AQA GCSE Physics | 8463

SPECIFICATION POINT 4.2.3.2

Mains electricity

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**47**
Available paper years	**2003–2024**

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.

4.2.3.2 Mains electricity

Answer 01 · Mark scheme June 2003 | 3451H | Original Q8 | Legacy

The full source mark scheme begins on page 80. Follow original question 8 in that document.

Answer 02 · Mark scheme June 2003 | 3462H3 | Original Q6 | Legacy

The full source mark scheme begins on page 102. Follow original question 6 in that document.

Answer 03 · Mark scheme June 2004 | 3451H | Original Q13 | Legacy

The full source mark scheme begins on page 119. Follow original question 13 in that document.

Answer 04 · Mark scheme June 2004 | 3451H | Original Q16 | Legacy

The full source mark scheme begins on page 119. Follow original question 16 in that document.

Answer 05 · Mark scheme June 2004 | 3462H3 | Original Q11 | Legacy

The full source mark scheme begins on page 140. Follow original question 11 in that document.

4.2.3.2 Mains electricity

Answer 06 · Mark scheme

November 2006 | PHY1A | Original Q9 | Legacy

Nine	**4**	**4**	**2**	**1***

*** Q9D** The awarding committee agreed that there are two possible correct answers for this question and therefore the test was marked out of 35.

4.2.3.2 Mains electricity

Answer 06 · Mark scheme

PHY1A (Energy and Electricity) Higher Tier

Question	Key		
One	**A**	conclusion	**2**
	B	evidence	**4**
	C	reliable	**1**
	D	research	**3**
Two	**A**	coal	**4**
	B	hydroelectric	**3**
	C	nuclear	**1**
	D	wind	**2**

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

*** Q4D** The awarding committee agreed that there are two possible correct answers for this question and therefore the test was marked out of 35.

4.2.3.2 Mains electricity

Answer 07 · Mark scheme June 2007 | PHY1A | Original Q4 | Legacy

Four	**3**	**3**	**3**	**1**

Answer 08 · Mark scheme June 2008 | PHY1BP | Original Q6 | Legacy

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

4.2.3.2 Mains electricity

Answer 09 · Mark scheme

Question 2

question	answers	extra information	mark
2(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
2(b)	(3 kW) fan heater	accept 3 kW accept the middle one	1

Question 2 continues on the next page

PHY1H

Question 2 continued

2(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**

4.2.3.2 Mains electricity

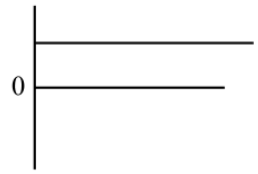
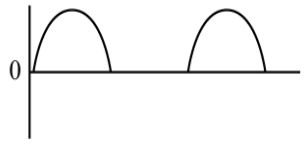
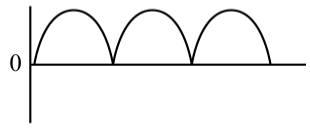
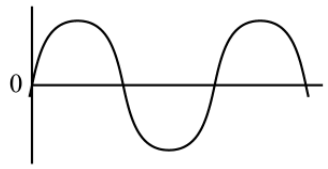
Answer 09 · Mark scheme January 2009 | PHY1H | Original Q2 | Legacy

PHY1H

4.2.3.2 Mains electricity

Answer 10 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)	d.c. flows in (only) one direction		1
	a.c. changes direction (twice every cycle)	accept a.c. constantly changing direction ignore references to frequency accept answers presented as a clear diagram e.g. dc:    ac:  	1

Question 5 continues on the next page

PHY2H

Question 5 continued

5(b)(i)	10	allow **1** mark for correct transformation and substitution i.e. $\frac{2.3}{230}$ or $\frac{2300}{230}$ an answer 0.01 gains **1** mark	2
5(b)(ii)	13 A	e.c.f. accept the fuse size that is the next listed value greater than answer (b)(i)	1
Total			**5**

4.2.3.2 Mains electricity

Answer 10 · Mark scheme January 2009 | PHY2H | Original Q5 | Legacy

PHY2H

4.2.3.2 Mains electricity

Answer 11 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)(i)	(quickly) becomes magnetised	**or** (quickly) loses its magnetism **or** 'it's *(a)* magnetic *(*material*)*' any reference to conduction of electricity/heat nullifies the mark	1
3(a)(ii)	any **four** from: • insulation prevents electricity/current flowing through the iron/core • alternating current/a.c. in the primary (coil) • produces a changing magnetic field (in the iron/core) • (and hence magnetic) field in the secondary (coil) • induces/generates/ produces an alternating potential difference/p.d./ voltage across the secondary (coil) • (and hence) alternating current/a.c. in the secondary (coil)	**or** 'insulation so electricity/ current only flows in the wires/turns/coils'	4

Question 3 continues on the next page

4.2.3.2 Mains electricity

PHY3H

Question 3 continued

question	answers	extra information	mark
3(b)	80 (turns)	**or** credit (1) for any equation which <u>if correctly evaluated</u> would give 80 example <u>230</u> = <u>3200</u> 5.75 number of turns	2
Total			**7**

4.2.3.2 Mains electricity

Answer 11 · Mark scheme January 2009 | PHY3H | Original Q3 | Legacy

PHY3H

4.2.3.2 Mains electricity

Answer 12 · Mark scheme June 2009 | PHY1H | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	HESS	accept gamma	1
1(a)(ii)	infra red	accept IR accept answers written in table do **not** accept heat	1
1(b)	clearer / more detailed / sharper / less distorted image any **one** from: • no light pollution • light is not scattered by the atmosphere	do **not** accept image is bigger accept no clouds to prevent observations accept light is scattered by the atmosphere (implies William Herschel) accept light does (not have to) pass through the atmosphere accept air for atmosphere do **not** accept answers in terms of distance	1 1

Question 1 continues on the next page . . .

4.2.3.2 Mains electricity

Answer 12 · Mark scheme

PHY1H

Question 1 continued . . .

question	answers	extra information	mark
1(c)	any **two** from: • <u>microwaves absorbed</u> by water (molecules) • signal strength greater (in dry environment) • more sensitive (in dry environment) • detect weaker signals (in dry environment) • more detailed / clearer image (in dry environment)	accept more microwaves reach telescope accept harder to detect signals in a humid environment accept image contains more information do **not** accept better image	2
1(d)	a fourth / extra galaxy / star	accept a planet / another object / source	1
Total			**7**

4.2.3.2 Mains electricity

Answer 12 · Mark scheme

June 2009 | PHY1H | Original Q1 | Legacy

PHY1H

4.2.3.2 Mains electricity

Answer 13 · Mark scheme

June 2009 | PHY2H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	0.0046	accept 4.6 mA allow **1** mark for correct substitution and transformation i.e. current = $\frac{230}{50\,000}$ an answer of 4.6 gains **1** mark	2
6(a)(ii)	• increases overall resistance • (in event of a shock) gives a smaller current	 accept gives smaller shock do **not** accept no shock/current	1 1
6(b)(i)	50 (hertz)	ignore units	1
6(b)(ii)	NO has the lowest current at which people cannot let go **or** YES changing the frequency changes the current by only a small amount	answer and reason needed accept a sensible reason in terms of their answer to (b) (i)	1

Question 6 continues on the next page . . .

