ± 0.2 **or** any value correctly obtained using their graph line	if no line drawn in (a), answer must be exactly 3	1
(ii)	3 days or their (b)(i)		1
(c)	radon-222	accept radon **or** 222 accept alpha or 3.8 correct isotope required for reason to score	1
	has the shortest half-life	accept the others have longer half-lives	1
total			7

4.1.1.1 Energy stores and systems

3451/F Q8

question	answers	extra information	mark
(a)	fossils of Cynognathus are found in Africa and South America		1
	the shapes ……. almost fit together	only two boxes should be ticked deduct **1** mark for each additional box to a minimum mark of **0**	1
(b)	continental		1
	crust		1
	tectonic		1
total			5

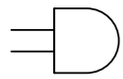
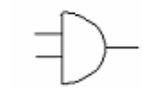
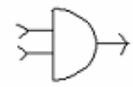
4.1.1.1 Energy stores and systems

3451/F Q9

question	answers	extra information	mark
(a)	capacitor	accept condenser	1
	LDR	**or** light dependent resistor accept 'ldr', 'Ldr' etc.	1
	relay (normally open)	do **not** accept 'relay normally closed'	1
(b)(i)	battery	accept '(battery of) cells' do **not** accept 'battery / cell'	1
(ii)	LED	**or** light emitting diode accept 'led' or 'Led' do **not** accept just 'diode'	1
(iii)	B will light (but C will not)	accept '(only) B will work' accept 'one is on the other is off' do **not** accept 'C is on and B is off'	1
(iv)	any **one** from: B is connected the right way round (and C is not) a (light emitting) diode only allows (a significant) current to flow in one direction B's anode is connected to the positive side of the supply B's cathode is connected to the negative terminal	N.B. the candidate's answer to part (b)(iii) may include this mark but do **not** credit if the response to part (b)(iii) is incorrect or there is any other contradiction if (iv) is completely consistent with (iii) which is wrong, allow **1** mark	1
(c)(i)	first input / second input / output 0 / 0 / **0** 1 / 0 / **0** 0 / 1 / **0** 1 / 1 / **1**	**all** correct allow: OFF NO OFF NO OFF NO ON YES	1
(ii)	truth (table)		1

cont…

3451/F Q9 cont…

(iii)		a Roman upper case D in any orientation without contacts is acceptable but if contacts are shown do **not** give the mark if there is any ambiguity or contradiction allow  	1
(d)	light sensor	**or** light dependent resistor **or** LDR accept 'ldr', Ldr' etc allow solar cell, photo cell	1
	NOT gate	accept 'Not gate' **or** 'not gate' if both correct but in the wrong order credit with **1** mark	1
total			12

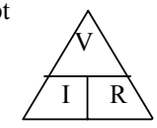
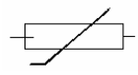
4.1.1.1 Energy stores and systems

3451/F Q10

question	answers	extra information	mark
(a)(i)	rays continued to meet on the right hand side of the lens and beyond	must be straight lines from the right hand side of the lens ignore details through the lens allow if no arrows	1
	meet exactly on the axis	negate mark if contradictory arrow(s) added do not need to go beyond the focus for this mark	1
(ii)	(principal) focus	**or** focal (point)	1
(iii)	converging	**or** convex	1
(b)(i)	**A**		1
(ii)	rays seem to come from this point	**or** words to this effect **or** shows this on the diagram	1
(iii)	diverging	**or** concave	1
(c)	film	accept any unambiguous method of showing the correct response	1
	smaller than		1
	further away from		1
(d)	any **three** from: • real image can be put on a screen • virtual image cannot be put on a screen / film • virtual image is imaginary • real image is formed where (real) rays cross / converge • virtual image is where virtual / imaginary rays (seem to) come from • virtual image formed where virtual rays intersect / cross	allow film allow real image has light travelling through it **or** virtual image is where rays seem to come from	3
total			13

4.1.1.1 Energy stores and systems

3451/F Q11

question	answers	extra information	mark
(a)(i)	$A_1 = 0.5$	ignore any units	1
	$A_4 = 0.5$	allow **1** mark for $A_1 = A_4 \neq 0.5$	1
(ii)	the resistance of **P** is more than 20 Ω		1
	a smaller current goes through P / A_2 (than 20 Ω)	dependent on getting 1st mark correct accept converse	1
(b)(i)	potential difference = current × resistance	accept pd / voltage for potential difference accept V = I × R, correct symbols and correct case only accept volts = amps × ohms accept  provided subsequent method is correct allow combination of physical quantities and named units allow voltage = I × R	1
(ii)	6	allow **1** mark for correct substitution	2
(iii)	6	accept their (b)(ii)	1
(c)	thermistor or 	accept correct circuit symbol allow phonetic spelling	1
	resistance goes down (as temperature of thermistor goes up)	do **not** accept changes for goes down do **not** accept an answer in terms of current only answers in terms of other components are incorrect	1
total			10

Physics B – AQA GCSE Mark Scheme, 2005 June series

3451/F Q12

question	answers	extra information	mark
(a)(i)	larger the distance, greater the time	accept 'they are proportional' accept converse	1
(ii)	any value between 6 and 9 years inclusive		1
(b)(i)	carbon dioxide		1
(ii)	(Venus) has high**er** temperature (than Mercury)	accept has the high**est** temperature accept Venus is hotter / hottest do **not** accept has a high / very high temperature	1
	(Venus) further from the Sun than Mercury	accept 'Venus is not the closest planet to the Sun' answer in terms of greenhouse effect only, scores **0** marks	1
total			5

4.1.1.1 Energy stores and systems

3451/F Q13

question	answers	extra information	mark
(a)(i)	20		1
(ii)	convection		1
(iii)	fit draughtproof strips	accept lay carpet accept fit curtains accept close doors / windows / curtains accept any reasonable suggestion for reducing a draught 'double glazing' alone is insufficient	1
(b)	air is (a good) insulator **or** air is a poor conductor	accept air cavity / 'it' for air	1
	reducing heat transfer by <u>conduction</u>	accept stops for reduces ignore convection do **not** accept radiation do **not** accept answers in terms of heat being trapped	1
(c)(i)	most cost effective	accept it is cheaper or low<u>est</u> cost accept shortest payback time accept in terms of reducing heat loss by the largest amount do **not** accept it is easier ignore most heat is lost through the roof	1
(ii)	4		1
total			7

4.1.1.1 Energy stores and systems

3451/F Q14

question	answers	extra information	mark
(a)(i)	constant speed	do **not** accept normal speed do **not** accept it is stopped / stationary	1
	in a straight line	accept any appropriate reference to a direction constant velocity gains **2** marks 'not accelerating' gains **2** marks terminal velocity alone gets **1** mark	1
(ii)	goes down owtte	accept motorbike (it) slows down	1
(b)(i)	20 (m/s)	ignore incorrect units	1
(ii)	acceleration = change in velocity / time (taken)	do **not** accept velocity for change in velocity accept change in speed accept $a = \frac{v-u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$ **or** a = $\frac{\Delta v}{t}$ do **not** accept $a = \frac{v}{t}$	1
(iii)	4 **or** their (b)(i) ÷ 5	allow **1** mark for correct substitution	2
	m/s^2	m/s/s **or** ms^{-2} **or** metres per second squared **or** metres per second per second	1
(c)	vehicle may skid / slide	loss of control / brakes lock / wheels lock accept greater stopping distance **or** difficult to stop	1
	due to reduced friction (between tyre(s) and road)	accept due to less grip do **not** accept no friction	1

cont…

3451/F Q14 cont…

(d)	any **three** from: • <u>increased</u> speed • <u>reduced</u> braking force • <u>slower</u> (driver) reactions • <u>poor</u> vehicle maintenance • <u>increased</u> mass / weight of vehicle • <u>poor</u> road surface • <u>more</u> streamlined	do **not** accept night time / poor vision N.B. specific answers may **each** gain credit eg tiredness (1), drinking alcohol (1), using drugs (1), driver distracted (1) etc specific examples may **each** gain credit eg worn brakes or worn tyres etc accept large mass / weight of vehicle if candidates give three answers that affect stopping distance but not specific to <u>increase</u> award **1** mark only	3
total			13

4.1.1.1 Energy stores and systems

3451/F Q15

question	answers	extra information	mark
(a)(i)	arrow from centre of the ball **and** at right angles to the string **and** in the correct direction	arrow should point to the student's belt accept free-hand 'straight' line do **not** accept curved line	1
(ii)	increase increase increase	accept 'be stronger / bigger' accept 'be stronger / bigger' accept 'be stronger / bigger'	1 1 1
(b)	speed velocity direction	all **three** correct any two correct for **1** mark otherwise **0** marks	2
(c)(i)	centripetal	accept 'centripedal' and other minor misspellings do **not** accept anything which could be 'centrifugal'	1
(ii)	gravity	accept 'weight' accept 'force of attraction due to mass(es) (of the Moon and the Earth)'	1
(iii)	electron(s)		1
(iv)	electrostatic	accept 'electrical' do **not** accept just 'centripetal'	1
total			10

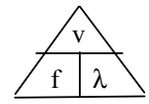
4.1.1.1 Energy stores and systems

3451/F Q16

question	answers	extra information	mark
(a)(i)	**X** at the centre of the lifebelt	measuring from the centre of **X**, allow 2 mm tolerance in any direction	1
(ii)	any **two** from: below the point of suspension at the centre (of the lifebelt) (because) the lifebelt / it is symmetrical	if X is on vertical line below the hanger (but not at centre) can gain the first point only accept '(vertically) below **Y**' accept 'in the middle' **or** (because) the mass / weight is evenly distributed	2
(b)	Nm **or** newton metre(s) 750	accept Newton metre(s) do **not** accept any ambiguity in the symbol ie NM, nM or nm (moment) = force × (perpendicular) distance (between line of action and pivot) **or** (moment) = 500 × 1.5 gains **1** mark	1 2
(c)	**Quality of written communication**: any **three** connected points from: low(er) <u>centre of mass / gravity</u> (more) <u>stable</u> less likely to fall over the <u>turning effect / moment</u> (of the weight of case) is less so the pull on her arm is less	for **2** of the underlined terms used in the correct context **or** <u>centre of mass / gravity</u> will be close(r) to the wheels / axle / ground **or** less <u>unstable</u> accept 'less likely to overturn' do **not** accept 'will not fall over' **or** so less effort is needed to hold the case ignore references to pulling the case	1 3
total			10

Physics B – AQA GCSE Mark Scheme, 2005 June series

3451/F Q17

question	answers	extra information	mark
(a)	any **two** from: • **amplitude** decreasing • **wavelength** increasing • **frequency** decreasing **Quality of written communication**	accept siren / sound getting quieter do **not** accept sound decreases accept pitch decreasing ignore reference to transverse wave ignore reference to speed contradictory statements within each point lose the mark all emboldened terms in candidate's answer used correctly	2 1
(b)(i)	ultrasound **or** ultrasonic		1
(ii)	wave speed = frequency × wavelength	accept speed / velocity for wave speed accept $v = f \times \lambda$ do **not** accept w for λ do **not** accept s for v accept  provided subsequent calculation shows a correct method	1
(iii)	339.2 **or** 340 **or** 339	allow **1** mark for using 212 000 allow **1** mark for correct substitution an answer of 0.3392 **or** 0.34 **or** 0.339 gains **1** mark only award full credit for a correct numerical answer with the unit changed to km/s	3
total			8

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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science: Double Award 3462/3F
Specification B (Co-ordinated)

Mark Scheme

2005 examination - June series

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Double Award
Foundation Tier 3462/3F

3462/3F Q1

question	answers	extra information	mark
(a)(i)	less than	accept any correct indication	1
(ii)	more than	accept any correct indication	1
(b)	any **two** from: stays above the same place above the equator one orbit takes 24 hours	 do **not** accept stays in the same place do **not** accept goes around equator unless qualified do **not** accept orbit at same speed as Earth do **not** accept orbit at a constant speed accept has same angular speed / velocity as Earth	2
total			4

3462/ 3F Q2

question	answers	extra information	mark
(a)	comet		1
(b)	large group / number / collection of stars	ignore reference to planets accept millions of stars do **not** accept thousands of stars do **not** accept loads of stars	1
(c)	giant supernova neutron		1 1 1
total			5

4.1.1.1 Energy stores and systems

3462/3F Q3

question	answers	extra information	mark
(a)(i)	radio		1
(ii)	gamma	accept microwave accept infrared	1
(iii)	ultra violet		1
(iv)	microwaves		1
(b)	the same as		1
(c)	**Quality of written communication**	award for a sensible sequence of **two** points	1
	X-rays do not go through lead	accept lead protects them from the X-rays accept not exposed to X-rays	1
	lead stops / reduces risk of X-rays harming / damaging / killing (persons) <u>cells</u>	accept X-rays (may) cause cancer accept organs for cell do **not** accept references to electric shock do **not** accept stops bones of people showing on X-ray answers involving the horse wearing an apron are incorrect references to gamma rays are incorrect	1
total			8

