AQA GCSE Physics | 8463

SPECIFICATION POINT 4.3.2.3

Changes of state and specific latent heat

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**10**
Available paper years	**2007–2024**

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.

4.3.2.3 Changes of state and specific latent heat

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

4.3.2.3 Changes of state and specific latent heat

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

4.3.2.3 Changes of state and specific latent heat

Answer 02 · Mark scheme

November 2009 | PHY1AP | Original Q8 | Legacy

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

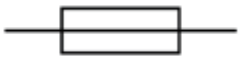
Answer 03 · Mark scheme

June 2016 | PH1FP | Original Q4 | Legacy

The full source mark scheme begins on page 17. Follow original question 4 in that document.

4.3.2.3 Changes of state and specific latent heat

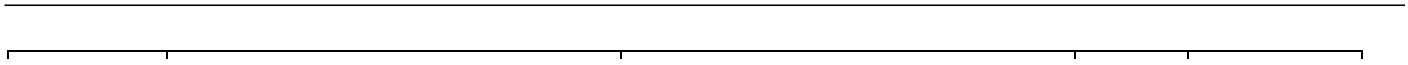
Answer 04 · Mark scheme June 2018 | 8463/1F | Original Q7

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

4.3.2.3 Changes of state and specific latent heat

Answer 04 · Mark scheme

June 2018 | 8463/1F | Original Q7



4.3.2.3 Changes of state and specific latent heat

Answer 05 · Mark scheme

June 2019 | 8463/1F | Original Q1

Question 1

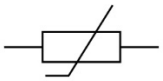
Question	Answers	Extra information	Mark	AO / Spec. Ref.
1.1	greater than less than	in this order only	1 1	4.3.1.1 AO1
1.2	boiling temperature is constant	ignore evaporation allow temperature remains the same	1 1	4.3.2.3 AO1
1.3	E = 0.063 × 2 260 000 E = 140 000 (J)	a correct answer that rounds to 140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

4.3.2.3 Changes of state and specific latent heat

Answer 06 · Mark scheme

November 2020 | 8463/1F | Original Q7

Question 7

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

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Answer 06 · Mark scheme

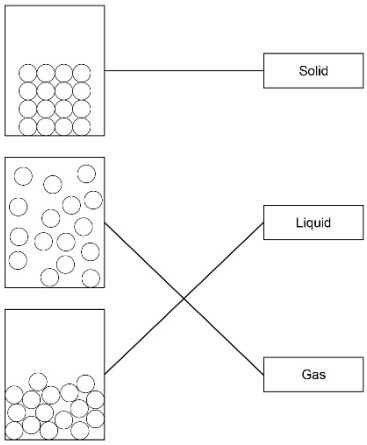
Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	ΔΘ = 80 (°C)		1	AO2 4.1.1.3 RPA 1
	E = 0.50 × 4200 × 80	allow E = 0.50 × 4200 × their value of ΔΘ	1	
	E = 168 000 (J)	allow an answer consistent with their value of ΔΘ	1	
07.7	m = 0.005 (kg)		1	AO2 4.3.2.3
	E = 0.005 × 2 260 000	this mark may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

4.3.2.3 Changes of state and specific latent heat

Answer 07 · 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	

4.3.2.3 Changes of state and specific latent heat

Answer 08 · 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

4.3.2.3 Changes of state and specific latent heat

Answer 08 · Mark scheme

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**

4.3.2.3 Changes of state and specific latent heat

Answer 09 · 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

4.3.2.3 Changes of state and specific latent heat

Answer 09 · 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

4.3.2.3 Changes of state and specific latent heat

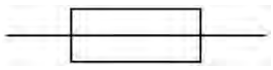
Answer 10 · Mark scheme

June 2024 | 8463/1F | Original Q7

Question 7

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	blue		1	AO1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3			1	AO1 4.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	current = $\frac{2.0}{0.40}$ current = 5.0 (A)		1 1	AO2 4.2.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	m = 0.000016 (kg) **or** $m = 1.6 \times 10^{-5}$ (kg) E = 0.000016 × 60 000 E = 0.96 (J)	 allow a correct substitution using an incorrectly / not converted value of m allow an answer consistent with an incorrectly / not converted value of m	1 1 1	AO2 4.3.2.3

4.3.2.3 Changes of state and specific latent heat

Answer 10 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	the total energy will be greater		1	AO3 4.1.2.1 4.3.2.3