4.2.3.2 Mains electricity

Answer 13 · Mark scheme

PHY2H

Question 6 continued . . .

question	answers	extra information	mark
6(c)	a current flows through from the live wire/metal case to the earth wire	accept a current flows from live to earth do **not** accept on its own if the current is too high	1
	this current causes the fuse to melt	accept blow for melt	1
Total			**8**

4.2.3.2 Mains electricity

Answer 14 · Mark scheme June 2009 | PHY3H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	the bigger the <u>masses</u> (of the dust and gases then) the bigger the force / gravity (between them)	accept the converse	1
4(a)(ii)	the greater the distance (between the dust and gases then) the smaller the force / gravity (between them)	accept the converse	1
4(b)	<u>radiation 'pressure'</u> and gravity / gravitational attraction these are balanced / in equilibrium **or** there is sufficient / a lot of hydrogen / fuel to last a very long time	 must be in correct context do **not** accept are equal second mark consequent on first	1 1
4(c)	any **two** from: • hydrogen runs out / is used up • nuclei larger than helium nuclei formed • (star expands to) / become(s) a <u>red giant</u>	 accept bigger atoms are formed however do **not** accept any specific mention of an atom with a mass greater than that of iron	2
Total			**6**

4.2.3.2 Mains electricity

Answer 14 · Mark scheme

June 2009 | PHY3H | Original Q4 | Legacy

PHY3H

4.2.3.2 Mains electricity

Answer 15 · Mark scheme January 2010 | PHY3H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	greater	accept bigger / larger / higher	1
6(b)	magnetic field / flux (1) cuts through the coil (1) p.d varies as the distance between magnet and coil changes / as the magnet rotates (1)	 **or** the converse accept voltage for p.d. accept varies for changes	3
6(c)	any **two** from: • move coil closer to the rim / wheel • more powerful magnet • more turns (on the coil) • coil with greater area • using an <u>iron</u> core	 **or** smaller gap between rim / wheel and coil accept extra magnets do **not** accept more coils	2
Total			**6**

4.2.3.2 Mains electricity

Answer 15 · Mark scheme

January 2010 | PHY3H | Original Q6 | Legacy

PHY3H

4.2.3.2 Mains electricity

Answer 16 · Mark scheme

June 2019 | PHY1H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	2.1	correct answer only	1
3(a)(ii)	3.15 **or** their (a)(i) × 1.5 correctly calculated	allow **1** mark for correct substitution ie 2.1 × 1.5 **or** their (a)(i) × 1.5	2
	kilowatt-hour	accept kWh **or** a substitution 2100 × 5400 scores **1** mark 2100 × 5400 incorrectly calculated with answer in joules scores **2** marks an answer of 11 340 000 scores **2** marks an answer of 11 340 000 J scores **3** marks	1
3(a)(iii)	most (input) energy is usefully transformed	accept does not waste a lot of energy accept most of the output / energy is useful do **not** accept it does not waste energy	1

Question 3 continues on the next page . . .

4.2.3.2 Mains electricity

PHY1H

Question 3 continued . . .

question	answers	extra information	mark
3(b)	the room is losing energy / heat		1
	at the same rate as the heater supplies it	this mark only scores if the first is scored do **not** accept heater reaches same temperature as room / surroundings rate of heat gain = rate of heat loss scores both marks	1
Total			**7**

4.2.3.2 Mains electricity

Answer 16 · Mark scheme June 2010 | PHY1H | Original Q3 | Legacy

PHY1H

4.2.3.2 Mains electricity

Answer 17 · Mark scheme

June 2010 | PHY2H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	125	allow **1** mark for obtaining time period = 0.008 (s) **or** frequency = 1 / time period (or their calculated time period)	2
	hertz **or** Hz	do **not** accept hz	1
6(b)	50 (hertz)		1
Total			**4**

4.2.3.2 Mains electricity

Answer 17 · Mark scheme June 2010 | PHY2H | Original Q6 | Legacy

PHY2H

4.2.3.2 Mains electricity

Answer 18 · Mark scheme

June 2010 | PHY2H | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	(rate of) flow of charge / electrons / ions	accept movement for flow do **not** accept flow of electricity	1
7(b)	7(.0)	accept 6.96 / 6.95 or an answer that would approximate to 6.96 if rounded allow **1** mark for obtaining correct power and changing to watts ie 1600 **or** allow **2** marks for correct substitution and transformation ie 1600 ÷ 230 an answer 0.00696 / 0.007 gains **2** marks allow **1** mark for 1.6 / 230 or 1.7 / 230 an answer 7.39 or 7.4 gains **2** marks	3
	amp (ere)	accept A	1
Total			**5**

4.2.3.2 Mains electricity

Answer 19 · Mark scheme

June 2010 | PHY3H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	(it is) magnetic	**or** will carry (an alternating) magnetic field **or** magnetises and demagnetises (easily) reference to conduction negates the mark	1
3(b)	so the current / electricity does not flow through the iron / core	accept 'so the current / electricity / wires do not short (circuit)' responses in terms of heat insulation negate the mark ignore references to safety	1
3(c)	5.75 or 5.8 or 6(.0) V / volt(s)	allow for **1** mark **either** $\frac{230}{\text{p.d.}} = \frac{20\,000}{500}$ **or** p.d. = 230 ÷ 40	2 1
Total			**5**

4.2.3.2 Mains electricity

Answer 19 · Mark scheme June 2010 | PHY3H | Original Q3 | Legacy

PHY3H

4.2.3.2 Mains electricity

Answer 20 · Mark scheme

June 2010 | PHY3H | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(a)	(enough) <u>dust and gas</u> (from space)	accept nebula for dust and gas accept hydrogen for gas mention of air negates this mark	1
	pulled together by: • gravitational attraction **or** • gravitational forces **or** • gravity		1
8(b)	forces (in the star) are <u>balanced</u>	accept equal and opposite for balanced accept in equilibrium for balanced	1
	forces identified as gravity and <u>radiation pressure</u>	both forces are required gravitational forces inwards balance / equal radiation pressure outwards for **2** marks accept for **2** marks an answer in terms of sufficient hydrogen to keep the <u>fusion</u> reactions going accept for **1** mark an answer in terms of sufficient fuel to keep the <u>fusion</u> reactions going	1

Question 8 is continued on the next page . . .

PHY3H

Question 8 continued . . .

8(c)	(explodes as) a supernova any **one** from: • outer layer(s) thrown into space • scatters dust and gas into space (for the formation of new stars) • elements distributed throughout space • matter left behind / core may form a neutron star • a black hole will form if the gravitational forces are enormous / sufficient mass is left behind	 do **not** accept just 'thrown into space' do **not** accept just 'dust and gas' do **not** accept just 'distributed' do **not** accept just 'neutron star' do **not** accept just 'black hole' do **not** accept any references to 'dark bodies' or 'black dwarfs' black hole forms if star is large enough is insufficient	1 1
Total			**6**

4.2.3.2 Mains electricity

Answer 21 · Mark scheme

November 2010 | PHY1AP | Original Q9 | Legacy

Nine	**2**	**3**	**4**	**3**

4.2.3.2 Mains electricity

Answer 22 · Mark scheme

January 2011 | PHY2H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	0.25 (A)		1
6(a)(ii)	75	allow **1** mark for converting 5 minutes to 300 seconds **or** allow **1** mark for correct substitution ie 0.25 × 300 allow **1** mark for an answer 1.25 allow **1** mark only for their (a)(i) × 300 correctly calculated	2
	coulombs or C	do **not** accept c	1
6(b)	any **two** from: • fault not repaired • larger current will (still) flow • aluminium foil will not melt (if a fault) • wiring will overheat / (may) cause a fire	accept if a fault was to occur accept aluminium foil needs a higher current / charge to melt accept idea of fire hazard do **not** accept explode etc	2
Total			**6**