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2005 June series

3462/3F Q4

question	answers	extra information	mark
(a)	light electrical		1 1
(b)	15% **or** 0.15	correct substitution gains **1** mark only an answer of 15 with no unit **or** an incorrect unit gains **1** mark an answer of 0.15 given with a unit gains **1** mark	2
(c)	the ticket machine is a long way from other electricity supplies		1
(d)	any figure between 5 and 10 inclusive	unit not required but if given must match numerical answer	1
total			6

4.1.1.1 Energy stores and systems

3462/3F Q5

question	answers	extra information	mark
(a)(i)	radon (gas)	do **not** accept gas	1
(ii)	background		1
(b)	bigger	accept any word which means bigger	1
(c)	**Z** alpha will not pass through aluminium or lead	if Z is not given, the reason does not score accept alpha cannot go through metals / dense material accept there is nothing to stop the radiation accept alpha will not pass through aluminium do **not** accept alpha will not pass through lead do **not** accept alpha stopped by air	1 1
total			5

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2005 June series

3462/3F Q6

question	answers	extra information	mark
(a)	loses negative charge / electrons	do **not** accept positive charge transfers to the comb do **not** accept friction	1
(b)	**A** attract		1
	B repel		1
	C attract		1
(c)	**F A D E**	allow **2** marks for 2 letters in the correct place allow **1** mark for 1 letter in the correct place	3
total			7

4.1.1.1 Energy stores and systems

3462/3F Q7

question	answers	extra information	mark
(a)	all points correctly plotted	tolerance ± $\frac{1}{2}$ square on y axis only allow **1** mark for 3 correctly plotted points	2
	attempt made to draw a smooth curve	do **not** accept dot-to-dot line	1
(b)(i)	3 days ± 0.2 **or** any value correctly obtained using their graph line	if no line drawn in (a), answer must be exactly 3	1
(ii)	3 days or their (b)(i)		1
(c)	radon-222	accept radon **or** 222 accept alpha or 3.8 correct isotope required for reason to score	1
	has the shortest <u>half-life</u>	accept the others have longer <u>half-lives</u>	1
total			7

4.1.1.1 Energy stores and systems

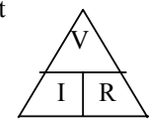
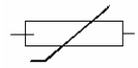
Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2005 June series

3462/3F Q8

question	answers	extra information	mark
(a)	fossils of Cynognathus are found in Africa and South America		1
	the shapes ……. almost fit together	only two boxes should be ticked deduct **1** mark for each additional box to a minimum mark of **0**	1
(b)	continental		1
	crust		1
	tectonic		1
total			5

4.1.1.1 Energy stores and systems

3462/3F Q9

question	answers	extra information	mark
(a)(i)	$A_1 = 0.5$ $A_4 = 0.5$	ignore any units allow **1** mark for $A_1 = A_4 \neq 0.5$	1 1
(ii)	the resistance of **P** is more than 20 Ω a smaller current goes through P / A_2 (than 20 Ω)	 dependent on getting 1st mark correct accept converse	1 1
(b)(i)	potential difference = current × resistance	accept pd / voltage for potential difference accept V = I × R, correct symbols and correct case only accept volts = amps × ohms accept  provided subsequent method is correct allow combination of physical quantities and named units allow voltage = I × R	1
(ii)	6	allow **1** mark for correct substitution	2
(iii)	6	accept their (b)(ii)	1
(c)	thermistor or  resistance goes down (as temperature of thermistor goes up)	accept correct circuit symbol allow phonetic spelling do **not** accept changes for goes down do **not** accept an answer in terms of current only answers in terms of other components are incorrect	1 1
total			10

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2005 June series

3462/3F Q10

question	answers	extra information	mark
(a)(i)	larger the distance, greater the time	accept 'they are proportional' accept converse	1
(ii)	any value between 6 and 9 years inclusive		1
(b)(i)	carbon dioxide		1
(ii)	(Venus) has high**er** temperature (than Mercury)	accept has the high**est** temperature accept Venus is hotter / hottest do **not** accept has a high / very high temperature	1
	(Venus) further from the Sun than Mercury	accept 'Venus is not the closest planet to the Sun' answer in terms of greenhouse effect only, scores **0** marks	1
total			5

4.1.1.1 Energy stores and systems

3462/3F Q11

question	answers	extra information	mark
(a)(i)	20		1
(ii)	convection		1
(iii)	fit draughtproof strips	accept lay carpet accept fit curtains accept close doors / windows / curtains accept any reasonable suggestion for reducing a draught 'double glazing' alone is insufficient	1
(b)	air is (a good) insulator **or** air is a poor conductor	accept air cavity / 'it' for air	1
	reducing heat transfer by <u>conduction</u>	accept stops for reduces ignore convection do **not** accept radiation do **not** accept answers in terms of heat being trapped	1
(c)(i)	most cost effective	accept it is cheaper or low<u>est</u> cost accept shortest payback time accept in terms of reducing heat loss by the largest amount do **not** accept it is easier ignore most heat is lost through the roof	1
(ii)	4		1
total			7

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2005 June series

3462/3F Q12

question	answers	extra information	mark
(a)(i)	<u>constant</u> speed	do **not** accept normal speed do **not** accept it is stopped / stationary	1
	in a straight line	accept any appropriate reference to a direction constant velocity gains **2** marks 'not accelerating' gains **2** marks terminal velocity alone gets **1** mark	1
(ii)	goes down owtte	accept motorbike (it) slows down	1
(b)(i)	20 (m/s)	ignore incorrect units	1
(ii)	acceleration = <u>change in velocity</u> time (taken)	do **not** accept velocity for change in velocity accept change in speed accept $a = \frac{v-u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$ **or** a = $\frac{\Delta v}{t}$ do **not** accept $a = \frac{v}{t}$	1
(iii)	4 **or** their (b)(i) ÷ 5	allow **1** mark for correct substitution	2
	m/s^2	m/s/s **or** ms^{-2} **or** metres per second squared **or** metres per second per second	1
(c)	vehicle may skid / slide	loss of control / brakes lock / wheels lock accept greater stopping distance **or** difficult to stop	1
	due to reduced friction (between tyre(s) and road)	accept due to less grip do **not** accept <u>no</u> friction	1

cont…

4.1.1.1 Energy stores and systems

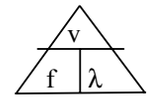
3462/3F Q12 cont…

(d)	any **three** from: • <u>increased</u> speed • <u>reduced</u> braking force • <u>slower</u> (driver) reactions • <u>poor</u> vehicle maintenance • <u>increased</u> mass / weight of vehicle • <u>poor</u> road surface • <u>more</u> streamlined	do **not** accept night time / poor vision NB specific answers may **each** gain credit eg tiredness (1), drinking alcohol (1), using drugs (1), driver distracted (1) etc specific examples may **each** gain credit eg worn brakes or worn tyres etc accept large mass / weight of vehicle if candidates give three answers that affect stopping distance but not specific to <u>increase</u> award **1** mark only	3
total			13

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2005 June series

3462/3F Q13

question	answers	extra information	mark
(a)	**Quality of written communication**	all emboldened terms in candidate's answer used correctly	1
	any **two** from: • **amplitude** decreasing • **wavelength** increasing • **frequency** decreasing	accept siren / sound getting quieter do **not** accept sound decreases accept pitch decreasing ignore reference to transverse wave ignore reference to speed contradictory statements within each point lose the mark	2
(b)(i)	ultrasound **or** ultrasonic		1
(ii)	wave speed = frequency × wavelength	accept speed / velocity for wave speed accept $v = f \times \lambda$ do **not** accept w for λ do **not** accept s for v accept  provided subsequent calculation shows a correct method	1
(iii)	339.2 **or** 340 **or** 339	allow **1** mark for using 212 000 allow **1** mark for correct substitution an answer of 0.3392 **or** 0.34 **or** 0.339 gains **1** mark only award full credit for a correct numerical answer with the unit changed to km/s	3
total			8

Version 1.0: 0906

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Physics 3451/F
Specification B

Mark Scheme

2006 examination - June series

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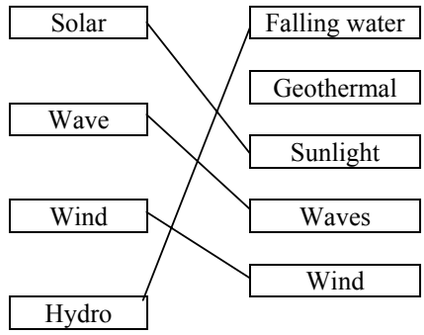
Physics (Specification B)
Foundation Tier 3451/F

3451/F Q1

question	answers	extra information	mark
(a)	4 correct lines drawn  	**1** mark for each correct line if more than 4 lines are drawn mark incorrect ones first. Mark only 4 lines	4
(b)	4		1
(c)(i)	nuclear		1
(ii)	(natural) gas	do **not** accept natural	1
total			7

4.1.1.1 Energy stores and systems

3451/F Q2

question	answers	extra information	mark
(a)(i)	ultra violet		1
(ii)	kill the cells	accept destroys the cells accept makes cells cancerous accept damage cells accept harms cells accept changes DNA accept cause cells to mutate accept skin cells for cells accept cause cancer do **not** accept skin for cells do **not** accept burns the cells	1
(b)(i)	the sunbed uses an alternating current (a.c.) supply		1
(ii)	10.8	accept **1** mark for correct substitution of power in W or kW and time in hours or seconds	2
total			5

4.1.1.1 Energy stores and systems

3451/F Q3

question	answers	extra information	mark
(a)(i)	M		1
(ii)	K		1
(iii)	J		1
(iv)	O		1
(b)(i)	billions of years		1
(ii)	red giant	any answer in terms of explosion or supernova is **incorrect**	1
	contracts / shrinks to	incorrect reference to black hole negates **1** mark	1
	white dwarf		1
total			8

4.1.1.1 Energy stores and systems

3451/F Q4

question	answers	extra information	mark
(a)(i)	A and C	**both** answers must be correct in either order	1
(ii)	A and B	**both** answers must be correct in either order	1
(iii)	same number of protons plus neutrons **or** same number of nucleons	accept number of particles in nucleus the same do **not** accept they add up to 6 unless qualified	1
(b)(i)	any **two** from: • boron - 12 • carbon - 14 • oxygen - 15 • lead - 209	**both** required both name **and** number must be given	1
(ii)	any **two** from: • boron - 11 • carbon - 12 • oxygen - 16 • lead - 207	**both** required both name **and** number must be given	1
(c)	alpha		1
total			6

Physics B – AQA GCSE Mark Scheme, 2006 June series

3451/F Q5

question	answers	extra information	mark
(a)	(good) insulator	accept does not conduct (electricity) accept does not conduct heat or electricity do **not** accept does not conduct heat outside is tough is insufficient	1
(b)	fuse		1
(c)	connect the green and yellow / earth wire	accept wires must be connected to screws	1
	swap the brown and blue wires round		1
total			4

3451/F Q6

question	answers	extra information	mark
(a)	fossils	answers can be in either order	1
	water		1
(b)	increased		1
(c)	radio telescope		1
total			4

4.1.1.1 Energy stores and systems

3451/F Q7

question	answers	extra information	mark
(a)(i)	electrical		1
	kinetic	accept movement	1
(ii)	heat	answers can be in either order	1
	sound		1
(b)(i)	360	accept **1** mark for correct substitution	2
(ii)	watt		1
(c)	the stairlift is not moving the stairlift is moving at constant speed	**both** answers are required for the mark	1
total			8

3451/F Q8

question	answers	extra information	mark
(a)(i)	(up) further **or** (up) faster	any reference to downwards movement loses credit accept <u>with</u> more force accept motion would increase	1
(ii)	down	accept the opposite way accept drop	1
(b)(i)	direct current		1
(ii)	Z		1
total			4

4.1.1.1 Energy stores and systems

3451/F Q9

question	answers	extra information	mark
(a)	level of radiation (detected) will not change	ignore reference to particles	1
	if thickness of aluminium changes	accept for **both** marks a specific example eg if the aluminium gets thicker the level of radiation detected stays the same. accept for **1** mark gamma will pass through aluminium	1
	QoWC for 2 points in a sensible sequence		1
(b)	S W T V	all in correct order accept **2** marks for 2 correct accept **1** mark for 1 correct	3
total			6

4.1.1.1 Energy stores and systems

3451/F Q10

question	answers	extra information	mark
(a)	thermistor(s) LDR(s) switch(es) LED(s) buzzer(s) motor(s)	**1** mark each or light dependent resistor(s) or light emitting diode(s)	6
(b)(i)	1st input / 2nd input / Output 0 / 0 / **0** 1 / 0 / **0** 0 / 1 / **0** 1 / 1 / 1	all correct	1
(ii)	Input / Output 0 / **1** 1 / **0**	**both** correct	1
(iii)	1st input / 2nd input / Output 0 / 0 / 0 1 / 0 / **1** 0 / 1 / **1** 1 / 1 / **1**	all correct	1
(c)(i)		do **not** credit any attempt which could equally well be a poorly drawn attempt at the symbol for a cell	1
(ii)	charge increases	accept 'electrons' accept 'energy **or** gets bigger/larger	1 1
total			12

