GCSE
Physics

8463/1F – PAPER 1 – FOUNDATION TIER

Mark scheme

8463

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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.

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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
- 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 and underlining

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 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]

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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

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 ecf 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 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore 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.

3.10 Do <u>not</u> accept

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

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

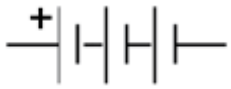
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Answers	Extra information	Mark	AO/ Spec. Ref
01.1	chemical kinetic	in this order only	1 1	AO1 4.1.1.1
01.2	$E_k = 0.5 \times 80 \times 12^2$ $E_k = 5760$ (J)	an answer of 5760 (J) scores **2** marks	1 1	AO2 4.1.1.2
01.3	E = 0.040 × 480 × 50 E = 960 (J)	an answer of 960 (J) scores **2** marks	1 1	AO2 4.1.1.3
01.4	increased		1	AO1 4.3.2.1
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	0.08 (s)		1	AO3 4.2.1.3
02.2	the current goes higher than normal value **or** the current goes higher than 1.5 A	allow the current goes (too) high	1	AO1 4.2.1.3
02.3	P = 1.5 × 24 P = 36 (W)	an answer of 36 (W) scores **2** marks	1 1	AO2 4.2.4.1
02.4	LED lamps waste a smaller proportion of the input energy than filament lamps		1	AO1 4.1.2.2
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	correct circuit symbol 3 cells joined in series in correct orientation eg 	 ignore absence of + symbol	1 1	AO1 4.2.1.1
03.2	$R = \frac{12}{1.6}$ R = 7.5 (Ω)	an answer of 7.5 (Ω) scores **2** marks	 1 1	AO2 4.2.1.3
03.3	4.0 (Ω)	allow their answer to question **03.2** − 3.5 correctly calculated	1	AO2 4.2.2
03.4	it decreases the current would be higher (for the same p.d.) **or** more than one path for charge to flow **or** total resistance is always less than the smallest individual resistance	 reason only scores if correct box is chosen allow current for charge	1 1	AO1 4.2.2
Total			**7**	

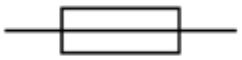
Question	Answers	Mark	AO / Spec. Ref.
04.1	**Level 2:** The method would lead to the production of a valid outcome. Key steps are identified and logically sequenced.	3–4	AO1 4.3.1.1
	Level 1: The method would not necessarily lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • part fill a measuring cylinder with water • measure initial volume • place object in water • measure final volume • volume of object = final volume – initial volume • fill a displacement / eureka can with water • water level with spout • place object in water • collect displaced water • measuring cylinder used to determine volume of displaced water		

04.2	density = $\frac{48.6}{18.0}$ density = 2.70 (g/cm^3)	an answer of 2.70 (g/cm^3) scores **2** marks	1 1	AO2 4.3.1.1
04.3	limestone		1	AO3 4.3.1.1
04.4	eye position when using measuring cylinder **or** water level in can (at start) not at level of spout **or** not all water displaced by stone is collected in container		1	AO3 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	volume would be lower / higher		1	AO3 4.3.1.1
Total			**9**	

Question	Answers		Mark	AO / Spec. Ref.
05.1	B	reason only scores if B is chosen	1	AO1 4.4.1.2
	americium has an atomic number of 95	allow proton number for atomic number allow B has a different atomic number allow B has an atomic number of 94	1	AO3 4.4.1.2
05.2	430 (years)	allow an answer between 420 and 440 (years)	1	AO2 4.4.2.3
05.3	430 (years) **or** their answer to question **05.2**	allow an answer between 420 and 440 (years)	1	AO1 4.4.2.3
Total			**4**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	nucleus neutron gamma rays	in this order only	1 1 1	AO1 4.4.4.1
06.2	$\frac{25\,000\,000}{2\,400\,000}$ 11	an answer of 11 scores **2** marks an answer of 10.4 with no working scores **1** mark	1 1	AO2 4.1.3
06.3	any **two** from: • waste is radioactive • waste has a long half-life • waste is toxic • waste needs to be buried • risk of catastrophic accidents • fuel is non-renewable	allow nuclear waste allow waste remains dangerous for a long time allow waste is difficult to dispose of allow named accident eg Fukushima, Chernobyl, Three Mile Island	2	AO1 4.1.3
06.4	**similarity:** (carbon dioxide concentration and global temperature have) both increased **difference:** the carbon dioxide (concentration) continues to increase whereas temperature (increase) levels off	allow they both show a positive correlation allow carbon dioxide (concentration) increases more quickly than temperature (increase)	1 1	AO3 4.1.3
Total			**9**	