4.2.3.2 Mains electricity

Answer 22 · Mark scheme January 2011 | PHY2H | Original Q6 | Legacy

PHY2H

4.2.3.2 Mains electricity

Answer 23 · Mark scheme

Question 4

question	answers	extra information	mark
4(a)	10	allow **1** mark for correct substitution ie $\frac{230}{Vs} = \frac{4600}{200}$	2
4(b)	any **one** from: • to prevent short circuiting • to ensure that the current flows / goes round the coil • to prevent the current entering the core	do **not** accept electrocution do **not** accept electricity for current answers including heat / energy loss negate mark	1
4(c)(i)	(soft) iron	do **not** accept 'steel'	1
4(c)(ii)	can be magnetised because it is magnetic	answers including it's a conductor negate mark	1
Total			**5**

4.2.3.2 Mains electricity

Answer 23 · Mark scheme January 2011 | PHY3H | Original Q4 | Legacy

PHY3H

4.2.3.2 Mains electricity

Answer 24 · Mark scheme

January 2011 | PHY3H | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(a)	gravitational attraction	accept 'gravity' accept (nuclear) fusion	1
8(b)	radiation 'pressure' and gravity / gravitational attraction are balanced / in equilibrium **or** there is sufficient / a lot of hydrogen / fuel to last a very long time / for (nuclear) fusion	must be in correct context accept are equal and opposite do **not** accept 'equal' do **not** accept constant supply of hydrogen this mark only scores if linked to the supply of hydrogen / fuel reference to burning negates both marks	1 1
8(c)(i)	(conversion of) hydrogen to helium by (nuclear) fusion	accept (conversion of) lighter elements to heavier elements note do **not** credit spelling of 'fusion' which could be 'fission' reference to burning negates both marks	1 1
8(c)(ii)	massive supply / lots of hydrogen		1
8(d)	distributed throughout the Universe / space	do **not** accept Solar System for Universe	1
Total			**7**

4.2.3.2 Mains electricity

Answer 25 · Mark scheme

March 2011 | PHY1AP | Original Q5 | Legacy

Five	**A** economical **2** **B** efficient **1** **C** environmental **3** **D** ethical **4**			
	A	**B**	**C**	**D**

Answer 26 · Mark scheme

June 2011 | PHY1AP | Original Q3 | Legacy

Three	**2**	**1**	**1**	**3**

Answer 27 · Mark scheme

June 2011 | PHY1BP | Original Q4 | Legacy

Four	**2**	**3**	**4**	**1**

4.2.3.2 Mains electricity

Answer 28 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)	brown		1
1(b)	outside/case is plastic / an insulator	accept is double insulated accept non-conductor for plastic do **not** accept it / hairdryer is plastic	1
1(c)(i)	(1) S_1 (2) S_1 and S_3	and no other both required, either order	1 1
1(c)(ii)	S_1 must be ON (for either heater to work) S_1 switches the fan on	do **not** accept reference to 'fan' switch	1 1
1(d)	1495 watt(s) or W	allow **1** mark for correct substitution, ie 6.5 × 230 an answer of 1.495 kW gains **3** marks although the unit is an independent mark for full credit the unit and numerical value must be consistent accept joules per second or J/s	2 1
Total			**9**

4.2.3.2 Mains electricity

Answer 28 · Mark scheme June 2011 | PHY2H | Original Q1 | Legacy

PHY2H

4.2.3.2 Mains electricity

Answer 29 · Mark scheme

June 2011 | PHY3H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	(forces due to) gravity and radiation pressure correct direction of forces (forces) are balanced / equilibrium / equal	 accept for **3** marks an answer in terms of sufficient hydrogen (1) to keep fusion reaction (1) reference to burn / burning negates this mark going at a continuous /steady rate (1) if fuel is used instead of hydrogen maximum of **2** marks	1 1 1
6(b)	the Sun will remain stable (for several billion years) based on evidence	 accept a specific example of evidence eg that the Sun has remained stable during the life of our planet / for 4.5 billion years **or** still contains more than 50 % hydrogen **or** by comparison with the lifecycle of (similar) stars allow a refutation eg not based on prejudice / whim / hearsay / folk law / historical or religious authority	1 1
Total			**5**

4.2.3.2 Mains electricity

Answer 29 · Mark scheme June 2011 | PHY3H | Original Q6 | Legacy

PHY3H

4.2.3.2 Mains electricity

Answer 30 · Mark scheme

June 2012 | PH2HP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	50 000 ohm / Ω	allow **1** mark for correct substitution, ie 6 = 0.00012 x R **or** 6 = 0.12 x R **or** answers of 25 000 or 50 gain **1** mark **or** allow 1 mark for an incorrect answer caused by one error only ie using 3V or an incorrect conversion of current an answer 50kΩ gains **3** marks	2 1
7(a)(ii)	(body) resistance changes **or** body fat/resistance affected by (many) factors	 accept named factor, eg age, gender, height, fitness, bone structure, muscle, drinking water related to body fat/resistance	1
7(a)(iii)	gives misleading / wrong/inaccurate value (because) high water content changes body resistance	 do not credit if specifically linked to a change in mass/weight accept a specific change to resistance water changes body mass is insufficient	1 1
7(b)(i)	RCCB – detects difference between current in live and neutral (wires) fuse – (overheats and) melts	accept RCCB can be reset accept blows for melts	1 1

Question 7 continues on the next page

PH2HP

Question 7 continued

question	answers	extra information	mark
7(b)(ii)	switches the circuit / hedge trimmers off within 60 milliseconds	allow for **1** mark the RCCB/it is (very) fast. do not accept the bigger the current the faster the RCCB switches off	2
Total			**10**

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

4.2.3.2 Mains electricity

Answer 31 · Mark scheme

January 2013 | PH2HP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	50(Hz)	ignore any unit given	1
6(a)(ii)	any **two** from: • (some) current flows to Earth • current flows through copper braid • RCCB detects difference between current in live and neutral wire	 accept ground for Earth accept current flows through the earth wire accept electricity for current in either the first or second marking point but not both	2
6(a)(iii)	can be reset **or** faster acting	accept does not need replacing accept switches circuit off faster	1
6(b)(i)	79 200 coulombs / C	allow **1** mark for correct substitution, ie $11 = \frac{Q}{2 \times 3600}$ an answer 22 gains **1** mark do **not** accept c	2 1
6(b)(ii)	18 216 000 **or** 230 × their (b)(i) correctly calculated	accept for **2** marks 18 216 kJ **or** 18.216 MJ allow **1** mark for correct substitution, ie 230 × their (b)(i) **or** allow **1** mark for power calculated as 2530(W)	2

Question 6 continues on the next page . . .

PH2HP

Question 6 continued . . .

question	answers	extra information	mark
6(c)	increases temperature of thermistor changes resistance (of thermistor)	 do **not** accept increases resistance (of thermistor) an answer decreases resistance (of thermistor) gains **2** marks	1 1
Total			**11**

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

4.2.3.2 Mains electricity

Answer 32 · Mark scheme

June 2013 | PH2HP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	35	an answer with more than 2 sig figs that rounds to 35 gains **2** marks allow **2** marks for correct method, ie $\frac{230}{6.5}$ allow **1** mark for I = 6.5 (A) **or** R = $\frac{230}{26}$ an answer 8.8 gains **2** marks an answer with more than 2 sig figs that rounds to 8.8 gains **1** mark	3
6(b)(i)	(maximum) current exceeds maximum safe current for a 2.5 mm^2 wire **or** (maximum) current exceeds 20 (A)	accept power exceeds maximum safe power for a 2.5 mm^2 wire (maximum) current = 26 (A) is insufficient	1
	a 2.5 mm^2 wire would overheat / melt	accept socket for wire do **not** accept plug for wire	1
6(b)(ii)	(contains) live, neutral and earth wires	accept is a three-core cable	1
	cross-sectional area of (live and neutral) wire(s) (minimum of) 4 mm^2	accept 6 mm^2 for 4 mm^2	1
	wire / cable should be insulated	accept a suitable named insulator, eg PVC / rubber / plastic	1

Question 6 continues on the next page . . .