3451/F Q11

question	answers	extra information	mark
(a)(i)	A		1
(ii)	B		1
(iii)	mass is larger	credit if the response is clear by some other means e.g. it is ringed	1
	wire is shorter	credit if the response is clear by some other means e.g. it is ringed	1
(b)	moment		1
	distance		1
(c)(i)	1		1
(ii)	5		1
(iii)	any **two** from • remove slotted mass(es) • slide (slotted) masses / weights nearer pivot • slide forcemeter away from the pivot • slide rod to the left	 **or** ….. to the left **or** ….. to the right **or** …. so that the slotted masses side is shorter **or** …. so that the forcemeter side is longer	2
(d)	centre of the rectangle	accept *2*mm tolerance any direction	1
	centre of the circle	accept *2*mm tolerance any direction	1
	on centre line and 10mm above base	accept *2*mm tolerance any direction	1
total			13

3451/F Q12

question	answers	extra information	mark
(a)	0.05 (A)	ignore incorrect units if given accept 'the same' / 'the same as K' / 'the same as the other ammeter' do **not** accept 'same as the other meter'	1
(b)(i)	any **two** from: • two cells are joined + to + • some of the cells potential difference is across the diode / ammeters / wires **or** the pd of the cells is shared by all components • the other components have a resistance • cells not fully charged **or** cells partially run down • cells have an internal resistance	 answers in terms of current gain no marks accept one cell in the wrong way accept two cells are joined back-to-back accept two cells are joined – to – accept battery for cell do **not** accept answers in terms of all the cells or in terms of energy only accept voltage for pd do **not** accept using up pd accept a named component / components / wire has a resistance do **not** accept voltage of cells is less than 1.5 unless explained do **not** accept cells are not as powerful unless explained	2
(ii)	the diode has a (very) high resistance (in the reverse direction) a diode only conducts / allows current to flow in one direction	 accept little / no current flows do **not** accept blocks / cuts flow	1 1

Continued

4.1.1.1 Energy stores and systems

3451/F Q12

question	answers	extra information	mark
(c)	**QoWC** for the use of the word resistance	annotate Q✓ Q✗ accept resistant	1
	accept increase / change / decrease throughout question but a contradiction loses **one** mark with change as neutral		
	as the pd / current increases / changes	accept voltage for pd must be correctly linked to at least one of the following points accept	1
	the temperature of the filament increases / changes	lamp / bulb for filament accept filament becomes hotter	1
	increasing / changing the **resistance** of the lamp		1
		accept for **1** mark only the filament lamp does not obey Ohm's law	
total			9

4.1.1.1 Energy stores and systems

3451/F Q13

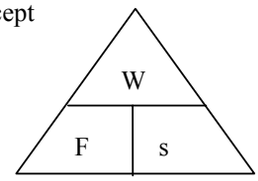
question	answers	extra information	mark
(a)	0.5		1
	hertz	accept Hz but **not** HZ / hz / hZ accept (waves) per second **or** / sec **or** / s **or** s^{-1} **or** sec^{-1}	1
(b)	any **one** from: • any named part of the electromagnetic spectrum • S – waves / secondary waves • wave on a rope	 do **not** accept seismic waves / earthquake do **not** accept slinky unless clearly described	1
(c)	transverse – disturbance / vibration is perpendicular to the direction of energy transfer / wave travel	accept a correctly labelled diagram	1
	longitudinal – disturbance / vibration is parallel to the direction of energy transfer / wave travel	accept a correctly labelled diagram part explanation of the difference between transverse **and** longitudinal gains **1** mark	1
(d)(i)	TIR shown	needs to stay inside water jet ignore number of reflections **or** arrow heads lines straight by eye	1
(ii)	bigger than	any indication of correct answer	1
total			7

Physics B – AQA GCSE Mark Scheme, 2006 June series

3451/F Q14

question	answers	extra information	mark
(a)	W		1
	has only two states **or** is either on or off	accept discrete values only do **not** credit answer purely in terms of shape	1
(b)	any **one** from:		1
	• higher quality	accept clearer do **not** accept easier to read ignore faster accept <u>less</u> distortion **or** <u>less</u> weakening of signal strength do **not** accept no distortion / weakening on its own	
	• increased carrying capacity	accept more information can be sent **or** more channels	
	• errors can be rectified		
total			3

3451/F Q15

question	answers	extra information	mark
(a)(i)	all points plotted accurately	accept **1** mark for 5 correct plots ± ½ small square on stopping distance	2
	line of best fit must be continuous	accept attempt at a reasonable curve does not need to go through 0 0 do **not** accept a straight line do **not** accept dot-to-dot	1
(ii)	4 to 6 (metres)	accept ecf from (a)(i) accept **1** mark for value taken correctly from graph at 25mph **or** correct method shown	2
(b)(i)	0.7 (s)	incorrect unit = 0 marks	1
(ii)	constant speed / velocity	accept (continued as) 30mph accept did not change / stayed the same accept no acceleration	1
(iii)	3.3(s)	penalise incorrect unit once only	1
(iv)	reaction time increases / is longer **or** thinking distance increases	do **not** accept reaction time slower **or** reactions are slower	1
	stopping distance / it increases	do **not** accept travels at constant speed for longer	1
(c)(i)	work done = force (applied) × distance (moved)	accept W = F × s or W = F × d accept  provided subsequent method is correct	1

Continued

4.1.1.1 Energy stores and systems

3451/F Q15

question	answers	extra information	mark
(ii) **E**	2100	accept 2.1 kilo accept **1** mark for using 7000 N	2
(iii)	2100 (joules)	accept their (c)(ii)	1
total			14

3451/F Q16

question	answers	extra information	mark
(a)(i)	refraction		1
(ii)	it changes speed **or** change in density	accept it speeds up do **not** accept it slows down do **not** accept air is more dense than glass	1
(b)(i)	sound / waves <u>diffract</u> through the gap (in the wall) **or** over the wall **or** because the gate is open	do **not** accept reflection this only scores if first marking point is given accept for **1** mark only sound / waves go through the gap and <u>spread out</u> **or** diagram showing wave fronts spreading out from open gates if diagram is labelled as diffraction both marks can be scored	1 1
(ii)	less diffraction	accept no diffraction accept gates <u>absorb</u> sound / noise / waves accept gates <u>reflect</u> sound / noise / waves do **not** accept rebounds / stops / blocks out	1
total			5

3451/F Q17

question	answers	extra information	mark
(a)	both rays brought to a focus at F on the right	do **not** have to be continued beyond F	1
	lines have been drawn **accurately** with a ruler	only credit if 1st mark credited do **not** credit if contradictory arrow(s) added	1
(b)	rays seem to come from a focus at G on the left and continued to the right of the lens	this mark is for the current idea of divergence	1
	lines have been drawn **accurately** with a ruler	only credit if 1st mark credited do **not** credit if contradictory arrow(s) added	1
(c)	…lens… …image… …object… …image… ...object… …lens…	lens as 1st and 6th words (1) image and object in the correct order 2nd and 3rd words (1) image and object in correct order 4th and 5th words (1)	max 3
(d)(i)	correct statement about real image real rays intersect / cross to form a real image **or** a real image can be formed on a screen **or** real image is (always) on the opposite side (of the lens) **or** real image is (always) upside down (to the object)	may be credited from a correct diagram	1
	correct statement about virtual / imaginary image virtual / imaginary rays intersect / cross to form a virtual image **or** a virtual / imaginary image cannot **or** virtual / imaginary image is (always) on the same side (of the lens) **or** virtual / imaginary image is (always) same way up (as the object)	may be credited from a correct diagram	1

Continued

4.1.1.1 Energy stores and systems

3451/F Q17

question	answers	extra information	mark
(ii)	**either** image needs to fall on / affect the film **or** image needs to fall on / affect the light sensors / charged coupled devices (CCDs) (in a digital camera / mobile phone) **or** image needs to cause a chemical reaction (in / on the film)		1
total			10

4.1.1.1 Energy stores and systems

3451/F Q18

<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>(a)</td><td>AND (gate)

OR (gate)

NOT (gate)

LED or light emitting diode</td><td>accept ‘and’

accept ‘or’

accept ‘not’ or invert gate

accept ‘led’</td><td>1

1

1

1</td></tr>
<tr><td>(b)(i)</td><td>NOT (gate) and AND (gate)</td><td>both in either order or ‘(the) gates’

any additions lose the mark</td><td>1</td></tr>
<tr><td>(ii)</td><td><table><tr><th>Switch for fire</th><th>Tilt switch</th><th>Signal to relay</th></tr><tr><td>0</td><td>0</td><td>…0…</td></tr><tr><td>0</td><td>1</td><td>…0…</td></tr><tr><td>1</td><td>0</td><td>…1…</td></tr><tr><td>1</td><td>1</td><td>…0…</td></tr></table></td><td>all correct

allow off or no
off no
on yes
off no</td><td>1</td></tr>
<tr><td>(iii)</td><td>(relay) acts as / is a switch

either
small current from the electronic / control circuit / system (1)

large current through the output / (electric) fire (1)

or

full current through electronic control system (1)

may damage components / lead to overheating / electric shock (1)

QoWC for correct use of the scientific term ‘current’</td><td>accept implication that it works as a switch e.g. ‘turns on fire’

or ‘small current through the coil (of the relay)’

do not accept small current is turned into a large current

annotate Q✓ Q×

if answer in terms of voltage isolation / voltage/ p.d. accept QoWC mark for correct use</td><td>1

1

1

1</td></tr>
<tr><td>total</td><td></td><td></td><td>10</td></tr>
</table>

Version 1.0: 0906

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science: Double Award 3462/3F
Specification B

Mark Scheme

2006 examination - June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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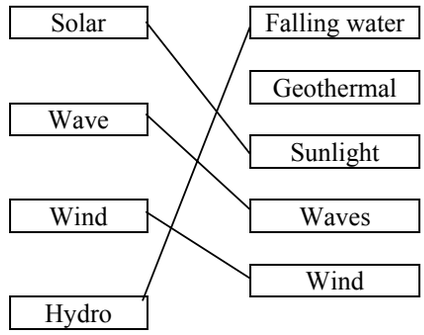
Double Award (Co-ordinated)
Foundation Tier 3462/3F

3462/3F Q1

question	answers	extra information	mark
(a)	4 correct lines drawn  	**1** mark for each correct line if more than 4 lines are drawn mark incorrect ones first. Mark only 4 lines	4
(b)	4		1
(c)(i)	nuclear		1
(ii)	(natural) gas	do **not** accept natural	1
total			7

4.1.1.1 Energy stores and systems

3462/3F Q2

question	answers	extra information	mark
(a)(i)	ultra violet		1
(ii)	kill the cells	accept destroys the cells accept makes cells cancerous accept damage cells accept harms cells accept changes DNA accept cause cells to mutate accept skin cells for cells accept cause cancer do **not** accept skin for cells do **not** accept burns the cells	1
(b)(i)	the sunbed uses an alternating current (a.c.) supply		1
(ii)	10.8	accept **1** mark for correct substitution of power in W or kW <u>and</u> time in hours or seconds	2
total			5

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2006 June series

3462/3F Q3

question	answers	extra information	mark
(a)(i)	M		1
(ii)	K		1
(iii)	J		1
(iv)	O		1
(b)(i)	billions of years		1
(ii)	red giant	any answer in terms of explosion or supernova is **incorrect**	1
	contracts / shrinks to	incorrect reference to black hole negates **1** mark	1
	white dwarf		1
total			8

4.1.1.1 Energy stores and systems

3462/3F Q4

question	answers	extra information	mark
(a)(i)	A and C	**both** answers must be correct in either order	1
(ii)	A and B	**both** answers must be correct in either order	1
(iii)	same number of protons plus neutrons **or** same number of nucleons	accept number of particles in nucleus the same do **not** accept they add up to 6 unless qualified	1
(b)(i)	any **two** from: • boron - 12 • carbon - 14 • oxygen - 15 • lead - 209	**both** required both name **and** number must be given	1
(ii)	any **two** from: • boron - 11 • carbon - 12 • oxygen - 16 • lead - 207	**both** required both name **and** number must be given	1
(c)	alpha		1
total			6

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2006 June series

3462/3F Q5

question	answers	extra information	mark
(a)	(good) insulator	accept does not conduct (electricity) accept does not conduct heat or electricity do **not** accept does not conduct heat outside is tough is insufficient	1
(b)	fuse		1
(c)	connect the green and yellow / earth wire	accept wires must be connected to screws	1
	swap the brown and blue wires round		1
total			4

3462/3F Q6

question	answers	extra information	mark
(a)	fossils	answers can be in either order	1
	water		1
(b)	increased		1
(c)	radio telescope		1
total			4

