AQA GCSE Physics | 8463

SPECIFICATION POINT 4.3.1.2

Changes of state

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**14**
Available paper years	**2007–2025**

Using this booklet

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

Name: _____ **Date:** _____

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

4.3.1.2 Changes of state

Answer 01 · Mark scheme

January 2007 | PHY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
(a)(i)	as a source of thermal <u>radiation</u>	accept heat for thermal radiation accept to act as the Sun do **not** accept sunlight alone	1
(ii)	any **one** from: • volume of water • distance between lamp and boiling tube • initial / starting temperature of water • same room temperature	accept amount for volume do **not** accept time or same insulation material	1
(iii)	any **one** from: • greater sensitivity / precision • could link to a computer for (automatic) data analysis • could take more frequent readings • reduces instrument reading error	do **not** accept more reliable (negates mark) accept more accurate do **not** accept easier to use on its own	1
(b)(i)	acts as a control	accept to be able to make a comparison accept to see the difference do **not** accept 'to make it a fair test' OWTTE on its own	1
(ii)	(plastic) <u>foam</u> and aluminium foil		1

Continued on next page

4.3.1.2 Changes of state

Answer 01 · Mark scheme

question	answers	extra information	mark
(iii)	(aluminium) foil is a poor absorber of thermal radiation **or** (aluminium) foil is a (good) reflector of thermal radiation	accept heat / infra red for thermal radiation do **not** accept 'reflects sunlight' on its own	1
	(plastic) foam traps air which is a (good) insulator	accept (plastic) foam is a poor conductor / (good) insulator do **not** accept 'the material' is a good insulator / poor conductor	1
(c)	particles vibrate with a bigger / stronger amplitude / faster / with more (kinetic) energy	accept particles vibrate more do **not** accept start to vibrate only	1
	energy transferred by collisions with other particles	do **not** accept answers in terms of free/mobile electrons	1
total			9

4.3.1.2 Changes of state

Answer 02 · Mark scheme

June 2007 | PHY1A | Original Q8 | Legacy

Eight	**4**	**3**	**1**	**2**

Answer 03 · Mark scheme

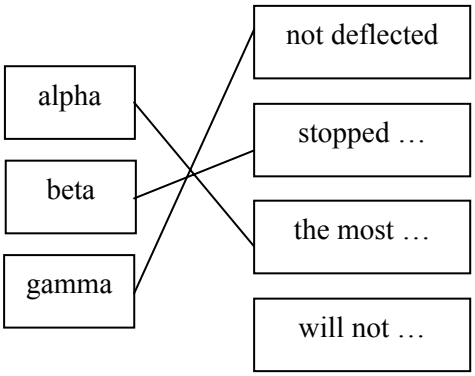
June 2007 | PHY1F | Original Q3 | Legacy

The full source mark scheme begins on page 24. Follow original question 3 in that document.

4.3.1.2 Changes of state

Answer 04 · Mark scheme

Question 3

question	answers	extra information	mark
(a)	3 lines correctly drawn  	**1** mark for each correct line if more than one line is drawn from a box in List **A** all lines from that box are wrong	3
(b)	nucleus	accept nuclei do **not** accept nuclear	1
(c)	**Y**	do **not** accept gamma	1
	any **two** from:	do **not** accept other properties of gamma	2
	• least dangerous (inside the body)	do **not** accept not dangerous accept not as harmful as alpha (inside the body)	
	• least ionising		
	• penetrates through the body	do **not** accept can be detected externally	
	• is a gas / can be breathed in	accept it is not a solid (cannot score if **Z** chosen) if **X** chosen can score this gas mark if **Z** chosen can score **both** gamma marks	

Question 3 continues on the next page

PHY1F

Question 3 continued

question	answers	extra information	mark
(d)	any **one** from: • longer shelf life • food can be supplied from around the world • wider market for farmers • cost to consumers (may be) lower • less likely to / will not get food poisoning	do **not** accept kills bacteria accept stays fresh longer / stops it going bad / mouldy accept infection / disease / ill for food poisoning	1
total			8