PH2HP

Question 6 continued . . .

question	answers	extra information	mark
6(c)	a.c. is constantly changing direction	accept a.c. flows in two directions accept a.c. changes direction a.c. travels in different directions is insufficient	1
	d.c. flows in one direction only		1
Total			**10**

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

4.2.3.2 Mains electricity

Answer 33 · Mark scheme

June 2013 | PH3HP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	(the alternating current creates) a changing / alternating magnetic field		1
	(magnetic field) in the (iron) core	accept that links with the secondary coil current in the core negates this mark	1
	(causing a) potential difference (to be) induced in / across secondary coil	accept voltage for p.d.	1
7(b)(i)	20	allow **1** mark for correct substitution, ie $\frac{230}{V_s} = \frac{575}{50}$ **or** $\frac{V_s}{230} = \frac{50}{575}$	2

Question 7 continues on the next page . . .

PH3HP

Question 7 continued . . .

question	answers	extra information	mark
7(b)(ii)	0.3 **or** correct calculation using $230 \times I_p$ = their (b)(i) × 3.45	allow **1** mark for correct substitution, ie $230 \times I_p = 20 \times 3.45$ allow ecf from (b)(i) for 20 **OR** substitution into this equation $\frac{I_p}{I_s} = \frac{N_s}{N_p}$	2
7(c)	(switch mode transformers) use (very) little power / current / energy when switched on but no load is applied **or** it is more efficient	accept no for little ignore it is more portable do **not** accept electricity for power / current / energy accept does not get as hot **or** less heat produced	1
7(d)	any **one** from: • fewer (waste) batteries have to be sent to / buried in land-fill • the soil is polluted less by batteries in land-fill • fewer (waste) batteries have to be recycled • fewer batteries have to be made • less raw materials are used in making batteries • customers have to replace their batteries less often • customers have to buy fewer (replacement) batteries	longer lifetime is insufficient it costs less is insufficient	1
Total			**9**

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

4.2.3.2 Mains electricity

Answer 34 · Mark scheme June 2014 | PH2HP | Original Q7 | Legacy

7(a)	drill is double insulated	accept no exposed metal parts accept the outside is an insulator accept plastic is an insulator	1	AO1 2.4.1j
7(b)	4.4	allow **1** mark for correct substitution, ie 1012 = I × 230 provided no subsequent incorrect numerical step	2	AO2 2.4.2c
7(c)	detects a (very small) difference between the current in the live wire and the current in the neutral wire		1	AO1 2.4.1i
Total			**4**	

4.2.3.2 Mains electricity

Answer 35 · Mark scheme

June 2015 | PH2HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
3(a)(i)	splitting of a(n atomic) nucleus	do not accept splitting an atom	1	AO1 2.6.1b	E
3(a)(ii)	Neutron		1	AO1 2.6.1c	E
3(b)(i)	nuclei have the same charge **or** nuclei are positive	accept protons have the same charge	1	AO1 2.3.1d	E
3(b)(ii)	(main sequence) star	accept Sun or any correctly named star accept red (super) giant	1	AO1 2.6.2b	E
3(c)(i)	any **two** from: • easy to obtain / extract • available in (very) large amounts • releases more energy (per kg) • produces little/no radioactive waste	do **not** accept figures *only* naturally occurring is insufficient seawater is renewable is insufficient less cost is insufficient	2	AO2/3 2.6	E
3(c)(ii)	any **one** from: • makes another source of energy available • increases supply of electricity • able to meet global demand • less environmental damage • reduces amount of other fuels used	accept any sensible suggestion accept a specific example accept a specific example	1	AO3 2.6	E
3(d)	12	allow **1** mark for obtaining 3 half-lives	2	AO2 2.5.2h	E

4.2.3.2 Mains electricity

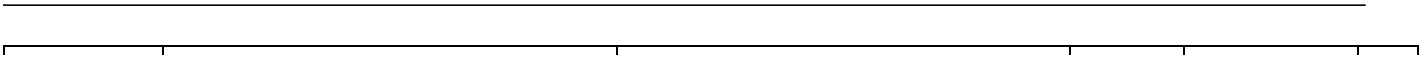
Answer 35 · Mark scheme June 2015 | PH2HP | Original Q3 | Legacy

Total			**9**

4.2.3.2 Mains electricity

Answer 35 · Mark scheme

June 2015 | PH2HP | Original Q3 | Legacy



4.2.3.2 Mains electricity

Answer 36 · Mark scheme June 2015 | PH3HP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. ref.
8(a)	an alternating current through the primary coil (in the charging base)	it must be clear which coil is being referred to	1	AO1 P3.3.2d
	causes a changing / alternating magnetic field in / around the (iron) bar		1	
	which <u>induces</u> an (alternating) p.d. across the secondary coil (in the toothbrush)	accept <u>induces</u> an (alternating) current in the secondary coil	1	
8(b)	18	allow **1** mark for correct substitution, ie $\frac{230}{7.2} = \frac{575}{n_s}$	2	AO2 P3.3.2g
Total			5	

4.2.3.2 Mains electricity

Answer 37 · Mark scheme

June 2016 | PH2HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	pin made from brass because it is (hard and) a (good electrical) conductor outer case plastic/rubber because it is a (good electrical) insulator	 accept copper for brass metal is insufficient heat conductor on its own negates heat insulator on its own negates	 1 1	AO1 2.4.1f
4(b)(i)	live		1	AO1 2.4.1g
4(b)(ii)	makes it hot/warm	melts is insufficient	1	AO1 2.4.2a
4(b)(iii)	8.7	accept an answer that rounds to 8.7 allow **1** mark for correct substitution ie 2000 = 230 × I an answer of 0.0087**or** 0.009 **or** 3.0(4) **or** 5.65 **or** 5.7 gains **1** mark	2	AO2 2.4.2c
4(c)	a (large) current goes from the live wire to the earth wire (which causes) the fuse to (overheat and) melt	accept metal case for live wire accept a current goes from live to earth do not accept electricity for current accept blow for melt break is insufficient do not accept snap / blow up for melt	1 1	AO1 2.4.1k

4.2.3.2 Mains electricity

Answer 37 · Mark scheme

June 2016 | PH2HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(d)	reduce chance of an electric shock	accept to reduce the risk of an accident accept prevent electric shock accept prevent electrocution accept prevent or reduce the risk of an (electrical) fire accept an electric shock can kill you accept it can kill you accept so you can use it safely	1	AO3 2.4
Total			9	