4.1.1.1 Energy stores and systems

3462/3F Q7

question	answers	extra information	mark
(a)(i)	electrical		1
	kinetic	accept movement	1
(ii)	heat	answers can be in either order	1
	sound		1
(b)(i)	360	accept **1** mark for correct substitution	2
(ii)	watt		1
(c)	the stairlift is not moving the stairlift is moving at constant speed	**both** answers are required for the mark	1
total			8

3462/3F Q8

question	answers	extra information	mark
(a)(i)	(up) further **or** (up) faster	any reference to downwards movement loses credit accept <u>with</u> more force accept motion would increase	1
(ii)	down	accept the opposite way accept drop	1
(b)(i)	direct current		1
(ii)	Z		1
total			4

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2006 June series

3462/3F Q9

question	answers	extra information	mark
(a)	level of radiation (detected) will not change	ignore reference to particles	1
	if thickness of aluminium changes	accept for **both** marks a specific example eg if the aluminium gets thicker the level of radiation detected stays the same. accept for **1** mark gamma will pass through aluminium	1
	QoWC for 2 points in a sensible sequence		1
(b)	S W T V	all in correct order accept **2** marks for 2 correct accept **1** mark for 1 correct	3
total			6

4.1.1.1 Energy stores and systems

3462/3F Q10

question	answers	extra information	mark
(a)	0.05 (A)	ignore incorrect units if given accept 'the same' / 'the same as K' / 'the same as the other ammeter' do **not** accept 'same as the other meter'	1
(b)(i)	any **two** from: • two cells are joined + to +	answers in terms of current gain no marks accept one cell in the wrong way accept two cells are joined back-to-back accept two cells are joined – to – accept battery for cell do **not** accept answers in terms of all the cells or in terms of energy only	2
	• some of the cells potential difference is across the diode / ammeters / wires **or** the pd of the cells is shared by all components	accept voltage for pd do **not** accept using up pd	
	• the other components have a resistance	accept a named component / components / wire has a resistance	
	• cells not fully charged **or** cells partially run down	do **not** accept voltage of cells is less than 1.5 unless explained do **not** accept cells are not as powerful unless explained	
	• cells have an internal resistance		
(ii)	the diode has a (very) high resistance (in the reverse direction)		1
	a diode only conducts / allows current to flow in one direction	accept little / no current flows do **not** accept blocks / cuts flow	1

Continued

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2006 June series

3462/3F Q10

question	answers	extra information	mark
(c)	**QoWC** for the use of the word resistance	annotate Q✓ Q✗ accept resistant	1
	accept increase / change / decrease throughout question but a contradiction loses **one** mark with change as neutral		
	as the pd / current increases / changes	accept voltage for pd must be correctly linked to at least one of the following points accept	1
	the temperature of the filament increases / changes	lamp / bulb for filament accept filament becomes hotter	1
	increasing / changing the **resistance** of the lamp	accept for **1** mark only the filament lamp does not obey Ohm's law	1
total			9

4.1.1.1 Energy stores and systems

3462/3F Q11

question	answers	extra information	mark
(a)	0.5		1
	hertz	accept Hz but **not** HZ / hz / hZ accept (waves) per second **or** / sec **or** / s **or** s^{-1} **or** sec^{-1}	1
(b)	any **one** from: • any named part of the electromagnetic spectrum • S – waves / secondary waves • wave on a rope	 do **not** accept seismic waves / earthquake do **not** accept slinky unless clearly described	1
(c)	transverse – disturbance / vibration is perpendicular to the direction of energy transfer / wave travel	accept a correctly labelled diagram	1
	longitudinal – disturbance / vibration is parallel to the direction of energy transfer / wave travel	accept a correctly labelled diagram part explanation of the difference between transverse **and** longitudinal gains **1** mark	1
(d)(i)	TIR shown	needs to stay inside water jet ignore number of reflections **or** arrow heads lines straight by eye	1
(ii)	bigger than	any indication of correct answer	1
total			7

4.1.1.1 Energy stores and systems

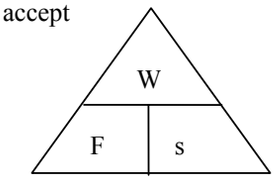
Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2006 June series

3462/3F Q12

question	answers	extra information	mark
(a)	W		1
	has only two states **or** is either on or off	accept discrete values only do **not** credit answer purely in terms of shape	1
(b)	any **one** from:		1
	• higher quality	accept clearer do **not** accept easier to read ignore faster accept <u>less</u> distortion **or** <u>less</u> weakening of signal strength do **not** accept no distortion / weakening on its own	
	• increased carrying capacity	accept more information can be sent **or** more channels	
	• errors can be rectified		
total			3

4.1.1.1 Energy stores and systems

3462/3F Q13

question	answers	extra information	mark
(a)(i)	all points plotted accurately	accept **1** mark for 5 correct plots ± ½ small square on stopping distance	2
	line of best fit must be continuous	accept attempt at a reasonable curve does not need to go through 0 0 do **not** accept a straight line do **not** accept dot-to-dot	1
(ii)	4 to 6 (metres)	accept ecf from (a)(i) accept **1** mark for value taken correctly from graph at 25mph **or** correct method shown	2
(b)(i)	0.7 (s)	incorrect unit = 0 marks	1
(ii)	constant speed / velocity	accept (continued as) 30mph accept did not change / stayed the same accept no acceleration	1
(iii)	3.3(s)	penalise incorrect unit once only	1
(iv)	reaction time <u>increases</u> / is <u>longer</u> **or** thinking distance <u>increases</u>	do **not** accept reaction time slower **or** reactions are slower	1
	stopping distance / it <u>increases</u>	do **not** accept travels at constant speed for longer	1
(c)(i)	work done = force (applied) × distance (moved)	accept W = F × s or W = F × d accept  provided subsequent method is correct	1
(ii)	2100	accept 2.1 kilo accept **1** mark for using 7000 N	2
(iii)	2100 (joules)	accept their (c)(ii)	1
total			14

4.1.1.1 Energy stores and systems

Science: Double Award (Co-ordinated) – AQA GCSE Mark Scheme, 2006 June series

3462/3F Q14

question	answers	extra information	mark
(a)(i)	refraction		1
(ii)	it changes speed **or** change in density	accept it speeds up do **not** accept it slows down do **not** accept air is more dense than glass	1
(b)(i)	sound / waves <u>diffract</u> through the gap (in the wall) **or** over the wall **or** because the gate is open	do **not** accept reflection this only scores if first marking point is given accept for **1** mark only sound / waves go through the gap and <u>spread out</u> **or** diagram showing wave fronts spreading out from open gates if diagram is labelled as diffraction both marks can be scored	1 1
(ii)	less diffraction	accept no diffraction accept gates <u>absorb</u> sound / noise / waves accept gates <u>reflect</u> sound / noise / waves do **not** accept rebounds / stops / blocks out	1
total			5

AQA

GCSE

Science A / Physics

PH1FP

Mark scheme

4405/4403
June 2015

Version/Stage: 1.0 Final

4.1.1.1 Energy stores and systems

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Further copies of this mark scheme are available from aqa.org.uk

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Mark Scheme

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.1 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.2 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.5 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.6 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.2 Ignore / Insufficient / Do not allow

Ignore of insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

4. Quality of Communication and levels marking

In Question **7a** students are required to produce extended written material in English, and will be assessed on the quality of their communication as well as the standard of the scientific response.

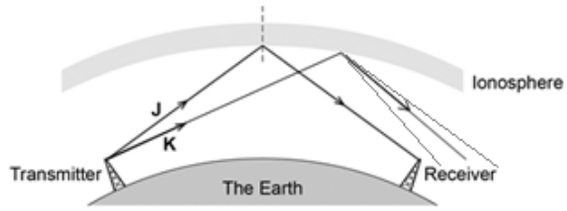
Students will be required to:
- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed
- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar

Question	Answers	Extra information	Mark	AO / Spec. ref.
1(a)(i)	reflection of wave **K** at or within the ionosphere angle i = angle r  	allow dashed lines 'judge by eye' tolerance for the reflected ray is between the first e and last r ignore arrows a reflected ray to the receiver doesn't score 2nd mark additional rays shown doesn't score 2nd mark	1 1	AO2 P1.5.2b
1(a)(ii)	normal		1	AO1 P1.5.2a
1(b)(i)	microwave		1	AO1 P1.5.1k
1(b)(ii)	refraction		1	AO1 P1.5.1g
1(c)	All electromagnetic waves are transverse. All electromagnetic waves have the same speed in a vacuum.		1 1	AO1 P1.5.1b, c, d
Total			**7**	

4.1.1.1 Energy stores and systems

MARK SCHEME – GCSE SCIENCE A / PHYSICS – PH1FP– JUNE 2015

Question	Answers	Extra information	Mark	AO / Spec. ref.
2(a)	chemical kinetic sound	correct order only	1 1 1	AO1 P1.2.1a
2(b)	48% or 0.48	an answer of 0.48 with a unit gains **1** mark an answer of 0.48% gains **1** mark an answer of 48 with or without a unit gains **1** mark	2	AO2 P1.2.1d
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. ref.
3(a)(i)	because they contain free electrons		1	AO1 P1.1.3a
3(a)(ii)	because they are good absorbers of infrared radiation		1	AO1 P1.1.1c
3(b)(i)	insulators		1	AO1 P1.1.3a
3(b)(ii)	the rate of energy transfer would be lower.		1	AO1 P1.1.3c
3(c)	power time	allow the temperature (of the oven) watts or wattage is insufficient	1 1	AO1 P1.3.1b
3(d)	it can be switched on / off remotely	accept sensible suggestions about remote operation eg can be turned on / off from work **or** food can be cooked before you get home	1	AO3 P1.1
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. ref.
4(a)	20 790 (J)	an answer of 21 000 (J) (2 s.f.) gains **2** marks allow **1** mark for correct substitution: ie E = 0.33 x 4200 x 15 provided no subsequent step shown	2	AO2 P1.1.4d
4(b)	temperature		1	AO1 P1.1.4d
4(c)	(top pan) balance	accept scales do **not** accept a scale do **not** accept weighing scales do **not** accept newtonmeter do **not** accept spring balance	1	AO1 P1.1.4d
4(d)	dark / black / (dark) grey convection	 correct order only	1 1	AO1 P1.1.1c P1.1.3c
4(e)(i)	created	accept made	1	AO1 P1.2.1a
4(e)(ii)	increases		1	AO1 P1.2.1c
Total			**8**	

Question	Answers	Extra information	Mark	AO/Spec. ref.
5(a)(i)	high levels of infrared radiation (from the Sun)	allow lots of (solar) energy (available) do **not** accept 'heat' for infrared 'it is hot' is insufficient 'lots of sunlight' is insufficient	1	AO2 P1.4.1a
5(a)(ii)	reflected		1	AO1 P1.5.1g
5(a)(iii)	boiler turbine transformer	correct order only	1 1 1	AO1 P1.4.1a
5(b)	2 100 000 (kWh)	allow **1** mark for correct substitution i.e. 140 000 x 15 provided no subsequent step	2	AO2 P1.3.1c
5(c)(i)	only 1 wind turbine was considered **or** other wind turbines may have generated more electricity only 1 week's weather was reported on **or** wind speed varies from one week to another	accept only one location is considered accept insufficient sample size 'wind speed varies' is insufficient	1 1	AO3 P1.4
5(c)(ii)	any **one** from: • wind speed is too high / low • wind is unreliable	allow no wind allow too windy allow wind is variable	1	AO1 P1.4

Question 5 continues on the next page . . .

Question 5 continued . . .

Question	Answers	Extra information	Mark	AO/Spec. ref.
5(c)(iii)	any **one** from: • wind is a renewable energy source • do not use fuel • energy source is free • do not release carbon dioxide • do not release greenhouse gases • do not release sulfur dioxide • do not cause acid rain • do not cause climate change • do not cause global warming • do not cause global dimming	answer must be an advantage of wind, converse answers in terms of fossil fuels are insufficient accept do not release pollutant gases 'no pollution' is insufficient	1	AO1 P1.4.1f
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. ref.
6(a)(i)	C		1	AO2 P1.5.4a
6(a)(ii)	The speed of star **B** is less than the speed of star **D**.		1	AO3 P1.5.4b
6(b)	300 000 000 m/s	allow **1** mark for correct substitution ie 200 000 x 1500 provided no subsequent step shown allow unit correctly indicated in list if not written in answer space	2 1	AO2 AO1 P1.5.1j
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7 (a)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4 and apply a 'best-fit' approach to the marking.		6	AO2 AO3 P1.2 HSW

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant information	There is a relevant statement about an energy saving method	There is at least one clear comparison of energy saving methods and their cost effectiveness with an appropriate calculation	There is a comparison of energy saving methods and their cost effectiveness with appropriate calculations. Comparison to include further detail.

examples of physics points made in the response	extra information
examples of relevant statements • energy efficient boiler saves the most (energy / money) per year • loft insulation costs the least to install • double-glazing costs the most to install	
examples of statements that include cost effectiveness • loft insulation is the most cost effective in the long term • double-glazing is the least cost effective • loft insulation has the shortest payback time • double-glazing has the longest payback time • payback time calculated for any method	payback times: energy efficient boiler: 6.25 years loft insulation: 2 years double glazing: 100 years cavity wall insulation: 2.86 years
examples of further detail • for cost effectiveness install in the following order: loft, cavity wall, boiler, double-glazing • for reducing energy use install in the following order: boiler, loft, cavity wall, double glazing • don't install double-glazing for insulation purposes • double-glazing won't pay for itself in your lifetime • justified choice of best / worst method	

Question 7 continued . . .

