AQA

GCSE
PHYSICS
8463/1F

Paper 1 Foundation Tier

Mark scheme

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Version: 1.0 Final Mark Scheme

2 1 6 G 8 4 6 3 / 1 F / M S

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 Examiner.

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
- the Assessment Objectives, level of demand 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 not 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.

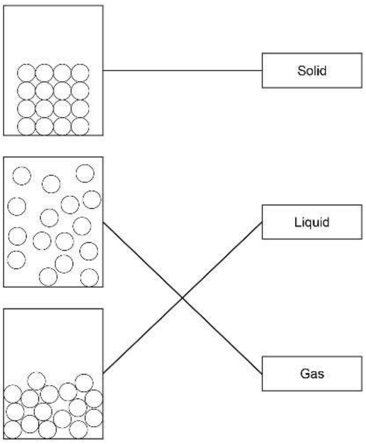
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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 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**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	A: transmission / power cables	allow transmission / power lines allow cables ignore wires	1	AO1 4.2.4.3
	B: <u>step-down transformer</u>		1	
02.2	less thermal energy is transferred to the surroundings.		1	AO1 4.2.4.3
02.3	charge flow = $\frac{500\ 000\ 000}{25\ 000}$		1	AO2 4.2.4.2
	charge flow = 20 000 (C)		1	
02.4	total current = 7.20 (A)		1	AO2 4.2.4.1
	P = 230 × 7.20	allow a correct substitution of an incorrect total current	1	
	P = 1656 (W)	allow a correct calculation using an incorrect total current	1	
02.5	dishwasher		1	AO3 4.2.4.1 4.2.4.2
	has the largest current **or** has the largest power (input)		1	
02.6	E = 600 × 32 000 000		1	AO2 4.1.1.4
	E = 19 200 000 000 (J) **or** E = 1.92 × 10^{10} (J)		1	
Total			**12**	

Question 3

Question	Answers		Mark	AO/ Spec. Ref
03.1	**Level 2**: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.		3–4	AO1 4.3.1.1 RPA5
	Level 1: The method would not necessarily lead to a valid outcome. Some steps are identified, but the method is not fully logically sequenced.		1–2	
	No relevant content		0	
	Indicative content • use a eureka/displacement can • fill the eureka/displacement can with water • fill the eureka/displacement can up to the spout • place lime in eureka/displacement can • collect water that overflows • use a measuring cylinder to measure volume of water **OR** • use a measuring cylinder • part fill the measuring cylinder with water • measure the initial volume of water • place lime in measuring cylinder • record new volume of water • volume of lime = new volume – initial volume			
03.2	mean = $\frac{(2.1+2.1+2.4)}{3}$		1	AO2 4.3.1.1 RPA5
	mean = 2.2 (cm^3)		1	
03.3	allows anomalous results to be identified and ignored		1	AO1 4.3.1.1 RPA5
	reduces the effect of random errors when using the equipment		1	

03.4	density = $\frac{84}{120}$		1	AO2 4.3.1.1 RPA5
	density = 0.70 (g/cm^3)		1	

Total			**10**	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	increased decreased stayed the same		1 1 1	AO3 4.2.1.3 4.2.2
04.2	random error		1	AO3 4.2.1.3 4.2.2
04.3	$A_2 = 0.12$ (A) $A_5 = 0.36$ (A)		1 1	AO1 4.2.2
04.4	$P = 0.12^2 \times 15$ $P = 0.216$ (W)		1 1	AO2 4.2.4.1
Total			**8**	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	atomic number		1	AO1 4.4.1.2
05.2	number of neutrons		1	AO1 4.4.1.2
05.3	Alpha		1	AO3 4.4.2.2 4.4.2.1
05.4	Beta		1	AO3 4.4.2.2
05.5	decrease increase	this order only	1 1	AO3 AO1 4.4.2.1
05.6	the time it takes for the count rate of a sample to halve		1	AO1 4.4.2.3
05.7	so the activity of the source is approximately constant		1	AO3 4.4.2.3
Total			**8**	