4.2.3.2 Mains electricity

Answer 37 · Mark scheme

June 2016 | PH2HP | Original Q4 | Legacy



4.2.3.2 Mains electricity

Answer 38 · Mark scheme

June 2018 | 8463/1H | Original Q5

Question	Answers	Extra information	Mark	AO/ Spec. Ref
05.1	potential difference	in this order only allow p.d. allow voltage	1	AO1 4.2.1.4
	temperature		1	
05.2	the current increases (when the potential difference increases)		1	AO1 4.2.1.4
	(which) causes the temperature of the filament to increase		1	
	(so) the resistance increases	do **not** accept resistance increases and then levels off	1	
05.3	a higher proportion / percentage of the (total) power / energy input is usefully transferred **or** higher (useful) power / energy output for the same (total) power / energy input	wastes less energy is insufficient	1	AO2 4.1.2.2
05.4	potential difference increases		1	AO2 4.2.2
	current decreases		1	AO1 4.2.2
05.5	1000 (Ω)	reason only scores if R =1000 (Ω)	1	AO2 4.2.1.3
	potential difference is shared in proportion to the resistance	allow a justification using a correct calculation	1	

4.2.3.2 Mains electricity

Answer 38 · Mark scheme

June 2018 | 8463/1H | Original Q5

Question	Answers	Extra information	Mark	AO/ Spec. Ref
05.6		an answer of 1.7×10^{-3} (A) scores **4** marks		AO2 4.2.1.3
	$12 = I \times 7000$		1	
	$I = \frac{12}{7000}$		1	
	$I = 1.71 \times 10^{-3}$ (A)	an answer that rounds to 1.7×10^{-3} (A) scores **3** marks	1	
	$I = 1.7 \times 10^{-3}$ (A) **or** $I = 0.0017$ (A)	this answer only	1	
		an answer of 2.4×10^{-3} (A) scores **2** marks		
		if no other marks scored allow **1** mark for calculation of total resistance (7000 Ω)		
Total			**14**	

4.2.3.2 Mains electricity

Answer 39 · Mark scheme

June 2018 | 8463/1H | Original Q9

Question	Answers	Extra information	Mark	AO/ Spec. Ref
09.1	risk of electric shock (if someone touched the case)	allow risk of electrocution (if someone touched the case)	1	AO1 4.2.3.2
09.2		an answer of 11 (A) scores **3** marks		AO2 4.2.4.1
	$2530 = I \times 230$	this mark may be awarded if P is incorrectly / not converted	1	
	$I = \frac{2530}{230}$	this mark may be awarded if P is incorrectly / not converted	1	
	$I = 11$ (A)	this answer only	1	
		an answer of 0.011 (A) scores **2** marks		
09.3		an answer of 0.12 (kg) **or** an answer that rounds to 0.12 (kg) scores **5** marks		AO2 4.2.4.2 4.1.1.3
	$E = 2530 \times 14$	this mark may be awarded if P is incorrectly / not converted	1	
	$E = 35\,420$ (J)	this answer only	1	
	$35\,420 = m \times 4200 \times 70$	allow their calculated E = m × 4200 × 70	1	
	$m = \frac{35\,420}{4200 \times 70}$	allow $m = \frac{\text{their calculated E}}{4200 \times 70}$	1	
	$m = 0.12$ (kg)	allow an answer that is consistent with their calculated value of E	1	
Total			**9**	

4.2.3.2 Mains electricity

Answer 40 · Mark scheme

June 2018 | 8463/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	random	human error is insufficient	1	AO3 4.6.1.3
05.2	accept any practical suggestion that could cause a range of values eg misjudging the centre of the ray eg not replacing mirror / ray box in the same position	measuring the angle incorrectly is insufficient moving the mirror / ray box is insufficient	1	AO2 4.6.1.3
05.3	range = 10 **or** mean of 51 calculated 5(°)	an answer of 5(°) scores **2** marks	1 1	AO3 4.6.1.3
05.4	within experimental accuracy the angle of incidence and the angle of reflection are the same **or** the angle of reflection is usually different to the angle of incidence relevant use of data eg at 20° / 30° / 40° there is at least one measurement of angle of reflection that is exactly the same **or** at 50° there are big differences	allow the angle of incidence is nearly the same as the angle of reflection allow only a few of the values are the same / similar allow the idea of a range of values allow 50° includes anomalous results an answer in terms of calculated mean(s) may score both marks eg mean calculated for one or more angle of reflection (1) conclusion correctly stating angle i = / ≠ angle r (1)	1 1	AO3 4.6.1.3

4.2.3.2 Mains electricity

Answer 40 · Mark scheme

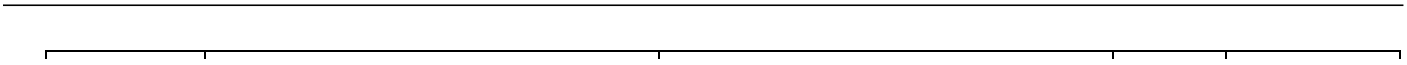
June 2018 | 8463/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	results could be collected for angles (of incidence) not yet measured	allow a stated angle of incidence eg 10º or 60º changing the mirror is insufficient ignore repeat the measurements	1	AO3 4.6.1.3
05.6	replace the mirror with an irregular reflecting surface	allow use an irregular reflecting surface replace mirror with paper is insufficient do **not** accept use a glass block	1	AO3 4.6.1.3
Total			**8**	

4.2.3.2 Mains electricity

Answer 40 · Mark scheme

June 2018 | 8463/2H | Original Q5



4.2.3.2 Mains electricity

Answer 41 · Mark scheme

June 2019 | 8463/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1.1	The energy transferred each second to the bulb.		1	4.1.1.4 AO1
1.2	power = potential difference × current **or** $P = VI$		1	4.2.4.1 AO1
1.3	$40 = I \times 230$ $I = \frac{40}{230}$ I = 0.17 (A)	an answer of 0.17 (A) scores **3** marks a correct answer that rounds to 0.17 (A) scores **3** marks	1 1 1	4.2.4.1 AO2
1.4	efficiency = $\frac{\text{useful power output}}{\text{total power input}}$		1	4.1.2.2 AO1
1.5	$0.30 = \frac{\text{useful power output}}{9.0}$ useful power output = 0.30 × 9.0 useful power output = 2.7 (W)	an answer of 2.7 (W) scores **3** marks	1 1 1	4.1.2.2 AO2
1.6	bulbs also transfer thermal energy the efficiency of the light bulb also needs to be considered	allow light bulbs emit infrared radiation as well as visible light ignore so people know how bright the bulb is allow the cost to power the light bulb depends on the efficiency allow to see how much energy is wasted	1 1	4.1.2.2 4.1.1.4 AO1 AO3
Total			**11**	

4.2.3.2 Mains electricity

Answer 42 · Mark scheme

June 2019 | 8463/1H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4.1	electric car journey will take a (much) longer time (because) battery will need recharging **or** (because) the car will need to stop for 40 minutes	allow diesel car journey will take a shorter time allow diesel car will not need to be refuelled	1 1	4.1.3 AO3
4.2	energy stored in diesel = 45 × 51 = 2295 (MJ) energy stored in batteries = 0.95 × 280 = 266 (MJ) (so) the diesel stores more energy than the battery (and the diesel car has a higher range)	 this mark is dependent on correct calculations of energy stored	1 1 1	4.1.3 1AO1 1AO2 1AO3
4.3	any **2** from: • recharging is a continuous process • fewer cells needed in the car • more cars can be charged at the same time	 allow cars do not need to stop to recharge allow shorter journey times allow don't have to wait for battery to recharge allow longer time between recharges allow the range of the electric car is increased allow smaller battery needed in the car allow do not need to find a charging point allow fewer charging stations needed ignore it is quicker ignore cost of charging ignore methods of electricity generation	2	4.1.3 AO1

4.2.3.2 Mains electricity

Answer 42 · Mark scheme

June 2019 | 8463/1H | Original Q4

4.4	when cars are plugged in the energy from car batteries could be transferred back to the National Grid	 allow mains supply for National Grid allow energy from car batteries could be used to power household appliances	1 1	4.1.3 AO1
Total			**9**	