Question	Answers	Extra information	Mark	AO / Spec. ref.
7(b)(i)	how effective a material is as an insulator	accept 'heat' for energy accept how effective a material is at keeping energy in accept the lower the U-value the better the insulator accept the lower the U-value the lower the rate of energy transfer	1	AO1 P1.1.4a
7(b)(ii)	(the U-value) decreases		1	AO1 P1.1.4b
Total			**8**	

4.1.1.1 Energy stores and systems

MARK SCHEME – GCSE SCIENCE A / PHYSICS – PH1FP– JUNE 2015

Question	Answers	Extra information	Mark	AO / Spec. ref.
8(a)(i)	0.5 °C		1	AO3 P1.1
8(a)(ii)	data is continuous **or** both variables are continuous **or** independent variable is continuous **or** time is continuous	accept results / measurements for data accept data is not categoric one variable is continuous is insufficient air temperature is continuous is insufficient	1	AO3 P1.1
8(b)(i)	20.5 (°C)		1	AO2 P1.1
8(b)(ii)	60 (minutes)	accept 1 hour	1	AO2 P1.1
8(c)(i)	so a comparison can be made **or** outside temperature is a control variable	accept: (outside) temperature would affect energy required (to maintain temperature of the house) **or** (outside) temperature would affect internal temperature (of the house) **or** heat loss will be faster on a cold day outside temperature will affect the results is insufficient fair test is insufficient	1	AO3 P1.1

Question 8 continues on the next page . . .

Question	Answers	Extra information	Mark	AO / Spec. ref.
8(c)(ii)	the cost is equal to the number of kWh x the cost per kWh calculation 0.8 / 8.0 = 0.1 or 10%	accept (heating) bill depends on (number of) kWh used accept energy for kWh allow 7.2 / 8.0 = 0.9 or 90%	1 1	AO3 AO2 P1.1
8(c)(iii)	heating is on for more / less time (than anticipated) because some days it is cooler / warmer (than anticipated)	 accept other sensible suggestions an answer giving two sensible situations gains **2** marks possible examples: • some houses have different amounts of insulation • there are different styles of house temperature (inside / outside) is always changing is insufficient	1 1	AO3 P1.1
Total			**9**	

4.1.1.1 Energy stores and systems

GCSE

Additional Science / Physics

PH2FP

Mark scheme

4408/4403
June 2015

Version/Stage: 1.0: Final

4.1.1.1 Energy stores and systems

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Mark Scheme

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 Ignore / Insufficient / Do not allow

Ignore of insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

4. Quality of Communication and levels marking

In Question **8c** students are required to produce extended written material in English, and will be assessed on the quality of their communication as well as the standard of the scientific response.

Students will be required to:
- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed
- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

4.1.1.1 Energy stores and systems

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
1(a)	increases	accept reaches highest value do **not** accept increases and decreases	1	AO2 2.3.2	**E**
1(b)(i)	increases		1	AO1 2.3.2m	**A**
1(b)(ii)	increases		1	AO1 2.3.2m	**A**
1(c)	18 watt	allow **1** mark for correct substitution i.e. 12 x 1.5 provided no subsequent step accept W answer may be indicated in the list	2 1	AO2 2.4.2c AO1 2.4.2c	**E**
Total			**6**		

4.1.1.1 Energy stores and systems

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
2(a)	inside the Sun		1	AO1 2.6.2b	**A**
2(b)	fusion		1	AO1 2.6.2a	**G**
2(c)	energy		1	AO1 2.6.2f	**A**
Total			**3**		

4.1.1.1 Energy stores and systems

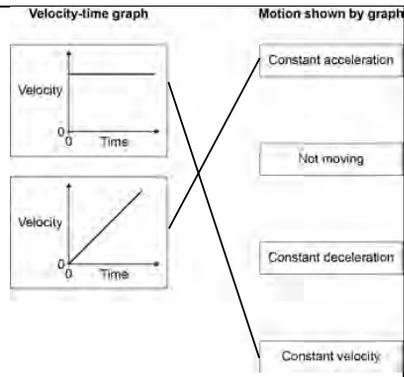
Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
3(a)	3 (.0)	allow **1** mark for correct substitution i.e. 25 x 0.12 provided no subsequent step	2	AO2 2.1.5d	**E**
3(b)(i)	elastic potential kinetic	correct order only	1 1	AO1 2.1.5c 2.2	**G**
3(b)(ii)	increases to 80(mm) (or more)	accept any number greater than 75 an answer 'it (more than) doubles' gains both marks	1 1	AO3 2.1.5a	**E**
3(c)(i)	weight		1	AO1 2.1	**A**
3(c)(ii)	Downward speed increases		1	AO1 2.1.1e	**A**
Total			**8**		

4.1.1.1 Energy stores and systems

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
4(a)(i)	(3-pin) plug	do **not** accept plug socket	1	AO1 2.4.1d	**E**
4(a)(ii)	live and neutral		1	AO1 2.4.1e	**A**
4(a)(iii)	double		1	AO1 2.4.1j	**G**
4(b)	Direct current (d.c.) only		1	AO1 2.4.1a	**A**
4(c)(i)	live		1	AO1 2.4.1g	**G**
4(c)(ii)	too great a current flows	accept a surge of current accept too great a power accept an electrical fault do **not** accept voltage / energy / electricity too high	1	AO1 2.4.1g	**E**
4(c)(iii)	can be reset (disconnects circuit) faster	accept does not need replacing cheaper is insufficient does not melt is insufficient quicker to fix / replace is insufficient	1 1	AO2 2.4	**E**
Total			**8**		

4.1.1.1 Energy stores and systems

MARK SCHEME – GCSE ADDITIONAL SCIENCE / PHYSICS – PH2FP– JUNE 2015

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
5(a)		if more than one line is drawn from a graph then all those lines are wrong allow **1** mark for 1 correct line	2	AO1 2.1.2f	**G**
5(b)	speed		1	AO1 2.1.2d	**G**
5(c)(i)	2.25	allow **1** mark for correct substitution i.e. $a = \frac{9-0}{4}$ or $a = \frac{9}{4}$ provided no subsequent step	2	AO2 2.1.2e	**E**
5(c)(ii)	The air resistance increases		1	AO1 2.1.4a	**A**
5(d)	2000 J mass is half **or** kinetic energy depends on mass	 do **not** accept weight for mass	1 1	AO2 2.2.1g	**E**
Total			**8**		

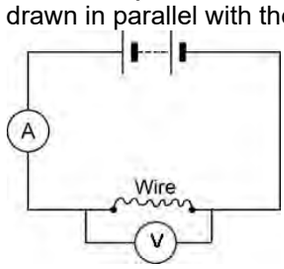
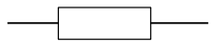
4.1.1.1 Energy stores and systems

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
6(a)	cell damage *or* cancer	accept kills/mutates cells radiation poisoning is insufficient ionising is insufficient	1	AO3 2.5.2g	**E**
6(b)(i)	any **one** from: • use tongs to pick up source • wear gloves • use (lead) shielding • minimise time (of exposure) • maximise distance (between source and teacher)	accept any other sensible and practical suggestion ignore reference to increasing / decreasing the number / thickness of lead sheets	1	AO3 2.5	**E**
6(b)(ii)	<u>background</u>		1	AO1 2.5.2b	**E**
6(c)(i)	curve drawn *from point 2,160*	do **not** accept straight lines drawn from dot to dot	1	AO2 2.5	**E**
6(c)(ii)	(also) increases	less radiation passes through is insufficient	1	AO3 2.5	**E**
6(c)(iii)	50	accept any value from 40 to 56 inclusive	1	AO3 2.5	**E**
6(d)	gamma only gamma (radiation) can pass through lead	 accept alpha **and** beta cannot pass through lead a general property of gamma radiation is insufficient	1 1	AO2 2.5.2e	**E**
Total			**8**		

4.1.1.1 Energy stores and systems

MARK SCHEME – GCSE ADDITIONAL SCIENCE / PHYSICS – PH2FP– JUNE 2015

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
7(a)(i)	p.d. is (directly) proportional to current **or** gradient/slope is constant ***or*** the lines show constant resistance	accept lines are straight / diagonal	1	AO2 2.3.2d/e/g	**E**
7(a)(ii)	C for the same p.d. the current is the smallest	reason only scores if C is chosen accept lowest gradient **and** the gradient = 1/R	1 1	AO2 2.3.2i	**E**
7(b)(i) clip with table 1	ohm	accept correct symbol Ω accept an answer written in Table 1 if not given in answer space	1	AO1 2.3.2h	**E**
7(b)(ii)	K and L only length varies	reason only scores if both K and L are chosen accept type of metal and the diameter are the same	1 1	AO3 2.3.2	**E**
7(b)(iii)	measure the resistance of more wires made from different metals	accept test more (types of) metals measure the resistance of more wires is insufficient they only use two metals is insufficient	1	AO3 2.3.2	**E**

7(c)(i)	voltmeter symbol correct and drawn in parallel with the wire 	accept voltmeter symbol correct and drawn in parallel with the battery	1	AO1 2.3.2c/f	**E**
7(c)(ii)	correct symbol drawn 	symbol must be rectangular	1	AO1 2.3.2c	**E**
Total			**9**		

Question	**Answers**	**Extra information**	**Mark**	**AO / Spec. ref.**	**ID**
8(a)	(an equal amount of) positive charge	do **not** accept charge on the atom / nucleus is positive	1	AO3 2.5.1	**E**
8(b)(i)	a (significant) number of alpha particles were scattered by more than 4° **or** alpha particles deflected backwards measurements / results could not be explained by 'plum pudding' model **or** measurements / results did not support predictions	accept (some) measurements / results were unexpected can be explained by the nuclear model is insufficient accept measurements / results did not support hypothesis	1 1	AO1 2.5 AO1	**E**
8(b)(ii)	many/(over)100 000 measurements / results taken	accept Rutherford(and Marsden) were respected scientists **or** scientists were respected accept measurements / results taken over several months the experiment was repeated many times is insufficient	1	AO3 2.5	**E**

Question 8 continues on the next page . . .

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
8(c)			6	AO1 2.5.1a/b/c	**E**

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
no relevant content	A brief description is given with some particles correctly named	A description is given with all three particles named **plus either** the polarity of charge associated with the three particles **or** the relative mass of the three particles **or** the relative mass for one particle and the relative charge for one particle given	A more detailed description is given, naming the particles and polarity of charge **and either** the relative mass is given for at least two particles **or** the relative charge is given for at least two particles

examples of the points made in the response	extra information		
brief description contains protons, neutrons and electrons protons are positive electrons are negative neutrons are uncharged has a nucleus **relative charge** proton +1 electron – 1 neutron 0 **relative mass** proton 1 neutron 1 electron (about) 1/2000 **more detailed description** protons and neutrons make up the nucleus electrons orbit the nucleus electrons are in shells most of the atom is empty space nucleus occupies a very small fraction of the volume of the atom electrons orbit at a relatively large distance from the nucleus most of the mass of the atom is contained in the nucleus the nucleus as a whole is positively charged total number of protons in the nucleus equals the total number of electrons orbiting it in an atom	accept protons and neutrons have the same mass accept electrons have tiny / negligible mass zero mass is neutral		

Total		**10**

4.1.1.1 Energy stores and systems

AQA

GCSE

Science A / Physics

PH1FP

Mark scheme

4405/4403
June 2016

Version 1.0: Final Mark Scheme

4.1.1.1 Energy stores and systems

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Mark Scheme

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
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- the Assessment Objectives and specification content that each question is intended to cover.

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At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 Ignore / Insufficient / Do not allow

Ignore of insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

4. Quality of Communication and levels marking

In Question **7(b)** students are required to produce extended written material in English, and will be assessed on the quality of their communication as well as the standard of the scientific response.