4.3.1.2 Changes of state

Answer 04 · Mark scheme June 2008 | PHY1F | Original Q3 | Legacy

PHY1F

4.3.1.2 Changes of state

Answer 05 · Mark scheme January 2010 | PHY1F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	gas		1
2(a)(ii)	one variable is categoric, the other is continuous		1
2(a)(iii)	fuel is **not** burned	accept nothing is burned do **not** accept they don't use fossil fuels	1
2(b)(i)	boiler steam turbine generator		1 1 1 1
2(b)(ii)	any **one** from: • wind • waves • tidal • geothermal • solar • falling water	 accept wind turbines accept tide accept the Sun / sunlight accept solar panels / cells do **not** accept light accept hydroelectric do **not** accept water do **not** accept any named biofuel	1
2(b)(iii)	18 000	allow **1** mark for showing a correct method ie 36 000 000 ÷ 2 000 an answer of 0.018 gains **1** mark	2
Total			**10**

4.3.1.2 Changes of state

Answer 05 · Mark scheme

January 2010 | PHY1F | Original Q2 | Legacy

PHY1F

4.3.1.2 Changes of state

Answer 06 · Mark scheme

June 2011 | PHY1F | Original Q5 | Legacy

Question 5

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

4.3.1.2 Changes of state

Answer 06 · Mark scheme June 2011 | PHY1F | Original Q5 | Legacy

PHY1F

Answer 07 · Mark scheme November 2011 | PHY1AP | Original Q9 | Legacy

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

4.3.1.2 Changes of state

Answer 08 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)	uranium-235	accept any correct indication	1
5(b)	splits / breaks (into two smaller parts)	nucleus is separated is insufficient do **not** accept atom splits – on its own	1
	and (two / three) neutrons		1
5(c)	steam	correct order only	1
	turbine		1
	generator		1
Total			6

4.3.1.2 Changes of state

Answer 08 · Mark scheme

June 2013 | PH2FP | Original Q5 | Legacy

PH2FP

4.3.1.2 Changes of state

Answer 09 · Mark scheme

June 2014 | PH1FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO spec ref
3(a)	solid		1	AO1 1.1.3a
3(b)	decreased decreased increased	correct order only	1 1 1	AO1 1.1.3a
3(c)(i)	A uses least / less energy (in 1 year)	reason only scores if A chosen a comparison is required accept uses least power accept uses least kWh	1 1	AO2 AO3 1.3.1b
3(c)(ii)	greater the volume the greater the energy it uses (in 1 year)		1	AO3 1.1.3
3(c)(iii)	a very small number sampled	accept only tested 3 accept insufficient evidence / data allow not all fridges have the same efficiency **or** a correct description implying different efficiencies only tested each fridge once is insufficient there are lots of different makes is insufficient	1	AO3 1.1.3
Total			8	

4.3.1.2 Changes of state

Answer 10 · Mark scheme

June 2016 | PH1FP | Original Q4 | Legacy

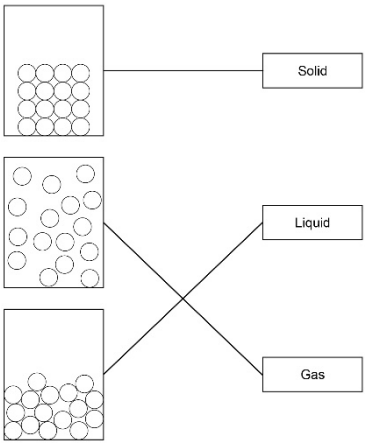
The full source mark scheme begins on page 36. Follow original question 4 in that document.

4.3.1.2 Changes of state

Answer 11 · Mark scheme

November 2021 | 8463/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		2 marks for all correct 1 mark for 1 or 2 correct	2	AO1 4.3.1.1
01.2	**B**		1	AO1 4.3.2.3
01.3	**D**		1	AO1 4.3.2.3
01.4	the kinetic energy of the particles		1	AO1 4.3.2.1 4.3.3.1
01.5	E = 0.250 × 334 000 E = 83 500 (J)		1 1	AO2 4.3.2.3
01.6	sublimates		1	AO1 4.3.1.2
Total			**8**	