4.2.3.2 Mains electricity

Answer 43 · Mark scheme

June 2019 | 8463/1H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6.1	50 Hz / hertz	 allow Hertz	1 1	4.2.3.1 AO1
6.2	(both) switches need to be closed / on to complete the series circuit **or** to allow charge to flow **or** so there is a current in the circuit		1 1	4.2.2 AO1
6.3	 $1800 = I^2 \times 32$ $I^2 = \frac{1800}{32}$ **or** $I^2 = 56.25$ $I = 7.5$ (A)	an answer of 7.5 (A) scores **3** marks an answer of 0.237(A) scores **2** marks this mark may be awarded if P is incorrectly or not converted this mark may be awarded if P is incorrectly or not converted this answer only	 1 1 1	4.2.4.1 AO2
6.4	 $1500 = \frac{450\ 000}{t}$ $t = \frac{450\ 000}{1500}$ $t = 300$ (s)	an answer of 300 (s) scores **3** marks an answer of 300 000 (s) scores **2** marks this mark may be awarded if P is incorrectly or not converted this mark may be awarded if P is incorrectly or not converted this answer only	 1 1 1	4.1.1.4 AO2
Total			**10**	

4.2.3.2 Mains electricity

Answer 44 · Mark scheme

November 2020 | 8463/1H | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	$5.75 = I \times 230$ $I = \frac{5.75}{230}$ $I = 0.025$ (A) $230 = 0.025 \times R$ **or** $R = \frac{230}{0.025}$ $R = 9200$ (Ω)	allow a correct substitution using an incorrect value of I **or** allow a correct rearrangement using incorrect value of I allow a correct calculation of resistance using an incorrect value of I alternative approach for 4th and 5th marks: $5.75 = 0.025^2 \times R$ (1) **or** $R = \frac{5.75}{0.025^2}$ $R = 9200$ (Ω) (1) alternative approach: $5.75 = \frac{230^2}{R}$ (3) $R = \frac{230^2}{5.75}$ (1) $R = 9200$ (Ω) (1)	1 1 1 1 1	AO2 4.2.4.1 4.2.1.3

4.2.3.2 Mains electricity

Answer 44 · Mark scheme

November 2020 | 8463/1H | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	one wire in the switch is live	allow the switch / circuit is live allow one wire is at a potential of 230 V	1	AO1 4.2.3.2
	the electrician is earthed **or** the electrician is at earth potential		1	
	(so) there will be a (large) potential difference between the live wire and the electrician / earth (if the electrician touched the wire)		1	
09.3	50 Hz has the lowest (maximum) let-go current		1	AO3 4.2.3.1
	a higher / lower / different frequency would allow people to let go at a greater current	allow a specific numerical example as opposed to a trend	1	
Total			**10**	

4.2.3.2 Mains electricity

Answer 45 · Mark scheme

June 2023 | 8463/2H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	iron	allow nickel / cobalt do not allow steel	1	AO1 4.7.3.4
	it is easily magnetised (and demagnetised)	allow it is a magnetic material MP 2 is dependent on MP 1	1	

4.2.3.2 Mains electricity

Answer 45 · Mark scheme

June 2023 | 8463/2H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	$\frac{230}{V_s} = \frac{2000}{40}$		1	AO2 4.7.3.4
	$V_s = \frac{40}{2000} \times 230$	subsequent marks can only be awarded if the first equation is correct and has been used	1	
	$V_s = 4.6$ (V)		1	
	$4.6 \times I_s = 6.9$	this mark may be awarded if the pd is incorrectly calculated	1	
	$I_s = 1.5$ A	allow a correctly calculated I_s using an incorrectly calculated pd	1	
	OR			
	$6.9 = I_p \times 230$ (1)			
	$I_p = \frac{6.9}{230}$ (1)	subsequent marks can only be awarded if the first equation is correct and has been used		
	$I_p = 0.03$ (A) (1)			
	$I_s = 0.03 \times \frac{2000}{40}$ (1)	this mark may be awarded if I_p is incorrectly calculated		
	$I_s = 1.5$ (A) (1)	allow a correctly calculated I_s using an incorrectly calculated I_p		

Total Question 8	7

Answer 46 · Mark scheme

June 2024 | 8463/1H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	50 (Hz) 230 (V)	this order only	1 1	AO1 4.2.3.1

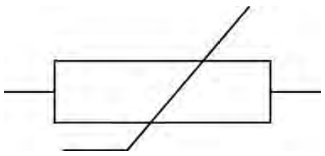
Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	340 mW = 0.34 W		1	AO2 4.2.4.1
	$0.34 = 0.75^2 \times R$	allow a correct substitution of an incorrectly / not converted value of P	1	
	$R = \dfrac{0.34}{0.75^2}$	allow a correct rearrangement of an incorrectly / not converted value of P	1	
	$R = 0.60$ (Ω)	allow an answer consistent with an incorrectly / not converted value of P allow a correct answer given to more than 2 sf	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	the dirt changes the (measured) resistance of the coin **or** the (measured) resistance is different from the expected resistance (of the coin)	allow the measured resistance does not match the resistance of a known coin allow dirt stops charge flow (through the coin) allow dirt stops the current (in the coin)	1	AO3 4.2.1.3

4.2.3.2 Mains electricity

Answer 46 · Mark scheme

June 2024 | 8463/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4			1	AO1 4.2.1.1

Answer 46 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	R_{Total} = 400 + 80 (= 480 Ω)		1	AO2 4.2.1.3 4.2.2
	12 = I × 480 **or** $I = \frac{12}{480}$	allow a correct substitution / rearrangement with R_{Total} in range 470 - 490 Ω	1	
	I = 0.025 (A)	allow a correct calculation using R_{Total} in range 470 - 490 Ω	1	
	V = 0.025 × 80	allow a correct substitution using their calculated value of I (using $V = IR$) and R_{Th} in range 70 - 90 Ω	1	
	V = 2.0 (V)	allow a correct calculation using their calculated value of I (using $V = IR$) and R_{Th} in range 70 - 90 Ω	1	
	OR			
	total R = 400 + 80 (= 480) (1)			
	ratio (Th:R) = 80:480 (1)	allow a range of R_{Th} between 70 and 90 Ω		
	ratio = 1:6 (1)	allow a correct ratio using a value of R_{Th} between 70 and 90 Ω		
	$V = \frac{1}{6} \times 12$ (1)	allow a correct substitution using a value of R_{Th} between 70 and 90 Ω		
	V = 2.0 (V) (1)	allow an answer in the range 1.8 (V) to 2.2 (V)		

Total Question 5	13

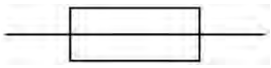
4.2.3.2 Mains electricity

Answer 47 · Mark scheme

June 2024 | 8463/1H | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	brown		1	AO1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2			1	AO1 4.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3	t = 0.400 (s)		1	AO2 4.2.1.2
	2.0 = I × 0.400	allow a correct substitution of an incorrectly / not converted value of t	1	
	$I = \frac{2.0}{0.400}$	allow a correct rearrangement using an incorrectly / not converted value of t	1	
	I = 5.0 (A)	allow an answer consistent with an incorrectly / not converted value of t	1	

4.2.3.2 Mains electricity

Answer 47 · Mark scheme

June 2024 | 8463/1H | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.4	L = 60 000 (J/kg)	allow full credit for a correct method using E = 0.00102 (kJ)	1	AO2 4.3.2.3
	1.02 = m × 60 000	allow a correct substitution of an incorrectly / not converted value of L	1	
	$m = \frac{1.02}{60\,000}$	allow a correct rearrangement using an incorrectly / not converted value of L	1	
	m = 1.7 × 10^{-5} (kg)	allow an answer consistent with an incorrectly / not converted value of L	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.5	time taken would increase		1	AO3
	more energy would need to be transferred (in total)	MP2 dependent on scoring MP1	1	AO1 4.1.2.1 4.3.2.3

Total Question 10	**12**

4.2.3.2 Mains electricity

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCSE

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Kathleen Tattersall: *Director General*

4.2.3.2 Mains electricity

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).