Students will be required to:
- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed
- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

4.1.1.1 Energy stores and systems

MARK SCHEME – GCSE SCIENCE A / PHYSICS – PH1FP– JUNE 2016

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	geothermal nuclear biofuel		1 1 1	AO1 1.4.1a 1.4.1d
1(b)	gravitational (potential) kinetic sound		1 1 1	AO1 1.3.1a 1.4.1b
1(c)(i)	90% or 0.9(0)	an answer of 0.9(0) with a unit gains **1** mark an answer of 90 with no unit or an incorrect unit gains **1** mark	2	AO2 1.2.1d
1(c)(ii)	60 (MW)	allow 10%	1	AO2 1.2.1b
1(c)(iii)	increased		1	AO1 1.2.1c
Total			**10**	

4.1.1.1 Energy stores and systems

MARK SCHEME – GCSE SCIENCE A / PHYSICS – PH1FP– JUNE 2016

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	46 200	accept 46 000 allow **1** mark for correct substitution ie 0.5 x 4200 x 22 provided no subsequent step	2	AO2 1.1.4d
2(b)	Energy is used to heat the kettle.		1	AO2 1.2.1b
2(c)	9 (pence)	allow **1** mark for correct substitution ie 0.6 x 15 provided no subsequent step	2	AO2 1.3.1d
2(d)(i)	conduction and convection		1	AO1 1.1.3a
2(d)(ii)	any **one** from: • water stays hotter for longer (than a 'conventional' kettle) • water boiled less often • less energy transferred to the surroundings • (new design is) more efficient		1	AO2 1.2
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	any **one** from: • (visible) light • UV / ultra violet • X-ray • gamma / γ-ray		1	AO1 1.5.1e
3(a)(ii)	less than less than the same as		1 1 1	AO1 1.5.1d 1.5.1e
3(b)(i)	(the) Big Bang (theory)		1	AO1 1.5.4e
3(b)(ii)	the red-shift of light from distant galaxies		1	AO1 1.5.4c
Total			**6**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	dependent		1	AO3 1.1.3b
4(b)	The equipment has a better resolution.		1	AO3 1.1.3
4(c)	(probe) C largest difference between reading and actual temperature	allow 103.2 reason only scores if C chosen accept larger it is 3.2 greater is insufficient comparing C with only one other probe is insufficient	1 1	AO3 1.1.3
4(d)(i)	12(°C)	accept a value between 12.0 and 12.2 inclusive	1	AO2 1.1.3d
4(d)(ii)	140 (seconds) <u>temperature</u> starts to rise	accept an answer between 130 and 150 inclusive only scores if time mark awarded accept the <u>temperature</u> was lowest (at this time)	1 1	AO2 AO3 1.1.3b
4(d)(iii)	increase	accept faster (rate)	1	AO1 1.1.3b
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	it would decrease the time		1	AO3 1.2.1a
5(b)	720 (J)	allow **1** mark for correct substitution ie 12 x 60 provided no subsequent step	2	AO2 1.3.1c
5(c)	dense rises falls	 accept equivalent words accept equivalent words	1 1 1	AO1 1.1.3a
5(d)	 decreases decreases decreases	more than one tick in any row negates the mark	 1 1 1	AO3 1.1.3c 1.1.3d
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	frequency		1	AO1 1.5.3b
6(b)	echo(es)		1	AO1 1.5.3c
6(c)	spreading (out) equal to	changing direction is insufficient moving apart is insufficient bending is insufficient accept: similar to same (order of magnitude) as slightly smaller than slightly larger than	1 1	AO1 1.5.1g
6(d)	340 (m/s)	allow **1** mark for correct substitution ie 25 000 x 0.0136 provided no subsequent step or allow 1 mark for a correct calculation showing an incorrect value from conversion to hertz x 0.0136 an answer of 0.34 gains **1** mark	2	AO2 1.5.1j
6(e)	(a wave where the) oscillations are parallel to the direction of energy transfer causing (areas of) compression and rarefaction	both marking points may appear as labels on a diagram accept vibrations for oscillations accept in same direction as for parallel to allow direction of wave (motion) for direction of energy transfer accept correct description in terms of particles mechanical wave is insufficient needs a medium to travel through is insufficient	1 1	AO1 1.5.1b
Total			**8**	

4.1.1.1 Energy stores and systems

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	any **one** from: • high cost of installing overhead power lines or underground cables or pylons • high cost as (very) long cables needed • amount of electricity required is too low	allow not enough (surplus) electricity would be generated	1	AO1 1.4.1e

Question 7 continues on the next page . . .

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7 (b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.		6	3 AO1 2 AO2 1 AO3 1.4.1b

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant information	at least **one** advantage **or one** disadvantage of either method	at least **one** advantage **and one** disadvantage is stated for **one** method **and** a different advantage **or** disadvantage is stated for the other method	clear comparison of advantages **and** disadvantages of **each** method

examples of physics points made in the response	extra information
Advantages of both methods:	
• both renewable sources of energy	
• both have no fuel (cost)	accept carbon neutral
• both have very small (allow 'no') running costs	accept no greenhouse gases
• no carbon dioxide produced	accept doesn't contribute to global warming
Advantages of wind:	
• higher average power output	produces more energy is insufficient
Advantages of hydroelectric:	
• constant / reliable power (output)	
• lower (installation) cost	
Disadvantages of wind:	
• higher (installation) cost	
• variable / unreliable power output	
• (may) kill birds / bats	
Disadvantages of hydroelectric:	
• lower power output	
• (may) kill fish or (may) damage habitats	
• more difficult to set up (within river)	
Disadvantages of both methods	
• (may be) noisy	
• visual pollution	ignore payback time unless no other relevant points made ignore time to build for both

Total			7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	a proportion / percentage of the energy is wasted	allow heat for energy allow some energy is wasted	1	AO2 1.2.1b 1.2.1c
	(wasted) energy is transferred to surroundings **or** energy is needed to heat pan (before food is heated)		1	
8(b)	(fins have a) large(r) surface area	accept fins increase the surface area	1	AO1 1.1.1c 1.1.1e 1.1.3c
	(black metal surface is a) good / better absorber of infrared radiation	allow 'heat' or 'energy' for infrared radiation ignore good emitter of infrared radiation not a good reflector is insufficient	1	
8(c)	the higher the temperature (of the saucepan) the greater the rate at which infrared radiation is emitted	accept converse answer allow the higher the temperature the more infrared radiation is emitted allow there is a positive correlation	1	AO2 1.1.1b
Total			**5**	

4.1.1.1 Energy stores and systems

Answer 99 · Examiner comments — June 2018 | 8463/2F | Original Q10

Question 10 (Standard demand)

10.1 Many of the students found the velocity-time graph difficult to interpret and relate to the motion of the ball, with many stating the ball was going upwards at an angle between A and B. However about 50% of students correctly stated that the ball accelerated between points A and B on the graph, however very few of these recognised that a straight line velocity-time graph represents a uniform acceleration and so failed to score the second mark available. Comments such as 'the ball accelerates at a constant speed' did not score a mark.

10.2 54% of students were able to give the correct direction.

10.3 As a new part of the specification this was answered well with about 60% of the students giving the correct answer.

Answer 99 · Examiner comments — June 2018 | 8463/2F | Original Q10

10.4 Few students appreciated that the negative velocity indicated that the ball was moving upwards, and that BC represented the ball hitting the ground. It was rare to read that the ball had a reduced velocity and therefore a reduced kinetic energy. Some students wrote that the ball would not rebound as high but did not relate this to an overall loss of gravitational potential energy. A small number of the students did recognise that the ball had lost energy overall in the bounce but did not state that because total energy is conserved, some of the ball's energy must have been transferred to the Earth. The majority of students simply described, correctly or incorrectly, the energy change as the ball fell or landed. There little appreciation that the question required students to consider the energy changes within a closed system.

4.1.1.1 Energy stores and systems

Answer 115 · Examiner comments June 2022 | 8463/1F | Original Q1

Question 1 (Low demand)

01.1 About 40% of students answered this question correctly.

01.2 Approximately 80% of students answered this question correctly. The most common mistake was to not square the extension. This would then just score a mark for the substitution, if correct.

01.3 Students were required to multiply their answer to question **01.2** by 40. However, many students did not answer this correctly. Many students tried to calculate the elastic potential energy using the equation, scoring zero marks. About 60% of students answered this question correctly.

01.4 About 65% of students scored 2 marks on this question. However, a number of students didn't score any marks as they did not appear to be able to calculate a percentage, which is one of the mathematical skills stated in the specification.

01.5 Approximately 60% of students answered this question correctly.

Answer 116 · Examiner comments June 2022 | 8463/1F | Original Q2

Question 2 (Low demand)

02.1 About 80% of students answered this question correctly. 'Metre stick' was ignored, so if students gave a list eg 'metre stick or tape measure' they could still score the mark.

02.2 About 90% of students completed this calculation correctly, scoring 2 marks.

02.3 About 90% of students completed this calculation correctly, scoring 2 marks.

02.4 90% of students identified the correct stop-clock.

02.5 90% of students completed this calculation correctly, scoring 2 marks. The most common mistake was to not square the speed. This would then just score a mark for the substitution, if correct.

4.1.1.1 Energy stores and systems

Answer 117 · Examiner comments

June 2022 | 8463/1F | Original Q6

Question 6 (Low and standard demand)

06.1 35% of students recognised the resistors were connected in parallel with the power supply.

06.2 70% of students answered this question correctly.

06.3 70% of students answered this question correctly.

06.4 95% of students answered correctly, All students had the equations on the Physics Equations Sheet for the 2022 series.

06.5 70% of students answered correctly, scoring 3 marks. Students who did not gain any marks commonly multiplied the power and the energy values together. The first marking point was for the substitution, which students who couldn't rearrange often failed to score as they only wrote down 3600 × 1200 and their incorrect answer.

06.6 About 55% of students identified the correct circuit symbol.

4.1.1.1 Energy stores and systems

Answer 118 · Examiner comments

June 2022 | 8463/2F | Original Q7

Question 7 (Low and standard demand)

07.1 Most of the students scored at least 1 mark with the majority scoring both.

07.2 The answers were split 50/50 between parallel and perpendicular.

07.3 About three quarters of the students chose the correct answer.

07.4 Very few of the students appeared to see the link between part 07.3 and 07.4. Those choosing the correct answer in 07.3 often went on to use the value 8 rather than 8000 and so scored zero. The students scoring both marks often did so for choosing the wrong answer '8' in part 07.3 but then using it in this calculation.

07.5 About 30% of the students failed to score 3 marks as they were unable to give the correct unit of wavelength.

07.6 Almost all the students were able to use the equations sheet to give the correct equation. A few students only wrote the three symbols inside a triangle - this is not an equation and so scored zero.

07.7 A significant minority of the students were unable to rearrange the equation correctly and thus ended up with an incorrect answer. Over half of the students scored all 3 marks.

07.8 Very few of the answers given linked the three marking points together in a logical, well written sequence. The idea that the sound from speaker B would take more time to reach the technician was often omitted. Approximately 15% of the students did not attempt the question.

Answer 119 · Examiner comments

June 2023 | 8463/1F | Original Q4

Question 4 (Low and Standard Demand)

04.1 93% of students scored 2 marks on this calculation question.

04.2 84% of students scored 2 marks for this calculation question.

04.3 In this exam series students were provided with an equations sheet with all equations given. 95 % of students answered the question correctly.

04.4 A question that discriminated well. 16% of students scored 3 marks, while 63 % of students scored 2 marks for an answer of 180 000, having not converted the time to seconds.

4.1.1.1 Energy stores and systems

Answer 119 · Examiner comments June 2023 | 8463/1F | Original Q4

04.5 Some students appeared to confuse the power output of the hydroelectric generator with the power demand of the consumers. 'People use less power in the summer' being seen as a common incorrect answer. Students needed to link rainfall / water level to the summer months to score both marks. Referring to 'hotter months' was insufficient for 'summer months' or named months. Examples of specific changes were creditworthy eg 'less/more water in the river' or 'rainfall may be less/more' for the 1st marking point. Both marking points could be the converse of what appeared in the mark scheme. 30% of students scored 2 marks, while 22% of students scored 1 mark.

Answer 120 · Examiner comments June 2023 | 8463/1F | Original Q5

Question 5 (Low Demand)

05.1 75% of students correctly identified the reason for using the funnel.

05.2 40% of students correctly identified the reason for not using insulation..

05.3 Well answered with 88 % of students scoring the mark. Answers of 'timer' were ignored, which means if a student wrote ' timer or stop-clock' they would score the mark.

05.4 Many students identified one or two ways to improve the experiment but very few could give a valid reason for why it would be an improvement. 32 % of students scored 2 marks, while 34% of students scored 1 mark. 'Same amount of insulation' was creditworthy, as was 'same amount of water'. Any suggested change followed by the reason 'it is more accurate' was insufficient to score the explanation mark.

05.5 71% of students scored 1 mark by choosing ' bar chart / graph', while only 4% of students scored 2 marks. Common answers which were insufficient were 'easier to read' and 'see the results more clearly'. 'Data is categoric' or 'data is not continuous' were creditworthy reasons which scored the second marking point.

Answer 121 · Examiner comments June 2023 | 8463/1F | Original Q6

Question 6 (Low Demand)

06.1 This question discriminated well with 24% of students scoring 3 marks, 39 % scoring 2 marks and 30% scoring 1 mark, for comparing the energy stores.

06.2 82% of students scored 2 marks for this calculation. The most common mistake was to forget to square the extension.

06.3 34% of students gave the correct reason.