Answer 12 · Mark scheme

June 2022 | 8463/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	balance		1	AO3 4.3.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	control variable		1	AO3 4.3.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	use tongs / gloves **or** use a heatproof mat	allow other sensible methods of avoiding contact with hot beaker eg using a cloth allow wait for the beaker (and hot water) to cool down	1	AO2 4.3.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	25 200 = 0.0090 L $L = \frac{25\,200}{0.0090}$ L = 2 800 000 **or** $L = 2.8 \times 10^6$ J/kg		1 1 1 1	AO2 AO2 AO2 AO1 4.1.1.4

4.3.1.2 Changes of state

Answer 12 · Mark scheme

June 2022 | 8463/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	the transfer of thermal energy from the water to the surroundings		1	AO3 4.3.2.3 4.1.2.1

Total Question 5		**8**

Answer 13 · Mark scheme

June 2023 | 8463/1F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	polarity of the potential difference doesn't change	allow direction of the potential difference doesn't change	1	AO1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	$E = QV$		1	AO1 4.2.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3	$5010 = Q \times 12$ $Q = \frac{5010}{12}$ $Q = 417.5$ (C)	 allow 418 (C)	1 1 1	AO2 4.2.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.4	$5010 = 0.015 \times L$ $L = \frac{5010}{0.015}$ $L = 334\,000$ (J/kg)		1 1 1	AO2 4.3.2.3

4.3.1.2 Changes of state

Answer 13 · Mark scheme

June 2023 | 8463/1F | Original Q10

Question	Answers	Mark	AO / Spec. Ref.
10.5	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.3.1.1 4.3.2.1
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content • particles in a solid are in a regular pattern • particles in a liquid are in a random arrangement • particles in a solid are vibrating about fixed positions • particles in a liquid are moving freely • as the ice changes to water the temperature remains constant • because as the ice changes to water the potential energy of the particles increases • as the water warms the particles move faster • so the kinetic energy of the particles increases • internal energy is the total kinetic and potential energy of all the particles ignore any references to density of ice vs liquid water ignore any references to spacing of particles		

Total Question 10	14

4.3.1.2 Changes of state

Answer 14 · Mark scheme

June 2025 | 8463/1F | Original Q4

Question 4

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

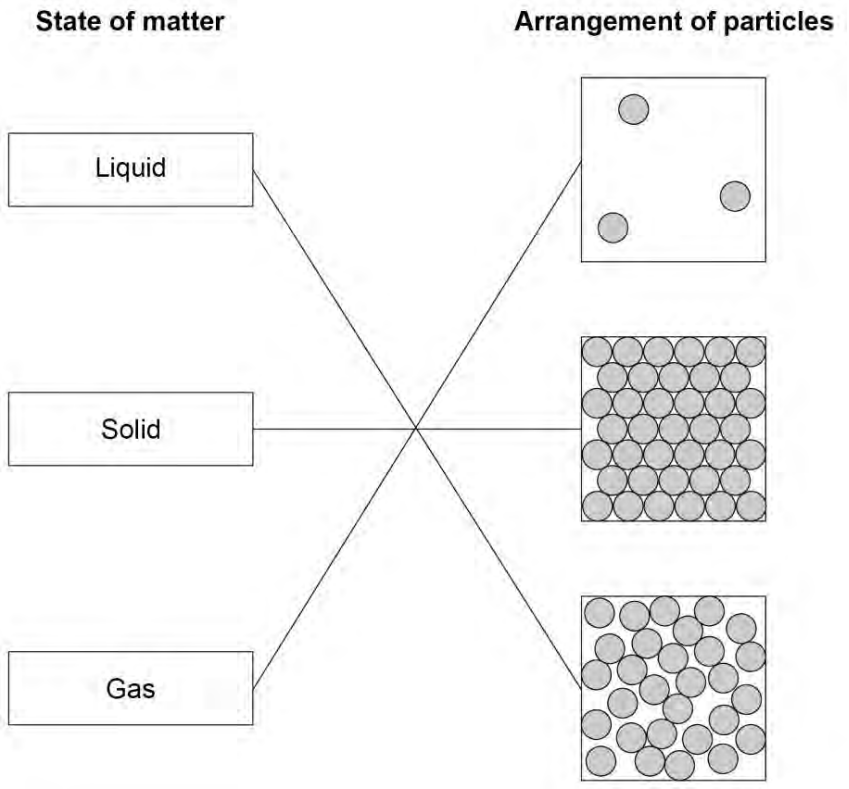
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	the kinetic energy increased		1	AO1 4.3.3.1