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**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	higher		1	AO2 4.1.2.1
08.2	low(er) hot(ter)	 allow warm(er)	1 1	AO1 4.1.2.1
08.3	advantage: • water heated continuously (by the Sun) **one** disadvantage from: • temperature of water is lower (for most of the time than water heated by immersion heater) • water may not be hot enough • it takes longer to heat the water	 allow less control over water temperature	 1 1	AO3 4.1.3
08.4	$\frac{4\ 030\ 000}{4\ 070\ 000}$ 0.99	an answer of 0.99 scores **2** marks allow an answer that rounds to 0.99 for **2** marks an answer of 99% scores **2** marks an answer of 99 or 0.99% scores **1** mark	 1 1	AO2 4.1.2.2
08.5	power = energy transferred / time	allow P = E / t	1	AO1 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6		an answer of 814 seconds scores **4** marks an answer of 13.57 minutes scores **4** marks		
	$5000 = \frac{4\ 070\ 000}{t}$		1	AO2 4.1.1.4
	$t = \frac{4\ 070\ 000}{5000}$		1	AO2 4.1.1.4
	t = 814		1	AO2 4.1.1.4
	seconds	other units of time must be consistent with numerical value	1	AO1 4.1.1.4
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	$P = \frac{120\ 000}{8.0}$ P = 15 000 (W)	an answer of 15 000 (W) scores **2** marks	1 1	AO2 4.1.1.4
09.2	energy is transferred in heating the surroundings friction causes energy to be transferred in non-useful ways		1 1	AO2 4.1.2.1
09.3	the switches are in parallel (so) closing either switch completes the circuit		1 1	AO2 4.2.1.1
09.4	gravitational potential energy = mass × gravitational field strength × height	allow E_p = m g h	1	AO1 4.1.1.2
09.5	E_p = 280 × 9.8 × 14 E_p = 38 416 (J) E_p = 38 000 (J)	an answer of 38 000 scores **3** marks an answer that rounds to 38 000 scores **2** marks	1 1 1	AO2 4.1.1.2
Total			**10**	

Question	Answers	Extra information	Mark	AO/ Spec. Ref
10.1	transfer of <u>electrons</u>	mention of positive charge moving negates both marks	1	AO1 4.2.5.1
	from the carpet to the student		1	
10.2	three arrows perpendicular to sphere's surface with all arrows directed inwards and distributed evenly around sphere		1	AO1 4.2.5.2
10.3	there is a potential difference between the student and the tap	do **not** accept the tap / sink is charged	1	AO1 4.2.1.2 4.2.1.3
	which causes electrons / charges to transfer from the student **or** which causes electrons / charges to transfer to the tap		1	4.2.5.1
	which earths the charge	allow the tap is earthed	1	
10.4	carpet / copper has a low resistance	allow carpet is a conductor **or** copper is a conductor	1	AO3 4.2.5.1 4.2.1.3
	lower / no build-up of charge (on the student) **or** (so there is a) smaller / no potential difference between student and tap / earth		1	
Total			**8**	

Question	Answers	Extra information	Mark	AO/ Spec. Ref
11.1	count rate = $\frac{819}{60}$ count rate = 13.65 corrected count rate = 13.35 (per second)	an answer of 13.35 (per second) scores **3** marks an answer of 13.95 (per second) scores **2** marks an answer of 801 (per second) scores **2** marks allow an answer of background = 0.30 × 60 = 18 (per minute) corrected count rate = 819 – 18 corrected count rate = 801 per minute	1 1 1	AO2 4.4.2.1 4.4.3.1
11.2	activity = 1250 × 180 activity = 225 000 (Bq)	an answer of 225 000 (Bq) scores **2** marks	1 1	AO2 4.4.2.1
11.3	yearly dose = 0.003 × 365 which is << 100 (mSv) **or** (well) below the lowest dose with evidence of causing cancer / harm	allow yearly dose = 1.095 (mSv)	1 1	AO3 4.4.3.1

Question	Answers	Extra information	Mark	AO/ Spec. Ref
11.4	people are able to compare a radiation risk / dose / hazard to the radiation dose from (eating) bananas		1	AO3 4.4.3.1
Total			**8**	

Question	Answers	Extra information	Mark	AO/ Spec. Ref
12.1	ammeter and voltmeter symbols correct voltmeter in parallel with wire ammeter in series with wire		1 1 1	AO1 4.2.1.1 4.2.1.3
12.2	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO1 4.2.1.3
	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 • length measured • length varied • current measured • potential difference measured • repeat readings • calculate resistance for each length • resistance = $\frac{\text{potential difference}}{\text{current}}$ • plot a graph of resistance against length • hazard: high current • may cause wire to melt / overheat • may cause burns (to skin) • use low currents			

Question	Answers	Extra information	Mark	AO/ Spec. Ref
12.3	the temperature of the wire would not change		1	AO3 4.2.1.3
12.4	the accuracy of the student's results would be higher the resolution of the length measurement would be higher		1 1	AO3 4.2.1.3
Total			**12**	