06.4 While 39% of students chose cord A, only 34% of students gave a correct reason. 'Greater extension' was insufficient unless also linked to 'snapping'.

4.1.1.1 Energy stores and systems

Answer 122 · Examiner comments June 2023 | 8463/1F | Original Q9

Question 9 (Standard Demand)

09.1 The answer needed to refer to the iron block's temperature rather than anything else the student focused on, such as air temperature. An answer referring to 'it' was taken as meaning the iron block as the subject of the question.11% of students scoredthe mark.

09.2 A question that discriminated well, with 17% of students scoring 4 marks, while 13 % of students scored 3 marks by using an incorrect temperature change. Students struggled to read the temperature change from the graph, ignoring the times given in the question. If a student assumed that the temperature change was 60°C, an answer of 216.6 would score 2 marks, whereas 216.7 would score 3 marks. 48% of students scored 0 marks.
If an incorrect temperature change is used it should be clear what values the student has used, either by drawing lines or by quoting data. The exception to this is if they use a temperature change of 60°C (final minus initial temperature on the graph). This would need no indication of what had been done. If they use a temperature instead of a temperature change they score zero.

09.3 32% of students scored 2 marks, while 59% of students scored 1 mark for identifying the effect of adding insulation.

Answer 123 · Examiner comments June 2023 | 8463/2F | Original Q2

02.1

22 % of students scored 1 mark and 61 % of students scored both marks for identifying the energies

02.2

The majority of the students identified the correct relationship between the speed and the braking distance. Those that didn't described the graph rather than mentioning braking distance or speed, or used incorrect phrases eg 'directly proportional'.

02.3

84% of students knew that braking distance increases when a road becomes icy.

02.4

This 3-mark question required students to calculate the change in velocity then use this correctly to determine the time taken. Many students failed to show how they calculated the change in velocity and could not be awarded any marks.

4.1.1.1 Energy stores and systems

Answer 123 · Examiner comments June 2023 | 8463/2F | Original Q2

02.5

86 % scored 2 marks for calculating the resultant force. Common mistakes involved dividing instead of multiplying, or calculating 1600 x 0.25^2, the squared apparently being inferred from the unit of deceleration (m/s^2).

02.6

77% of students were able to identify the control variable for the investigation.

02.7

Many students correctly stated that there would be a greater number of results, which could lead to a change in the mean. But some simply stated that different people have different reaction times. Credit was also given for those that stated the reaction times of 3 children tested may not be representative of the whole class. However, some only answered by saying 'only 3 children were tested' which was insufficient to get the mark.

02.8

30 % scored 1 mark and only 33 % scored 2 marks. Rather than describing a change to the experiment students would state how they thought music would affect the reaction time, or why music would affect the reaction time.
Many who got 1 mark suggested they did the experiment with music on but did not say to compare with previous results or do it with music off.

Answer 124 · Examiner comments June 2023 | 8463/2F | Original Q9

09.1

12% of students gave the answer perpendicular or a correct description of perpendicular. Common incorrect responses included parallel, opposite, and proportional.

09.2

29% of responses were level 1 and 45% were level 2. Very few students explained the need to calculate the temperature change or to compare the readings on infrared detectors. A number of students suggested using cold water, or even described a different practical. Students were not penalised for using tiny volumes of water, but many students have no concept of how much 50 ml is, for example.

4.1.1.1 Energy stores and systems

Answer 124 · Examiner comments

June 2023 | 8463/2F | Original Q9

09.3

Many students scored zero as they had selected the incorrect box. The reason had to state greatest/highest temperature, or the liquid was the hottest. A higher temperature or hotter liquid was insufficient to gain this mark. 21% of students scored both marks.

09.4

31% of students gained this mark. There seemed to be confusion as to which variable was the dependent variable. The majority of students gave control variables or the independent variable as their answer.

09.5

The most common response related to the matt black surface and the shiny white surface. This was awarded 1 mark. Some students did mention that black was the best absorber but failed to adequately describe the relative absorbance of matt versus shiny surfaces, as they did not explain this only applied for the same colour surface. Some students gave their response in terms of emission or reflection of IR radiation, both of which scored zero. Only 2% of students were able to give two meaningful conclusions.

09.6

90% of students correctly identified the formula for calculating pressure.

09.7

47% of students achieved full marks in this calculation. Many scored zero, as they calculated the total surface area, the volume or used the length of the cube.

4.1.1.1 Energy stores and systems

Answer 125 · Examiner comments

Question 1 (Low Demand)

01.1 Only 38% of students scored a mark for knowing that when a person touches a negatively charged metal dome they also become negatively charged.

01.2 55% of students scored a mark for this question about the force of repulsion between like charges.

01.3 Only 29% of students scored a mark for this question. The majority of wrong answers chose the diagram for the electric field around a positively charged dome.

01.4 62% of students chose the correct answer, knowing that an insulator has a high resistance. The most common incorrect answer was temperature.

01.5 67% of students answered this question correctly, knowing that a spark jumps when the air is ionised.

01.6 78% of students answered this question correctly, identifying electrons as the particle transferred when a spark jumps between two objects.

01.7 93% of students calculated the energy transferred correctly.

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4.1.1.1 Energy stores and systems

Answer 126 · Examiner comments — June 2024 | 8463/1F | Original Q3

Question 3 (Low / Standard demand)

03.1 53% of students scored a mark for this question showing how the extension of a bungee cord should be calculated.

03.2 90% of students scored both marks for correctly calculating the elastic potential energy.

03.3 90% of students scored both marks for correctly calculating the maximum kinetic energy.

03.4 95% of students chose the correct equation. However, in this exam series students were provided with a Physics Equations Sheet.

03.5 56% of students scored all 3 marks for this standard demand calculation question.
For 3 mark calculations, these general principles apply:
The 1st mark is for the substitution.
The 2nd mark is for the rearrangement.
The 3rd mark is for the answer.
In straightforward calculations, no working needs to be shown, but students should be encouraged to do so just in case the final answer is incorrect.
If the answer is correct, 3 marks can score.

03.6 27% of students scored 2 marks for this question, while 59% scored 1 mark. This question tested understanding of energy dissipation in energy transfers. A lot of students only ticked one box, ignoring the rubric of the question.

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Answer 127 · Examiner comments — June 2024 | 8463/1F | Original Q5

Question 5 (Low / Standard demand)

05.1 48% of students understood that the volume of air in the syringe decreased.

05.2 83% of students understood that the distance between the particles decreased.

05.3 85% of students understood that the frequency of collisions increased.

05.4 86% of students understood that the air pressure increased.

05.5 85% of students answered this question correctly, linking temperature increase to the mean speed of gas particles.

05.6 A standard demand calculation of temperature change, which was a good discriminator between students who could or could not rearrange an equation. 35% of students scored 3 marks, while 45% of students scored no marks.

4.1.1.1 Energy stores and systems

Answer 128 · Examiner comments

June 2024 | 8463/1F | Original Q9

Question 9 (Standard demand)

09.1 74% of students scored this mark. Common incorrect answers were 'method A' or 'method B', students thinking they were linking a method to the energy transfer.

09.2 63% of students scored this mark. Common incorrect answers were 'method A' or 'method B' students thinking they were linking a method to the energy transfer. Another common answer was 'hydroelectric energy' which didn't score. The word 'potential' was needed for an answer of 'gravitational potential'. As the question was worded it seemed reasonable to credit 'kinetic' since the water moving uphill would have kinetic energy before it reached its destination and stored only gravitational potential energy.

09.3 Many students failed to realise that the calculations needed were to show the amount of stored energy wasted or the amount of stored energy usefully transferred. Simple subtractions were insufficient to score the calculation marks. To score 4 marks, two comparisons were needed in addition to a comparative calculation. Although the comparative calculation performed by a minority of students involved dividing 33 600 kJ by 490 kJ and getting an answer of 68.6, which is the number of times more energy stored by method A compared to B. This single calculation was enough to score 4 marks with the two simple comparisons. The installation comparison only scored if value was added to the information eg Method A is easier to install or is likely to cost less money. 21% of students scored 3 or 4 marks, while 65% of students scored 1 or 2 marks.

09.4 A straightforward question that students found easy to answer with 40% of students scoring 3 or 4 marks, while 40% of students scored 1 or 2 marks. A lot of students gave an alternative solution without saying what activity should be reduced or stopped. An example would be 'use electric cars' without saying 'instead of using petrol/diesel cars'. As the majority of cars on the road are still petrol/diesel if a student said 'don't use cars' it was taken to be a petrol/diesel car and scored a mark. Some students discussed the reduction of 'food miles' by forcing people to shop locally, which was also creditworthy. 10% of students didn't attempt answer this question part.

4.1.1.1 Energy stores and systems

Answer 129 · Examiner comments June 2025 | 8463/1F | Original Q2

02.1

Most of the students scored 2 marks for plotting the bars correctly. Students scored 1 mark if they plotted points rather than bars. Many students did not label the x-axis. Students who labelled it but did not score usually labelled the x-axis and the y-axis 'x' and 'y'. Almost 60 % of the students scored all 3 marks.

02.2

Just under half of the students scored 2 marks for choosing copper and giving a valid reason, while 10 % of the students scored only 1 mark with a reason that was insufficient or incorrect. Many students chose steel as it took the greatest time to melt the wax.

02.3

Almost 90 % of the students scored 2 marks on this SHC calculation. Students who scored only the substitution mark usually did not put the denominator in brackets when entering the calculation in their calculator.

02.4

Nearly all of the students chose the correct equation from the equations sheet. A mixture of quantities and symbols scored the mark. Upper case or lower-case letters scored the mark. Equation triangles were insufficient to score the mark.

02.5

About 5 % of the students scored the substitution mark but then failed to rearrange correctly.

4.1.1.1 Energy stores and systems

Answer 130 · Examiner comments June 2025 | 8463/1F | Original Q4

04.1
Just over 90 % of the students knew that the speed of the gas particles increased.

04.2
Nearly 80 % of the students knew that the kinetic energy of the gas particles increased.

04.3
Nearly 90 % of the students knew that the number of collisions each second increased.

04.4
Just over 70 % of the students knew that the force exerted by the gas particles increased.

04.5
When completing a matching type questions students should be encouraged to draw straight lines only.

04.6
Just fewer than 50 % of the students identified the state as liquid.

04.7
Just over 50 % of the students identified the state as solid.

Answer 130 · Examiner comments June 2025 | 8463/1F | Original Q4

04.8
Students found this question about internal energy difficult. Only about 11 % of the students scored 2 marks, while a further 33 % of the students scored 1 mark.

4.1.1.1 Energy stores and systems

Answer 131 · Examiner comments June 2025 | 8463/1F | Original Q5

05.1
This question discriminated well with 44% of the students scoring 3 marks, 10 % of the students scoring 2 marks and 28 % of the students scoring 1 mark.

05.2
Nearly 70 % of the students scored the mark for identifying the circuit symbol for a fuse.

05.3
Most of the students scored 2 marks on this grade 1-3 calculation.

05.4
About 94 % of the students scored both marks on this calculation of resistance. Students who scored 0 marks usually rearranged the equation and multiplied the current^2 by the power. When students are provided with the equation at the point they need it in the exam, there is no need to rearrange the equation before using it as it is a grade 1-3 question.

05.5
Just over 60 % of the students scored 2 marks for correct comparisons between kettle A and kettle B. Many students did not read the instructions for the question and only ticked one box.

Answer 132 · Examiner comments June 2025 | 8463/1F | Original Q6

06.1
Nearly 90 % of the students scored 2 marks on this calculation of elastic potential energy.

06.2
The vast majority of the students identified the correct equation for gravitational potential energy.

06.3
Just over half of the students scored 3 marks on this calculation of mass using the gravitational potential energy equation.

06.4
About 65 % of the students understood that the elastic potential energy of the spring decreased.

06.5
About 80 % of the students understood that the kinetic energy of the toy decreased.

4.1.1.1 Energy stores and systems

Answer 132 · Examiner comments June 2025 | 8463/1F | Original Q6

06.6
Just over 60 % of the students understood that the gravitational potential energy of the toy increased.

06.7
Just over 30 % of the students chose two correct reasons for the toy eventually stopping. About 50% of the students scored 1 mark. Many students did not read the instructions for the question and only ticked one box.

Answer 133 · Examiner comments June 2025 | 8463/1F | Original Q7

07.1
This was a grade 1-3 calculation of current with just over 90 % of the students scoring 2 marks.

07.2
A grade 1-3 calculation of energy transferred with 95 % of the students scoring 2 marks.

07.3
About 94 % of the students identified the correct equation for efficiency.

07.4
Just over half of the students scored 3 marks on this calculation using the efficiency equation. Many students struggled to rearrange the equation correctly scoring just one mark for the substitution. Students should be encouraged to substitute first then rearrange, as many students did both actions in one go using an incorrect rearrangement and so scored no marks.

07.5
Nearly 60 % of the students scored 1 mark for predicting the efficiency of the motor.

07.6
Just fewer than 50 % of the students scored this mark. Students who tried to describe the relationship were less successful than students who just described the shape of the line. Students who stated that the gradient changes also scored the mark, as a better description than the line is curved.