Total Question 7	**9**

4.3.2.3 Changes of state and specific latent heat

AQA

GCSE

Science A / Physics

PH1FP

Mark scheme

4405/4403
June 2016

Version 1.0: Final Mark Scheme

4.3.2.3 Changes of state and specific latent heat

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

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

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

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4.3.2.3 Changes of state and specific latent heat

Mark Scheme

Information to Examiners

1. General

The mark scheme for each question shows:

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

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

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

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

2. Emboldening

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

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

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

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

3. Marking points

3.1 Marking of lists

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

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

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

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

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

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

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

3.2 Use of chemical symbols / formulae

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

3.3 Marking procedure for calculations

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

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

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

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

3.6 Phonetic spelling

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

3.7 Brackets

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

3.8 Accept / allow

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

3.9 Ignore / Insufficient / Do not allow

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

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

4. Quality of Communication and levels marking

In Question **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.

4.3.2.3 Changes of state and specific latent heat

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**	

4.3.2.3 Changes of state and specific latent heat

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**	

4.3.2.3 Changes of state and specific latent heat

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

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**	

4.3.2.3 Changes of state and specific latent heat

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

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**	

4.3.2.3 Changes of state and specific latent heat

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**	

4.3.2.3 Changes of state and specific latent heat

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**	

4.3.2.3 Changes of state and specific latent heat

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 . . .

4.3.2.3 Changes of state and specific latent heat

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

4.3.2.3 Changes of state and specific latent heat

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

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

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Answer 08 · 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.

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Answer 09 · 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.

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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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Answer 10 · Examiner comments

June 2024 | 8463/1F | Original Q7

Question 7 (Low / Standard demand)

07.1 42% of students answered this question correctly, identifying the colour of the insulation around the live wire.

07.2 Students were slightly more successful answering this question, with 48% correctly identifying the colour of the insulation around the neutral wire.

07.3 64% of students were able to identify the circuit symbol for a fuse.

07.4 92% of students scored 2 marks for this question. For low demand calculations the equation is provided in the rearrangement needed to answer the question.

07.5 72% of students multiplied numbers given in this standard demand calculation and scored 2 marks. Very few students attempted the unit conversion. Only 8% of students scored 3 marks for the correct final answer.

07.6 43% of students realised that the total energy would be greater.

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General

Grade 1-3 calculation questions were well answered, where the equation is always given and students will not be required to rearrange the equation. Grade 4-5 calculation questions involving equation recall were answered better this year than in 2018 and students are scoring many of their marks on the paper by answering the subsequent calculation questions correctly. At grade 4-5 students are expected to be able to either rearrange an equation or convert a unit, so it is beneficial for students to be able to quickly identify if the units given in a question are correct for the use in the equation. Question 10.1 was generally well attempted and students who had carried out Required Practical Activity 2 would have had a material advantage over those who hadn't.

Handwriting sometimes makes it very difficult for examiners to read what has been written. Students who have handwriting that is difficult to read may benefit from a scribe or from word processing their answers in exams.

Levels of demand

Questions are set at two levels of demand on this paper:

- low demand questions are targeted at students working at grades 1–3
- standard demand questions are targeted at students working at grades 4–5.

A student's final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (Low demand)

01.1 Around 77% of students scored 2 marks. Around 16% of students scored 1 mark.

01.2 Only around 8% of students scored 2 marks. Both evaporation and change of state were common, insufficient answers for the first marking point. Less than half of the students scored 1 mark. The marking points were independent, so if the change of state was incorrect eg melting, the student could still score the second marking point.

01.3 Around 91% of students scored 2 marks. In calculations where students are provided with the equation (grades 1-3) students are not expected to rearrange the equation. Some students incorrectly tried to convert the kg into g and scored 0 marks.

01.4 Approximately 82% of students scored 3 marks. In calculations where students are provided with the equation (grades 1-3) students are not expected to rearrange the equation. Some students incorrectly tried to convert the kg into g and scored 0 marks for the calculation. Some students set out their calculation, but then multiplied the two values rather than dividing.

Question 2 (Low demand)

02.1 About 67% of students identified the correct decay equation.

02.2 More than three quarters of the students identified why alpha radiation is dangerous inside the human body.

02.3 Just below three quarters of students scored 2 marks. Most correct answers read the values from the graph as intended (460, 280) and students didn't need the tolerance given in the mark scheme.

