
GCSE SCIENCE A / PHYSICS

PH1FP

Mark scheme

4405/4403

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Version: 1.0 Final

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

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 / ; e.g. 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.

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

Candidate	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)

Candidate	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, 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, 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 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 Ignore / Insufficient / Do not allow

Ignore or 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.

Quality of Written Communication and levels marking

In Question 9 candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

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

Level 1: basic

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

Level 2: clear

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

Level 3: detailed

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

Question	Answers	Extra information	Mark	AO spec ref
1(a)(i)	electrical	correct order only	1	AO1 1.2
	kinetic		1	
	sound		1	
1(a)(ii)	transferred into surroundings / atmosphere	accept warms the surroundings allow released into the environment becomes heat or sound is insufficient	1	AO1 1.2.1c
1(b)	0.7 / 70 %	an answer of 70 without % or with the wrong unit or 0.7 with a unit gains 1 mark	2	AO2 1.2.1d
Total			6	

Question	Answers	Extra information	Mark	AO spec ref
2(a)(i)	A		1	AO2 1.5.3b
2(a)(ii)	B		1	AO2 1.5.3b
2(b)	340	allow 1 mark for correct substitution ie 850×0.4 provided no subsequent step shown	2	AO1 AO2 1.5.1j
	metres/second	accept m/s	1	
2(c)	higher than		1	AO1 1.5.4a
	shorter than		1	
Total			7	

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	

Question	Answers	Extra information	Mark	AO spec ref
4(a)(i)	<u>water</u>	accept boiled or turned to steam do not accept evaporated	1	AO1 1.4.1d
	heated		1	
	<u>generator</u>		1	
4(a)(ii)	geothermal power stations provide a reliable source of electricity		1	AO1 1.4.1d
4(b)	falling water		1	AO1 1.4.1b
Total			5	

Question	Answers	Extra information	Mark	AO spec ref
5(a)(i)	any two from: <ul style="list-style-type: none"> • mass (of block) • starting temperature • final / increase in temperature • voltage / p.d. • power (supplied to each block) • type / thickness of insulation 	accept weight for mass } temperature is insufficient same power supply insufficient same insulation insufficient	2	AO2 4.3.2a
5(a)(ii)	one of variables is categoric or (type of) material is categoric	accept the data is categoric accept a description of categoric do not accept temp rise is categoric	1	AO3 4.4.2c
5(a)(iii)	concrete (heater on for) longest / longer time	reason only scores if concrete chosen a long time or quoting a time is insufficient do not accept it is the highest bar	1 1	AO2 AO3 1.3.1c
5(a)(iv)	4500 (J)	allow 1 mark for correct substitution ie $2 \times 450 \times 5$ provided no subsequent step shown	2	AO2 1.1.4d

Question 5 continues on the next page . . .

Question 5 continued . . .

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

Question	Answers	Extra information	Mark	AO spec ref
6(a)	decreases increases	correct order only	1 1	AO1 1.5.1e
6(b)	absorbed	makes the glass warmer is insufficient (energy) is wasted is insufficient	1	AO3 1.5.1
6(c)(i)	intensity (of transmitted light) depends on thickness or to enable a valid comparison or it is a control variable	accept absorption depends on thickness it would affect the results is insufficient fair test is insufficient	1	AO3 1.5.1
6(c)(ii)	transmits the least light or absorbs the most light	accept very little light is transmitted do not accept transmits none of the light do not accept absorbs all of the light any reference to heat negates this mark	1	AO3 1.5.1
Total			5	

Question	Answers	Extra information	Mark	AO spec ref
7(a)	advantage any one from: <ul style="list-style-type: none"> produce no / little greenhouse gases / carbon dioxide 	allow produces no / little polluting gases allow doesn't contribute to global warming / climate change allow produce no acid rain / sulphur dioxide reference to atmospheric pollution is insufficient produce no harmful gases is insufficient	1	AO1 1.4.1a
	<ul style="list-style-type: none"> high(er) energy density in fuel long(er) operating life disadvantage any one from: <ul style="list-style-type: none"> produce (long term) radioactive waste accidents at nuclear power stations may have far reaching or long term consequences high(er) decommissioning costs long(er) start up time 	accept one nuclear power station produces as much power as several gas power stations nuclear power stations can supply a lot of or more energy is insufficient allow saves using reserves of fossil fuels or gas accept waste is toxic accept nuclear for radioactive accept high(er) building costs	1	

Question 7 continues on the next page . . .

Question 7 continued . . .

Question	Answers	Extra information	Mark	AO spec ref
7(b)(i)	12 000 (kWh)	allow 1 mark for correct substitution eg 2000×6 or $2\,000\,000 \times 6$ or $\frac{12\,000\,000}{1000}$ an answer of 12 000 000 scores 1 mark	2	AO2 1.3.1c
7(b)(ii)	any idea of unreliability, eg <ul style="list-style-type: none"> wind is unreliable shut down if wind too strong/weak wind is variable 	reference to weather alone is insufficient	1	AO1 1.4
7(c)	any one from: <ul style="list-style-type: none"> cannot be seen no hazard to (low flying) aircraft / helicopters unlikely to be or not damaged / affected by (severe) weather (normally) no / reduced shock hazard 	unlikely to be damaged is insufficient safer is insufficient less maintenance is insufficient installed in urban areas is insufficient	1	AO1 1.4
Total			6	

Question	Answers	Extra information	Mark	AO spec ref
8(a)	infrared / IR	correct answer only	1	AO1 1.1.1a
8(b)	any two from: <ul style="list-style-type: none"> increase the power / watts decrease the speed put biscuits through again 	<p>allow increase the temperature of the oven or make the oven hotter</p> <p>allow leave the biscuits in for longer</p> <p>increase radiation is insufficient ignore changes to the design of the oven</p>	2	AO2 1.3.1c
8(c)	<p>(inside) surface is a (good) reflector or poor absorber (of IR)</p> <p>(and) <u>outside</u> surface is poor emitter (of IR)</p> <p>(so) increases the energy reaching the biscuits</p>	<p>Ignore bounce for reflect</p> <p>surface is a (good) reflector of light does not score</p> <p>surface is a (good) reflector of light and infrared / heat does score</p> <p>allow reduces energy loss or makes oven more efficient do not accept no energy losses keeps oven hotter is insufficient</p>	<p>1</p> <p>1</p> <p>1</p>	AO1 1.1.1c, d
Total			6	

Question	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.		Mark	AO spec ref
9			6	AO1 1.1.2a
0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)	
No relevant content.	<p>Considers either solid or gas and describes at least one aspect of the particles.</p> <p>or</p> <p>Considers both solids and gases and describes an aspect of each.</p>	<p>Considers both solids and gases and describes aspects of the particles.</p> <p>or</p> <p>Considers one state and describes aspects of the particles and explains at least one of the properties.</p> <p>or</p> <p>Considers both states and describes an aspect of the particles for both and explains a property for solids or gases.</p>	<p>Considers both states of matter and describes the spacing and movement / forces between the particles. Explains a property of both solids and gases.</p>	
examples of the points made in the response <p>Solids</p> <ul style="list-style-type: none"> • (particles) close together • (so) no room for particles to move closer (so hard to compress) • vibrate about fixed point • strong forces of attraction (at a distance) • the forces become repulsive if the particles get closer • particles strongly held together/not free to move around (shape is fixed) <p>Gases</p> <ul style="list-style-type: none"> • (particles) far apart • space between particles (so easy to compress) • move randomly • negligible/no forces of attraction • spread out in all directions (to fill the container) 			extra information <p>any explanation of a property must match with the given aspect(s) of the particles.</p>	
Total				6