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

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

4.3.1.2 Changes of state

Answer 14 · Mark scheme

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

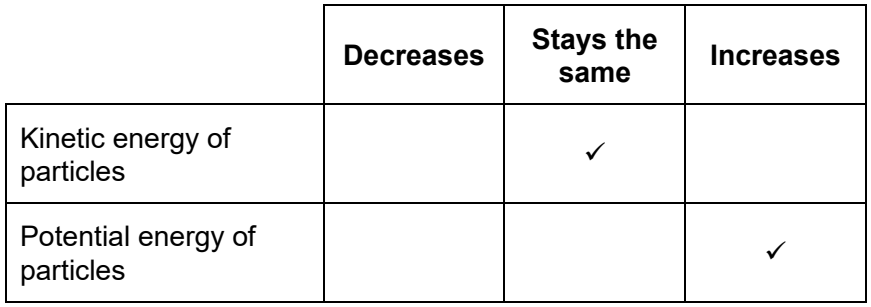
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	liquid		1	AO3 4.3.1.2

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

4.3.1.2 Changes of state

Answer 14 · Mark scheme

June 2025 | 8463/1F | Original Q4

Question	Answers	Mark	AO / Spec. Ref.
04.8			AO1 4.3.2.1
	do **not** accept more than one tick in each row		

	Decreases	Stays the same	Increases	Mark
Kinetic energy of particles		✓		1
Potential energy of particles			✓	1

Total Question 4	10

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

Mark Scheme

2007 examination - June series

4.3.1.2 Changes of state

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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Dr Michael Cresswell, Director General.

4.3.1.2 Changes of state

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

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

The 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 / ; eg allow smooth / free movement.)

3. Marking points

3.1 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.

4.3.1.2 Changes of state

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

3.2 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.

3.3 Marking procedure for calculations

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;

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

Papers should be constructed in such a way that the number of times errors can be carried forward 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.

3.6 Phonetic spelling

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

3.7 Brackets

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

3.8 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.

4.3.1.2 Changes of state

PHY1F Question 1

	answers	extra information	mark
(a)(i)	grid	accept any way of indicating correct answer	1
(ii)	increases voltage	accept any way of indicating correct answer	1
(iii)	230 V	accept any way of indicating correct answer	1
(iv)	reduce	accept any way of indicating correct answer	1
(b)(i)	increases the temperature	accept make it hotter / heat goes into the air accept convection currents accept sensible comment eg sound energy / it buzzes ignore pollutes the air	1
(ii)	less than 100%		1
total			6

4.3.1.2 Changes of state

PHY1F Question 2

	answers	extra information	mark
(a)	coal		1
(b)	fossil fuels can be used to generate electricity at any time a few large power stations can generate the electricity for a million homes	if more than 2 boxes ticked, mark incorrect boxes first	1 1
(c)(i)	no fuel is burnt	accept a named fuel accept nothing is burnt accept does not use (fossil) fuel	1
(ii)	kinetic		1
(iii)	any **two** from: • cause <u>noise</u> pollution • cause <u>visual</u> pollution • need concrete for bases • new roads / infrastructure needed • may interfere with TV / radio / mobile phone signals • dangerous to birds • do not generate all of the time • need a lot of generators • high <u>initial</u> / <u>capital</u> costs • reduces house prices	accept causes pollution for **1** mark accept generates <u>only</u> when the wind blows do **not** accept 'generate when the wind blows' do **not** accept 'take up a lot of space / land'	2
total			7

4.3.1.2 Changes of state

PHY1F Question 3

	answers	extra information	mark
(a)(i)	7pm	accept 19.00 / 1900	1
(ii)	8pm	accept 20.00 / 2000	1
	temperature drops more slowly	accept heat for temperature	1
		accept line is less steep	
(b)	insulator		1
	conduction*	*answers can be either way around	1
	convection*		1
(c)(i)	4 (years)		1
(ii)	it is the cheapest / cheaper / cheap	do **not** accept answers in terms of heat rising or DIY	1
	has the shortest / shorter payback time	do **not** accept short payback time	1
total			9