02.4 About 60% of students correctly estimated the mass remaining.

02.5 Students found this question difficult, with around 55% of students scoring 2 marks and around 27% of students scoring 1 mark.

Question 3 (Low demand)

03.1 Approximately 45% of students scored 1 mark for identifying a measuring instrument that could be used. About 9% of students scored 2 marks for describing an appropriate way to use it. Pythagoras was insufficient as the triangle described would not give the height of the zip wire.

03.2 Students were often very successful in calculation, with around 91% scoring 2 marks.

03.3 This question gave a good spread of marks. Over a fifth scored 3 marks, almost two fifths scored 2 marks and slightly below a quarter scored 1 mark. Gravitational potential energy or gravitational field strength were insufficient to score a mark.

Question 4 (Low demand)

04.1 Over a third of students answered this question correctly.

04.2 About 14% of students answered this question correctly.

04.3 This question about the alpha particle scattering experiment discriminated well between students. Around 16% of students scored 3 marks, around 45% of students scored 2 marks and around 30% of students scored 1 mark.

04.4 About 77% of students correctly identified what reproducible means. .

Question 5 (Low demand)

05.1 The most common correct answers linked CO_2 to global warming. Around 38% of students scored 2 marks and around 35% scored 1 mark. Common incorrect answers were usually vague and mentioned air pollution without being specific. There were many students who incorrectly linked CO_2 with the ozone layer.

05.2 Over half of the students scored 2 marks and over a third scored 1 mark. Insufficient answers included hydro and water. Answers using specification wording eg the tides were acceptable, as were terms like tidal, etc. Oil was insufficient as this was assumed to be non-renewable oil as opposed to palm oil or other biofuel oils.

05.3 Around 83% of students scored 2 marks for this percentage calculation. An answer of 78 scored 1 mark even if spurious calculations followed.

05.4 About 67% of students scored 2 marks. Quite a large number of misreads from the graph resulting in 0 marks and around 29% of students scored 0 marks.

05.5 Only around 5% of students scored 2 marks whilst half of the students scored 1 mark. Some students failed to make the connection between the time of day and sunrise. Some students talked vaguely about the energy stored by solar panels, confusing them with solar heating panels rather than solar photovoltaic panels.

Question 6 (Low and Standard demand)

06.1 More than half of the students scored 2 marks. To score a mark a comparative statement was needed eg lower, not low mass of power source. A statement using the word 'better' would be insufficient.

06.2 Around 64% of students scored 2 marks. Many students scored 1 mark for truncating and not rounding their answers, an answer of 26.08 would score only 1 mark for the substitution.

06.3 This question discriminated well, with about 16% scoring 2 marks and more than half scoring 1 mark. 'Increases the battery's power output' was insufficient to score a mark. 'Battery lasts longer' was insufficient to score a mark.

06.4 The quantities in the question are given in alphabetical order; there is no need for students to recall the equation in this order. Any correct rearrangement of the equation or use of the correct symbols for quantities was allowed. A mixture of symbols and words would also score the mark. Approximately 70% of students answered this question correctly.

06.5 It was encouraging to see many Foundation tier students successfully rearranging the equation. Around 77% of students scored 3 marks.

Question 7 (Low and Standard demand)

07.1 About 86% of students answered this question correctly.

07.2 Approximately 83% of students answered this question correctly. Students should refer to the Physics specification for the accepted symbols for circuit components. Textbooks and revision guides do not necessarily use the specification symbols. The circles in the component symbol scored a mark even if shown as blobs rather than circles.

07.3 Around 93% of students scored 2 marks. At grade 1-3, the equation is given and no rearrangement of the equation is needed. Students need to simply substitute and calculate the answer.

07.4 Around 93% of students scored 2 marks. At grade 1-3, the equation is given and no rearrangement of the equation is needed. Students need to simply substitute and calculate the answer.

07.5 About 23% of students answered this question correctly.

07.6 About 38% of students answered this question correctly.

07.7 Students can recall the equation in any correct rearrangement. The stem of the question lists the quantities in alphabetical order, so that there is no suggestion of the correct order.

Correct letters for quantities are acceptable in place of the quantity names. Voltage or p.d. were acceptable for potential difference. Approximately 57% of students answered this question correctly.

07.8 The first mark is for the substitution into the correct equation. The second mark is for the correct rearrangement of the correct equation. The third mark is for the correct final answer. About 58% of students scored 3 marks for this question. Grade 4-5 calculation questions require either a unit change or a rearrangement of the equation.