4.2.3.2 Mains electricity

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

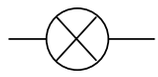
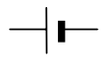
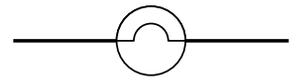
(…..) is used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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.

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

3451/F Q2

question	answers	extra information	mark
(a)	gas		1
(b)	fuel burning stations produce electricity at any time / all the time wind generator can only produce when the wind is strong enough	accept fuel available all the time accept it's not always windy	1 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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

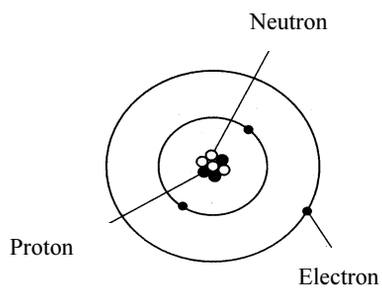
4.2.3.2 Mains electricity

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

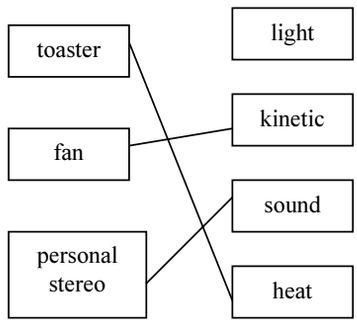
4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

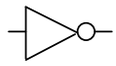
4.2.3.2 Mains electricity

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

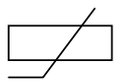
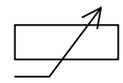
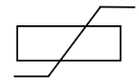
4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

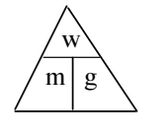
4.2.3.2 Mains electricity

3451/F Q14

question	answers	extra information	mark
(a)(i)	any **one** from:		1
	the ground	do **not** accept mobile phones	
	the air		
	radon (gas)		
	building materials		
	buildings		
	rocks / granite		
	food		
	cosmic <u>rays</u> **or** solar <u>rays</u>	accept from outer space accept sun but **not** sunlight	
	X-rays	accept medical uses	
	nuclear weapons testing		
	nuclear power stations / accidents		
(ii)	2	allow $\frac{1200}{60\times10}$ **or** $\frac{1200}{600}$ **or** 120 for **1** mark	2
(b)		answers must be comparative accept converse answers throughout	
	alpha: the count rate is (greatly) reduced by the card **or** the card absorbs alphas <u>but not betas</u>	accept paper for the card	1
	beta: the count rate is (greatly) reduced by the metal **or** the thin metal absorbs alphas <u>and</u> betas **or** the thin metal absorbs all of the radiation (from the source)	accept aluminium for the metal	1
	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 <u>much more</u> than 3 mm of metal	accept aluminium for the metal accept lead / aluminium for the metal	1
total			6

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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*

4.2.3.2 Mains electricity

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.

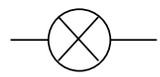
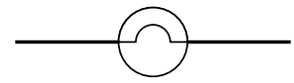
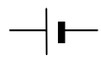
3.10 Unexpected Correct Answers not in the Mark Scheme

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.

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

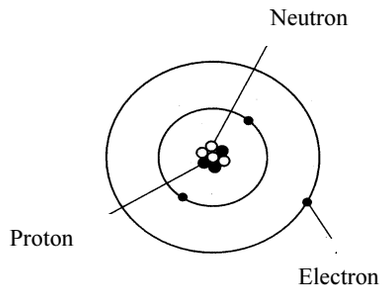
4.2.3.2 Mains electricity

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

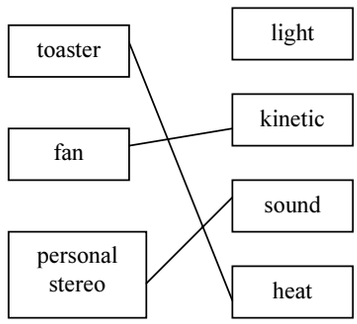
4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

3462/3F Q11

question	answers	extra information	mark
(a)	silver is a (good) reflector of heat (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

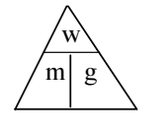
4.2.3.2 Mains electricity

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

4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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4.2.3.2 Mains electricity

GCSE PHYSICS

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

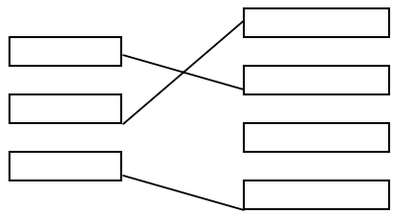
3451F Q2

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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 connect tanker to earth with a (conducting) wire / chain **or** earth the tanker	accept petrol for (petrol vapour) accept catch fire for explode accept ground for earth	1 1
(c)	**Quality of written communication** any **two** from: • when current greater than fuse rating / value • fuse (becomes hot and) melts / burns out • circuit is broken	for a logical sequence accept when current too great for appliance do **not** accept 'if there is too much current' do **not** accept voltage or electricity accept fuse blows / breaks accept circuit switched off this cannot score credit on its own	1 2
total			8

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4.2.3.2 Mains electricity

3451F Q5

question	answers	extra information	mark
(a)(i)	crust		1
(ii)	inner core is solid 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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4.2.3.2 Mains electricity

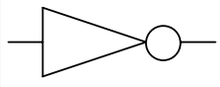
3451F Q6

	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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

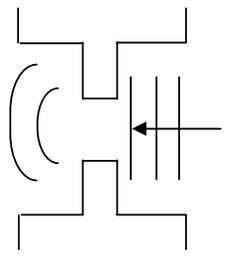
3451F Q8

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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4.2.3.2 Mains electricity

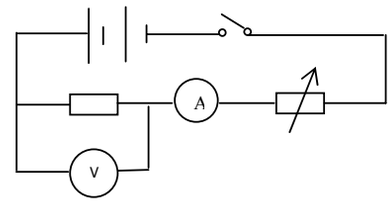
3451F Q9

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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 1.8×30) i.e. adding the correct 2 power values	2
total			9

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4.2.3.2 Mains electricity

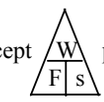
3451F Q12

question	answers	extra information	mark
(a)(i)	accelerating	accept getting faster accept speed / velocity increasing	1
(ii)	acceleration <u>increases</u>	accept velocity / speed increases <u>more</u> 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 <u>correct</u> use of 540 seconds	2
(iii)	velocity includes direction	accept velocity is a vector (quantity) accept converse answer	1
(c)	force of gravity (between <u>shuttle</u> and Earth) plus correct orbital speed (makes <u>shuttle</u> 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 <u>centripetal</u> 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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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)	input sensor → controlled by the processor processor → detects changes in the environment output device → decides what action is needed	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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4.2.3.2 Mains electricity

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	1
	… (both) inputs are on / high / 1 **or** current flows in both inputs	do **not** accept numerical values unless expanded	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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4.2.3.2 Mains electricity