4.3.1.2 Changes of state

PHY1F Question 4

	answers	extra information	mark
(a)(i)	any **one** from: • gamma • X-rays • infra red • microwaves • radio	 accept correct symbol accept IR do **not** accept heat do **not** accept TV	1
(ii)	all the waves travel at the same speed		1
(b)(i)	(skin) cancer / melanoma	accept damage eyesight accept sunburn do **not** accept sun tan do **not** accept sunstroke	1
(ii)	higher levels of UV greater risk to health / risk of skin cancer / (more) protection needed / most likely to get burnt / damage skin	accept UV at its strongest / sun's rays are strongest ignore 'sun is at its hottest' ignore 'sun is at its highest' accept greater damage to / easier to damage cells / mutate cells ignore just 'affect your health' must be idea of greater adverse effect on health	1 1
total			5

4.3.1.2 Changes of state

PHY1F Question 5

	answers	extra information	mark
(a)	C		1
(b)(i)	easy to maintain / access **or** (currently) cheaper than a space telescope **or** can modify (easily) an existing telescope **or** telescopes can be larger **or** can test new types of telescope (easily)	do **not** accept 'easier to use' do **not** accept easier to supply with power	1
(ii)	atmosphere does not block / distort the image	accept picture / data for image accept 'more detailed / clearer image / data / picture accept 'no light pollution' accept 'can look at the Earth' do **not** accept 'can see further' do **not** accept 'better view' do **not** accept 'clear view' do **not** accept 'can see more clearly'	1
total			3

4.3.1.2 Changes of state

PHY1F Question 6

	answers	extra information	mark
(a)(i)	electromagnetic (wave / radiation)	accept em (wave / radiation) ignore reference to frequency	1
(ii)	gamma can penetrate the crate / box / packaging	accept converse (but must relate to both alpha and beta) ignore just gamma radiation kills bacteria accept can get through to food	1
(iii)	neutrons		1
(b)(i)	absorb gamma / radiation	accept it stops / reduces the radiation	1
(ii)	any **one** from: • slow down the conveyor belt • food does more than one circuit • stay on the conveyor belt longer • food closer to the source / radiation	ignore larger doses / use more of the source ignore thinner packaging	1

Continued on next page

4.3.1.2 Changes of state

Question 6 continued

	answers	extra information	mark
(c)(i)	idea of testing food on humans / animals		1
	no (measured) ill effects **or** monitor their health	accept monitor people that have eaten the food accept a measurement / comparison for **1** mark eg measure the amount of radiation in treated food comparison plus a reason for the comparison would get **2** marks eg idea of measuring level of radiation in treated food **with** no measurable increase in level = **2** marks **or** comparing it to untreated food = **2** marks	1
(ii)	so can make own decision about eating or not eating treated food	accept may be against their religious / moral views accept some people prefer food that hasn't been tampered with ignore in case they don't like the idea of eating treated food accept don't want to eat treated food ignore might be allergic to the food eg think it will give them cancer = **0** marks think it will give you cancer so I need to know so that I can choose = **1** mark	1
total			8

4.3.1.2 Changes of state

PHY1F Question 7

	answers	extra information	mark
(a)	the outside colour of the cans		1
(b)(i)	18 (°C) **or** 88 to 70	ignore negative sign	1
(ii)	8 (°C) **or** 70 to 62	ignore negative sign	1
(c)	greater temperature difference between water and surroundings (at start)	must mention temperature difference ignore just water hotter accept energy used to heat cans initially	1
(d)	black		1
	temperature falls the fastest (in L)	accept (can L) loses more heat / cools quicker accept heat for temperature	1
	black is a good / the best / better emitter (of heat / radiation)	accept converse ignore black is best absorber	1
total			7