Question 8 (Low and Standard demand)

08.1 Around 63% of students answered this question correctly.

08.2 Around 86% of students answered this question correctly. Some students gave a precaution instead of a risk, which was insufficient.

08.3 Around 62% of students answered this question correctly, demonstrating that students still confuse the terms resolution and range.

08.4 Around 96% of students answered this question correctly.

08.5 Many students failed to substitute correctly into the equation that was printed on the Physics Equations Sheet. Many students multiplied the 3 values given in the question, which scored zero marks. The unit mark was independent, but a large number of students failed to recognise the correct unit from the box. More than a third of students scored 4 marks and around 16% of students scored 3 marks. A quarter of students scored 1 mark for either the correct unit or the correct substitution.

Question 9 (Standard demand)

09.1 About 45% of students correctly identified the meaning of power input.

09.2 Only a quarter of students scored this mark. Students can recall the equation in any correct rearrangement. The stem of the question lists the quantities in alphabetical order, so that there is no suggestion of the correct order. Correct letters for quantities are acceptable in place of the quantity names. Voltage or p.d. were acceptable for potential difference.

09.3 Around 13% of students scored 3 marks and about 81% scored zero. Students found this question difficult to answer, presumably due to their inability to recall the correct equation in the preceding question.

09.4 More than half of students answered this correctly. Some students failed to score the mark by writing input for both the denominator and the numerator.

09.5 Students who successfully recalled the equation in **09.4** were likely to score all 3 marks for this question. Only around 15% of students scored zero.

09.6 Many students restated the stem, rather than going the extra stage in the reasoning and linking to efficiency because thermal energy is also transferred by the light bulb. A number of students believed that knowing the rate at which the bulbs emitted visible light was a

safety concern related to the household electrics. Only around 1% of students scored 2 marks, about 16% of students scored 1 mark and around 73% of students scored zero marks.

Question 10 (Standard demand)

10.1 This question produced a good spread of marks. A mean score of 2.1 was achieved by students on the Foundation tier. Students who had experience of a similar practical benefitted from this as they were able to describe a method in sufficient detail to achieve Level 2. To achieve Level 3, a student needed to indicate that several values of number of layers were used, referring to the interval of 8 layers (as the graph showed) or that the experiment should be done with no layers. A control variable was also needed, either the initial temperature of the water, or the volume of water in each experiment. Some students gained no credit by describing different required practical methods. Around 2% of students scored 6 marks, around 15% of students scored 4 marks and about a fifth of students scored 2 marks. Around 10% of students didn't attempt the question.

10.2 Many students stated that it wasn't necessary to use both as it would be confusing. The datalogger would produce too much data was a common insufficient answer. A number of students stated that using a normal thermometer would be more appropriate, scoring zero marks. Less than 1% of students scored 2 marks and less than a fifth of students scored 1 mark.

Question 11 (Standard demand)

11.1 Over two-fifths of students scored 3 marks for this question. It wasn't necessary to give the answer to an appropriate number of significant figures, so answers of 0.502, 0.50 and 0.5 were all creditworthy. Some students calculated the jump height to be unlikely values; students should be encouraged to consider whether it is likely that someone can jump a height of 4.92 m, a commonly seen answer achieved by multiplying the 2 values given (41 × 0.12). Less than half of the students scored zero marks.

11.2 A common incorrect answer was E_k = mass × speed, since these were the quantities given in the question. A number of students also left out the 0.5 value even if they remembered that speed should be squared. Velocity was allowed instead of speed in the equation. Correct symbols were acceptable for the quantities in the equation. About 30% of students answered this question correctly.

11.3 Despite being asked to recall the equation in 11.2, most students simply multiplied or divided the 2 values given in the question (3.0 and 270), scoring 0 marks. Only around 19% of students scored 3 marks.

11.4 Some students commented on muscle mass and strength which were insufficient to score marks. Clear comparisons, including at least one difference and one similarity, were needed to score 4 marks. This question discriminated well between students; around 6% of students scored 4 marks, around 29% of students scored 2 marks and around 13% of students scored zero.

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11.5 Some students failed to score a mark because they simply restated the question, 'the scientist wanted the highest muscle power reading' without adding any value. The answer either needed to refer to the effect of repetition on performance (improvement or worsening) or that it was the maximum (or peak) muscle power that the scientist was investigating. A fifth of students answered this question correctly.

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Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

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