4.1.1.1 Energy stores and systems

Answer 134 · Examiner comments — June 2025 | 8463/1F | Original Q9

09.1

Electrical devices near water were insufficient, as was wires in the water. A low p.d. power supply also is not a hazard, unless water was spilled on it, in which case it would score for the 'spilled water' which is a hazard by itself in a typical Science lab. Risks by themselves like electrocution, electric shock or burns did not score but were ignored if given with an appropriate hazard. Nearly 50 % of the students scored this mark.

09.2

This question is asking about one of the required practical's given in the specification. So it is perhaps surprising that about 11 % of the students did not attempt the question. Only about 3 % of the students gave a good description and scored 5 or 6 marks

Many students read the equation from the equations sheet, but couldn't identify which equipment measured which quantity, so did not score in Level 2. To score 5 or 6 marks, students needed to be clear how the mass of the water should be determined. It was possible for a student to score 6 marks for measuring the energy needed to increase the temperature of a suitable volume of water by just 1°C as the method would work, even if the temperature change is not as large as may be needed to obtain an accurate value.

09.3

Any named insulation was allowed for this question. Aluminium / tin foil was also allowed as it would reduce energy transfer by infrared radiation. Place the beaker on a 'heatproof' mat was

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also creditworthy as it would decrease energy transfer through the base of the beaker by conduction. The vast majority of answers seen referred to adding a lid or adding insulation to the beaker. A small number of students thought that removing the joulemeter would solve the problem. Just over 70 % of the students scored the mark.

09.4

This question discriminated well between the students with many knowing how to work out a percentage difference. The most common mistake was to calculate the percentage difference between 4200 and 4410 which didn't score marks, unless they had set out the top of the equation correctly, (4410 – 4200) or (4200 – 4410) or calculated the difference of 210.

Many students calculated 105 or 1.05, which scored no marks unless the working out was shown. An answer of 4.76% or working showing a calculation of this figure, rounded to 5% scored no marks. Just over 30 % of the students scored 2 marks, while nearly 20 % of the students scored 1 mark.

4.1.1.1 Energy stores and systems

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4.1.1.1 Energy stores and systems

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General

Grade 1-3 calculation questions were well answered, where the equation is always given and students will not be required to rearrange the equation. Grade 4-5 calculation questions involving equation recall were answered better this year than in 2018 and students are scoring many of their marks on the paper by answering the subsequent calculation questions correctly. At grade 4-5 students are expected to be able to either rearrange an equation or convert a unit, so it is beneficial for students to be able to quickly identify if the units given in a question are correct for the use in the equation. Question 10.1 was generally well attempted and students who had carried out Required Practical Activity 2 would have had a material advantage over those who hadn't.

Handwriting sometimes makes it very difficult for examiners to read what has been written. Students who have handwriting that is difficult to read may benefit from a scribe or from word processing their answers in exams.

Levels of demand

Questions are set at two levels of demand on this paper:

- low demand questions are targeted at students working at grades 1–3
- standard demand questions are targeted at students working at grades 4–5.

A student's final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (Low demand)

01.1 Around 77% of students scored 2 marks. Around 16% of students scored 1 mark.

01.2 Only around 8% of students scored 2 marks. Both evaporation and change of state were common, insufficient answers for the first marking point. Less than half of the students scored 1 mark. The marking points were independent, so if the change of state was incorrect eg melting, the student could still score the second marking point.

01.3 Around 91% of students scored 2 marks. In calculations where students are provided with the equation (grades 1-3) students are not expected to rearrange the equation. Some students incorrectly tried to convert the kg into g and scored 0 marks.

01.4 Approximately 82% of students scored 3 marks. In calculations where students are provided with the equation (grades 1-3) students are not expected to rearrange the equation. Some students incorrectly tried to convert the kg into g and scored 0 marks for the calculation. Some students set out their calculation, but then multiplied the two values rather than dividing.

Question 2 (Low demand)

02.1 About 67% of students identified the correct decay equation.

02.2 More than three quarters of the students identified why alpha radiation is dangerous inside the human body.

02.3 Just below three quarters of students scored 2 marks. Most correct answers read the values from the graph as intended (460, 280) and students didn't need the tolerance given in the mark scheme.

02.4 About 60% of students correctly estimated the mass remaining.

02.5 Students found this question difficult, with around 55% of students scoring 2 marks and around 27% of students scoring 1 mark.

Question 3 (Low demand)

03.1 Approximately 45% of students scored 1 mark for identifying a measuring instrument that could be used. About 9% of students scored 2 marks for describing an appropriate way to use it. Pythagoras was insufficient as the triangle described would not give the height of the zip wire.

03.2 Students were often very successful in calculation, with around 91% scoring 2 marks.

03.3 This question gave a good spread of marks. Over a fifth scored 3 marks, almost two fifths scored 2 marks and slightly below a quarter scored 1 mark. Gravitational potential energy or gravitational field strength were insufficient to score a mark.

Question 4 (Low demand)

04.1 Over a third of students answered this question correctly.

04.2 About 14% of students answered this question correctly.

04.3 This question about the alpha particle scattering experiment discriminated well between students. Around 16% of students scored 3 marks, around 45% of students scored 2 marks and around 30% of students scored 1 mark.

04.4 About 77% of students correctly identified what reproducible means. .

Question 5 (Low demand)

05.1 The most common correct answers linked CO_2 to global warming. Around 38% of students scored 2 marks and around 35% scored 1 mark. Common incorrect answers were usually vague and mentioned air pollution without being specific. There were many students who incorrectly linked CO_2 with the ozone layer.

05.2 Over half of the students scored 2 marks and over a third scored 1 mark. Insufficient answers included hydro and water. Answers using specification wording eg the tides were acceptable, as were terms like tidal, etc. Oil was insufficient as this was assumed to be non-renewable oil as opposed to palm oil or other biofuel oils.

05.3 Around 83% of students scored 2 marks for this percentage calculation. An answer of 78 scored 1 mark even if spurious calculations followed.

05.4 About 67% of students scored 2 marks. Quite a large number of misreads from the graph resulting in 0 marks and around 29% of students scored 0 marks.

05.5 Only around 5% of students scored 2 marks whilst half of the students scored 1 mark. Some students failed to make the connection between the time of day and sunrise. Some students talked vaguely about the energy stored by solar panels, confusing them with solar heating panels rather than solar photovoltaic panels.

Question 6 (Low and Standard demand)

06.1 More than half of the students scored 2 marks. To score a mark a comparative statement was needed eg lower, not low mass of power source. A statement using the word 'better' would be insufficient.

06.2 Around 64% of students scored 2 marks. Many students scored 1 mark for truncating and not rounding their answers, an answer of 26.08 would score only 1 mark for the substitution.

06.3 This question discriminated well, with about 16% scoring 2 marks and more than half scoring 1 mark. 'Increases the battery's power output' was insufficient to score a mark. 'Battery lasts longer' was insufficient to score a mark.

06.4 The quantities in the question are given in alphabetical order; there is no need for students to recall the equation in this order. Any correct rearrangement of the equation or use of the correct symbols for quantities was allowed. A mixture of symbols and words would also score the mark. Approximately 70% of students answered this question correctly.

06.5 It was encouraging to see many Foundation tier students successfully rearranging the equation. Around 77% of students scored 3 marks.

Question 7 (Low and Standard demand)

07.1 About 86% of students answered this question correctly.

07.2 Approximately 83% of students answered this question correctly. Students should refer to the Physics specification for the accepted symbols for circuit components. Textbooks and revision guides do not necessarily use the specification symbols. The circles in the component symbol scored a mark even if shown as blobs rather than circles.

07.3 Around 93% of students scored 2 marks. At grade 1-3, the equation is given and no rearrangement of the equation is needed. Students need to simply substitute and calculate the answer.

07.4 Around 93% of students scored 2 marks. At grade 1-3, the equation is given and no rearrangement of the equation is needed. Students need to simply substitute and calculate the answer.

07.5 About 23% of students answered this question correctly.

07.6 About 38% of students answered this question correctly.

07.7 Students can recall the equation in any correct rearrangement. The stem of the question lists the quantities in alphabetical order, so that there is no suggestion of the correct order.

Correct letters for quantities are acceptable in place of the quantity names. Voltage or p.d. were acceptable for potential difference. Approximately 57% of students answered this question correctly.

07.8 The first mark is for the substitution into the correct equation. The second mark is for the correct rearrangement of the correct equation. The third mark is for the correct final answer. About 58% of students scored 3 marks for this question. Grade 4-5 calculation questions require either a unit change or a rearrangement of the equation.

Question 8 (Low and Standard demand)

08.1 Around 63% of students answered this question correctly.

08.2 Around 86% of students answered this question correctly. Some students gave a precaution instead of a risk, which was insufficient.

08.3 Around 62% of students answered this question correctly, demonstrating that students still confuse the terms resolution and range.

08.4 Around 96% of students answered this question correctly.

08.5 Many students failed to substitute correctly into the equation that was printed on the Physics Equations Sheet. Many students multiplied the 3 values given in the question, which scored zero marks. The unit mark was independent, but a large number of students failed to recognise the correct unit from the box. More than a third of students scored 4 marks and around 16% of students scored 3 marks. A quarter of students scored 1 mark for either the correct unit or the correct substitution.

Question 9 (Standard demand)

09.1 About 45% of students correctly identified the meaning of power input.

09.2 Only a quarter of students scored this mark. Students can recall the equation in any correct rearrangement. The stem of the question lists the quantities in alphabetical order, so that there is no suggestion of the correct order. Correct letters for quantities are acceptable in place of the quantity names. Voltage or p.d. were acceptable for potential difference.

09.3 Around 13% of students scored 3 marks and about 81% scored zero. Students found this question difficult to answer, presumably due to their inability to recall the correct equation in the preceding question.

09.4 More than half of students answered this correctly. Some students failed to score the mark by writing input for both the denominator and the numerator.

09.5 Students who successfully recalled the equation in **09.4** were likely to score all 3 marks for this question. Only around 15% of students scored zero.

09.6 Many students restated the stem, rather than going the extra stage in the reasoning and linking to efficiency because thermal energy is also transferred by the light bulb. A number of students believed that knowing the rate at which the bulbs emitted visible light was a

safety concern related to the household electrics. Only around 1% of students scored 2 marks, about 16% of students scored 1 mark and around 73% of students scored zero marks.

Question 10 (Standard demand)

10.1 This question produced a good spread of marks. A mean score of 2.1 was achieved by students on the Foundation tier. Students who had experience of a similar practical benefitted from this as they were able to describe a method in sufficient detail to achieve Level 2. To achieve Level 3, a student needed to indicate that several values of number of layers were used, referring to the interval of 8 layers (as the graph showed) or that the experiment should be done with no layers. A control variable was also needed, either the initial temperature of the water, or the volume of water in each experiment. Some students gained no credit by describing different required practical methods. Around 2% of students scored 6 marks, around 15% of students scored 4 marks and about a fifth of students scored 2 marks. Around 10% of students didn't attempt the question.

10.2 Many students stated that it wasn't necessary to use both as it would be confusing. The datalogger would produce too much data was a common insufficient answer. A number of students stated that using a normal thermometer would be more appropriate, scoring zero marks. Less than 1% of students scored 2 marks and less than a fifth of students scored 1 mark.

Question 11 (Standard demand)

11.1 Over two-fifths of students scored 3 marks for this question. It wasn't necessary to give the answer to an appropriate number of significant figures, so answers of 0.502, 0.50 and 0.5 were all creditworthy. Some students calculated the jump height to be unlikely values; students should be encouraged to consider whether it is likely that someone can jump a height of 4.92 m, a commonly seen answer achieved by multiplying the 2 values given (41 × 0.12). Less than half of the students scored zero marks.

11.2 A common incorrect answer was E_k = mass × speed, since these were the quantities given in the question. A number of students also left out the 0.5 value even if they remembered that speed should be squared. Velocity was allowed instead of speed in the equation. Correct symbols were acceptable for the quantities in the equation. About 30% of students answered this question correctly.

11.3 Despite being asked to recall the equation in 11.2, most students simply multiplied or divided the 2 values given in the question (3.0 and 270), scoring 0 marks. Only around 19% of students scored 3 marks.

11.4 Some students commented on muscle mass and strength which were insufficient to score marks. Clear comparisons, including at least one difference and one similarity, were needed to score 4 marks. This question discriminated well between students; around 6% of students scored 4 marks, around 29% of students scored 2 marks and around 13% of students scored zero.

4.1.1.1 Energy stores and systems

11.5 Some students failed to score a mark because they simply restated the question, 'the scientist wanted the highest muscle power reading' without adding any value. The answer either needed to refer to the effect of repetition on performance (improvement or worsening) or that it was the maximum (or peak) muscle power that the scientist was investigating. A fifth of students answered this question correctly.

4.1.1.1 Energy stores and systems

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.