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> C – alpha particle heading straight for the <u>nucleus</u> is <u>deflected</u> / <u>repelled</u> / <u>repulsed</u> 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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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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4.2.3.2 Mains electricity

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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

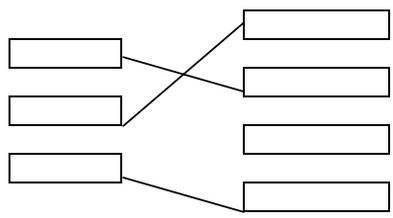
3462/3F Q2

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

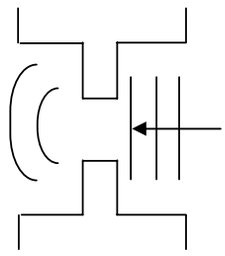
3462/3F Q6

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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4.2.3.2 Mains electricity

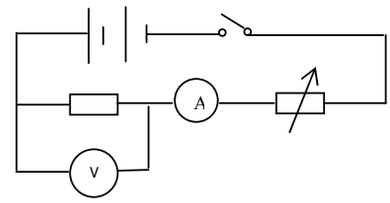
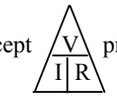
3462/3F Q7

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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 1.8×30) i.e. adding the correct 2 power values	2
total			9

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4.2.3.2 Mains electricity

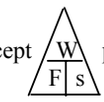
3462/3F Q10

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

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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4.2.3.2 Mains electricity

Answer 40 · Examiner comments

June 2018 | 8463/2H | Original Q5

Question 5 (Standard/**high** demand)

05.1 There were very few correct answers. Most answers described a specific error rather than a type of error. Many students incorrectly think that 'human error' is an acceptable answer.

05.2 There were many vague answers such as; ‘knocked the ray box’ that were not worthy of credit. Many students simply stated that there was a measuring error without further detail. Few students took the hint from Figure 7 that the rays were wide and so there would be difficulty in marking the exact position of each ray.

05.3 Nearly 70% of the students scored at least one mark for either calculating the mean or for calculating the range. Around 33% then calculated the uncertainty correctly.

05.4 Over 90% of the students scored at least one mark for either writing ‘I agree / disagree’ and quoting relevant data but not identifying the trend or for doing the converse.

05.5 About 23% of the students realised that the extra evidence would come from using a larger number of angles of incidence. Most answered in terms of repeating the same angles or comparing with another student’s results.

05.6 Many students simply wrote ‘change the mirror’ but did not say for what. Others suggested’ replacing the mirror but with a non-reflecting surface or a glass block. In this question it was important to realise that the replacement was in the context of an investigation and not simply recalling the meaning of diffuse reflection.

4.2.3.2 Mains electricity

Answer 44 · Examiner comments November 2020 | 8463/1H | Original Q9

Question 9 (High demand)

09.1 53% of students scored 5 marks on this multi-step calculation. Lower-scoring students didn't score marks for stating and trying to use incorrect physics equations or rearranging correct equations incorrectly. The main reasons for not scoring full marks included: knowing one form of an equation correctly, but re-arranging it incorrectly, eg stating P = I V then re-arranging it to I = V/P, mixing up two half-known equations eg P = I^2 V, not realising that the 5 marks for this question warranted more than using one basic equation, eg stating R = V/I and substituting the given value of power for I.

09.2 Students often didn't score the third mark because of their technical inaccuracies referring to potential difference of the live wire or the electrician instead of potential. Many students mixed up quantities like potential difference with current and charge in confused answers. The question discriminated well between students with 15% of students scoring 3 marks, 15% of students scoring 2 marks and 35% of students scoring 1 mark.

09.3 18% of students scored 2 marks, while 44% of students scored 1 mark. A good proportion of students appeared to understand what the graph was showing, but often had difficulty in expressing their ideas clearly. A number of students thought that a higher current would be a disadvantage, so stated either that the current was lower at frequencies other than 50Hz, or 're-wrote' the question to answer why 50Hz was the safest frequency. Simply reading off values from the graph was insufficient without an explanation of what the implications were.

Answer 45 · Examiner comments June 2023 | 8463/2H | Original Q8

08.1

Most students knew that iron is used for the core of a transformer and most of those were able to give an explanation. A significant number of students thought that iron was used because it is a good conductor of electricity, which demonstrates a misunderstanding of how transformers work.

08.2

55% of students gainiedall5 marks Most of the other students scored at least 3 marks for a partially correct answer. There were alternative ways of calculating the correct answer using the transformer and power equations, and it was pleasing to see so many students having the confidence to use them appropriately.

Answer 46 · Examiner comments

Question 5 (Standard/High Demand)

05.1 72% of students scored 2 marks, while 15% of students scored 1 mark. A number of students thought mains p.d. was 240 V. It was officially changed to 230 V in 1987 and this is the value given in the specification. However, it was more common for students to get the p.d. correct and the frequency incorrect.

05.2 A grade 6-7 calculation of resistance, which discriminated well between students. The conversion of milliwatts to watts proved a problem for the vast majority of students. 53% scored all 4 marks, while 36% scored 3 marks.

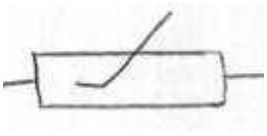
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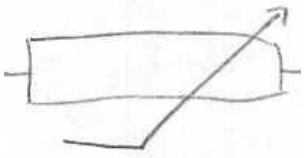
Answer 46 · Examiner comments

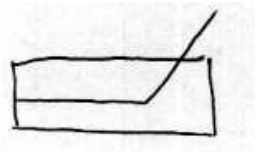
June 2024 | 8463/1H | Original Q5

05.3 64% of students scored a mark for suggesting why dirty coins are not recognised by the machine. Answers which were insufficient, but ignored, included 'Can't measure resistance' and 'Dirt is an insulator'..

05.4 63% of students scored a mark for drawing the thermistor symbol. Answers that were not acceptable included the following examples.







05.5 This grade 8-9 calculation, worth 5 marks, question discriminated well between students of different abilities. If a student did not calculate the total resistance and then use that value to calculate the current in the circuit, then they didn't score the first 3 marks. If a student calculated the current in the circuit using just the 400 Ω resistor, then they could use that value to score the 4th and 5th marks for the calculation of the p.d. across the thermistor, using $V = IR$.
Answers with a p.d. greater 12 V usually scored zero marks, due to fundamental Physics errors.
18% of students scored 5 marks, while 31% of students scored 2 marks. 46% of students scored 0 marks. In this exam series all equations were provided for the students on the Physics Equations Sheet.

4.2.3.2 Mains electricity

Answer 47 · Examiner comments

Question 10 (Standard/High Demand)

10.1 72% of students correctly identified the colour of the live wire insulation.

10.2 66% of students scored the mark on this question. Students who made the box for the answer into a fuse symbol did not score the mar nor did a fuse symbol added to any side of the box .

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10.3 A grade 6-7 calculation of current. 57% of students scored all 4 marks. 36% of students scored 3 marks, usually for incorrectly converting, or not converting, the unit.

10.4 A grade 6-7 calculation of mass. 61% of students scored 4 marks. 31% of students scored 3 marks for either incorrectly converting, or not converting, the unit.

10.5 40% of students scored 2 marks on this question recognising that the time would be longer because more energy in total would need to be transferred. An answer of ‘less energy is melting the wire’ was just enough to score the second mark. 15% of students scored zero on this question.

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4.2.3.2 Mains electricity

Answer 47 · Examiner comments

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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