



GCSE

Physics/Science A (Route 1)

PH1FP

Final Mark scheme

4403/4405

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Version/Stage: v1.0

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

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 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.

4. Quality of Communication and levels marking

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

Students will be required to:

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

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

Level 1: basic

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

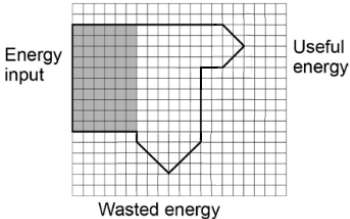
Level 2: clear

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

Level 3: detailed

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

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	<p>correct arrow widths 4 squares and 6 squares</p> <p>correct labels of useful and wasted energy</p> 		<p>1</p> <p>1</p>	AO1 1.2HSW
2(b)	a high proportion of the energy output is useful		1	AO1 1.2HSW
2(c)	720 000 (J)	<p>accept 720 kJ for 2 marks</p> <p>allow 1 mark for correct substitution provided no subsequent step ie $E = 200 \times 3600$</p>	2	AO2 1.3.1c
2(d)	<p>any two from:</p> <ul style="list-style-type: none"> • greater input • takes less time to charge • energy sources are renewable • can be used in remote location • no carbon dioxide released or greenhouse gases or doesn't contribute to global warming • no fuel / running cost • wind turbine can recharge the batteries at night • when it isn't windy, solar cells can recharge batteries 	more efficient is insufficient	2	AO3 1.3HSW 1.4HSW
Total			7	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	wavelength = N		1	AO1 1.5.1i
3(a)(ii)	amplitude = L		1	AO1 1.5.1i
3(b)	B		1	AO1 1.5.1e
3(c)(i)	equal to	accept the same as	1	AO1 1.5.2b
3(c)(ii)	the laser light is absorbed (by burglar's clothing) or the laser light is reflected (in a different direction)		1	AO2 1.5.1g
Total			5	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	transformers and power cables		1	AO1 1.4.2a
4(b)	any one from: <ul style="list-style-type: none"> • (more) difficult to repair / replace • (more) expensive to install / repair • (more) difficult to identify a break • potential hazard if dug up 	ignore damage to (animal) habitats	1	AO1 1.4
4(c)	voltage current efficiency		1 1 1	AO1 1.4.2b
4(d)	2850 (p)	accept £28.50 allow 1 mark for showing 190	2	AO2 1.3.1d
Total			7	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	expands	accept rises	1	AO1 1.1.3a
	dense		1	
	rises	accept moves	1	
	current		1	
		an answer of rises scores only once for either the first or third blank		
5(b)	any two from: <ul style="list-style-type: none"> • shape • surface area • room temperature • (surface) colour • thickness of material • how good an insulator it is 	ignore temperature of water ignore size accept if it has a cover	2	AO1 AO3 1.1.3c
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	(the speed of sound is) lower	accept converse	1	AO2 1.5
6(b)	336	accept 340 allow 1 mark for correct substitution ie 800×0.42 provided no subsequent step	2	AO1 AO2 1.5.1j
	m/s		1	
6(c)	less than		1	AO1 1.5.3b
	same as		1	
	same as		1	
6(d)	echo		1	AO1 1.5.3c
6(e)	Sound waves are longitudinal waves.		1	AO1 1.5 1.1.3c
	Sound waves transfer energy.		1	
Total			10	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	any two from: <ul style="list-style-type: none"> length / area / size / shape of turbine blades wind speed angle of blades / hairdryer 	ignore mass / weight / number of turbine blades ignore material of turbine blades accept distance / position of hairdryer allow power setting on hairdryer ignore speed of the turbine spinning	2	AO3 1.4.1b
7(b)(i)	3 points plotted correctly	allow 1 mark for 1 or 2 points plotted correctly ignore any line of best fit drawn	2	AO2 1.4.1b
7(b)(ii)	random (error)	ignore reference to anomaly	1	AO3 1.4.1b
7(b)(iii)	zero output voltage with 1 blade (as number of blades increases) output voltage increases	accept turbine didn't rotate with 1 turbine blade accept (as number of blades increases) speed increases do not accept direct proportion	1 1	AO3 1.4.1b
7(c)	any two from: <ul style="list-style-type: none"> output voltage / power (required) mass / weight / material / area / size / shape / length of blades height / position / location of turbine cost to construct turbine environmental impact of wind turbine 	ignore reference to efficiency ignore number of blades unqualified allow payback time accept reference to noise / visual pollution	2	AO3 1.4.1b
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	Doppler		1	AO1 1.5.4a
8(b)(i)	A frequency has increased	accept frequency is higher (compared to the emitted frequency) accept wavelength has decreased reason only scores if A is chosen	1 1	AO2 AO3 1.5.4a
8(b)(ii)	C greater change in frequency	accept greater change in wavelength reason only scores if C chosen	1 1	AO2 AO3 1.5.4a
Total			5	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9	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	AO1 AO2 AO3 1.1.1cde
0 marks		Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant information		A description of how at least one feature makes design A better than design B.	A basic explanation in terms of physical processes of how some features of design A make it better than design B.	A clear and correct explanation in terms of physical processes, including direct comparisons, of how most features of design A make it better than design B.
examples of physics points made in the response colour of pipe: <ul style="list-style-type: none">• black (pipe) surface is a good absorber of IR radiation / energy material of pipe: <ul style="list-style-type: none">• metal pipes are good conductors or <ul style="list-style-type: none">• metal pipes are better conductors than plastic pipes• higher rate of energy transfer through metal pipe colour of surface: <ul style="list-style-type: none">• (inside of solar panel is) white / shiny surface which is a good reflector of IR radiation to the pipe• (inside of solar panel is) white / shiny surface which is a poor absorber of IR radiation Insulation: <ul style="list-style-type: none">• layer of insulation reduces conduction through base of solar panel length of pipe / surface area of pipe: <ul style="list-style-type: none">• water is in solar panel for longer time• water absorbs more energy• pipe absorbs more IR design A has a greater water temperature increase (could be linked to any feature)			extra information accept converse answers in terms of why design B is worse than design A allow heat / radiation for IR throughout	
Total				6