4.3.1.2 Changes of state

AQA

GCSE

Science A / Physics

PH1FP

Mark scheme

4405/4403
June 2016

Version 1.0: Final Mark Scheme

4.3.1.2 Changes of state

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

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Mark Scheme

Information to Examiners

1. General

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

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

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

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

2. Emboldening

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

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

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

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

3. Marking points

3.1 Marking of lists

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

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

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

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

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

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

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

3.2 Use of chemical symbols / formulae

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

3.3 Marking procedure for calculations

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

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

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

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

3.6 Phonetic spelling

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

3.7 Brackets

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

3.8 Accept / allow

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

3.9 Ignore / Insufficient / Do not allow

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

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

4. Quality of Communication and levels marking

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

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

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

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

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

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

4.3.1.2 Changes of state

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

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

4.3.1.2 Changes of state

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

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

4.3.1.2 Changes of state

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

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

4.3.1.2 Changes of state

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

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

4.3.1.2 Changes of state

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

4.3.1.2 Changes of state

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

Question 7 continues on the next page . . .

PMT

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

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

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

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

Total			7

4.3.1.2 Changes of state

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

4.3.1.2 Changes of state

Answer 12 · Examiner comments

June 2022 | 8463/1F | Original Q5

Question 5 (Low and standard demand)

05.1 65% of students chose the correct measuring instrument.

05.2 60% of students chose the correct type of variable.

05.3 75% of students answered this question correctly. Not conventional lab equipment in many cases, but creditworthy. Gloves of varying description being a common response.

05.4 A question that discriminated well between students. 50% of students scored 4 marks for this calculation. Most incorrect answers multiplied the energy and the change in mass, which scored no marks for their numerical answer. The unit mark was independent so could be scored separately from the numerical answer.

05.5 55% of students chose the correct source of error.

4.3.1.2 Changes of state

Answer 13 · Examiner comments

June 2023 | 8463/1F | Original Q10

Question 10 (Standard Demand)

10.1 Very few correct answers, only 2% of students scored a mark. Many students gave answers in terms of charge flow and current which were insufficient. The specification does not mention alternating or direct current, only alternating or direct p.d. Answers like ' the potential difference flows in one direction' were insufficient to score.
. Saying the potential difference only travels/goes in one direction was insufficient, as this suggested charge flow. Saying that 'the potential difference is always positive' or 'the potential difference doesn't go negative' were creditworthy. 'The potential difference is in one direction' was creditworthy. 'The potential difference isn't alternating' was insufficient.

10.2 95% of students scored this mark. The equations sheet was provided for this exam series.

10.3 74% of students scored 3 marks. The most common mistake was to multiply the energy and the pd, which scored zero.

10.4 64% of students scored 3 marks. Students should appreciate that the first mark in a calculation is for the substitution, not the rearrangement. The substitution into an incorrectly rearranged equation scores zero. A substitution into an equation could score one mark even if the next step was an incorrect rearrangement.

10.5 Students made simple statements about the particle movement or particle arrangement, but usually made mistakes which stopped them scoring marks in Level 2. To score in Level 2, students needed to make comparisons of the movement and arrangement of particles in ice and liquid water. In addition to this, for students to score in Level 3, they needed to discuss either the change of state at constant temperature increasing the potential energy of the particles or how the warming of liquid water increased the kinetic energy of the particles. For 6 marks, both these aspects needed discussion. Students found this question difficult with less than 1% scoring 5 or 6 marks and14% scoring 3 or 4 marks.

4.3.1.2 Changes of state

Mark Ranges and Award of Grades

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

4.3.1.2 Changes of state

Answer 14 · Examiner comments June 2025 | 8463/1F | Original Q4

04.1
Just over 90 % of the students knew that the speed of the gas particles increased.

04.2
Nearly 80 % of the students knew that the kinetic energy of the gas particles increased.

04.3
Nearly 90 % of the students knew that the number of collisions each second increased.

04.4
Just over 70 % of the students knew that the force exerted by the gas particles increased.

04.5
When completing a matching type questions students should be encouraged to draw straight lines only.

04.6
Just fewer than 50 % of the students identified the state as liquid.

04.7
Just over 50 % of the students identified the state as solid.

Answer 14 · Examiner comments June 2025 | 8463/1F | Original Q4

04.8
Students found this question about internal energy difficult. Only about 11 % of the students scored 2 marks, while a further 33 % of the students scored 1 mark.