Question 6

Question	Answers	Extra information	Mark	AO/ Spec. Ref
06.1	(fixed) solar cells aren't always pointed (directly) at the Sun **or** (fixed) solar cells don't track the Sun (through the sky)		1	AO3 4.1.3
	(fixed) solar cells don't (always) receive maximum intensity of solar radiation	allow solar cells won't receive as much (solar) energy allow solar cells won't generate as much electricity	1	
06.2	Q = 3.5 × 3600		1	AO2 4.2.1.2
	Q = 12 600 (C)		1	
06.3	$\text{efficiency} = \dfrac{\text{useful power output}}{\text{total power input}}$		1	AO1 4.1.2.2
06.4	$0.16 = \dfrac{\text{useful power output}}{7500}$		1	AO2 4.1.2.2
	useful power output = 0.16 × 7500		1	
	useful power output = 1200 (W)		1	
06.5	the energy becomes less useful		1	AO1 4.1.2.1
06.6	a very large area would need to be covered with solar cells		1	AO3 4.1.3
Total			**10**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	gravitational potential kinetic	this order only	1 1	AO1 4.1.1.2 4.1.1.1
07.2	kinetic energy = 0.5 × mass × speed^2 **or** $E_k = ½mv^2$		1	AO1 4.1.1.2
07.3	$5040 = 0.5 \times m \times 12^2$ $m = \frac{5040}{0.5 \times 12^2}$ m = 70 (kg)		1 1 1	AO2 4.1.1.2
07.4	the thermal energy increases.		1	AO1 4.1.1.1
Total			**7**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	0 to 25 cm^3		1	AO2 4.3.3.2
08.2	temperature		1	AO1 4.3.3.2
08.3	101 000 × 12 = constant constant = 1 212 000 (Pa cm^3)		1 1	AO2 4.3.3.2
08.4	p × 24 = 1 212 000 $p = \frac{1\,212\,000}{24}$ p = 50 500 (Pa)	allow ecf from question **08.3**	1 1 1	AO2 4.3.3.2
08.5	there is more space between the gas particles		1	AO1 4.3.3.2
Total			**8**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	the polarity (of the supply) does not change	allow potential difference in one direction (only)	1	AO1 4.2.3.1
09.2	energy transferred = power × time		1	AO1 4.1.1.4 4.2.4.2
09.3	162 000 000 = 7200 × t $t = \frac{162\ 000\ 000}{7200}$ t = 22 500 (s)		1 1 1	AO2 4.1.1.4 4.2.4.2
09.4	$V = I \times R$		1	AO1 4.2.1.3
09.5	480 = 15 × R $R = \frac{480}{15}$ R = 32 (Ω)		1 1 1	AO2 4.2.1.3
09.6	time taken using system **A** is double the time of system **B**		1	AO3 4.2.4.1
Total			**10**	

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	nuclei decreases	do not accept atoms	1 1	AO1 4.4.4.2
10.2	m = 0.004 (kg) E = 0.004 × 5200 × 50 000 000 E = 1.04×10^9 (J) **or** E = 1 040 000 000 (J)	 allow a correct substitution of an incorrectly/not converted value of m allow a correct calculation using an incorrectly/not converted value of m	1 1 1	AO2 4.3.2.2 4.1.1.3
10.3	any **two** from: • to make sure the fusion process is possible • to develop an understanding of the process • to make adaptations to the process • to assess the efficiency of the process • to make predictions • assess safety risks • to assess environmental impact • set-up cost is lower (for small scale experiments)		2	AO3 4.1.3

10.4	releases carbon dioxide which causes global warming **OR** releases particulates which causes global dimming **or** which causes breathing problems **OR** releases sulfur dioxide which causes acid rain **OR** releases nitrogen oxides which causes breathing problems **or** which causes acid rain	allow releases greenhouse gases allow which causes climate change	1 1	AO1 4.1.3

Total			**9**	

Question 11

Question	Answers	Mark	AO/ Spec. Ref
11.1	**Level 3**: The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.2.1.4 RPA4
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan 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 current in **R** using the ammeter • measure the p.d. across **R** using the voltmeter • vary the resistance of the variable resistor (or vary the number of cells or use a variable power supply) • record a range of values of current and p.d. • ensure current is low to avoid temperature increase • switch circuit off between readings • reverse connection of **R** to power supply • repeat measurements of I and V in negative direction • plot a graph of current against p.d.		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
11.2	current and p.d. would not be directly proportional **or** I-V graph would not be straight **or** I-V graph would be curved		1	AO3 4.2.1.4 RPA4
	(because) resistance of **R** would increase		1	
11.3	0.2 (A)		1	AO3 4.2.2 RPA4
11.4	any **one** from: • less chance of misreading • no parallax error • it can give a reading closer to the true value	allow position of eye(s) does not affect reading allow 'it is more accurate' ignore 'no human error' ignore 'easier to read'	1	AO3 4.2.2 RPA4
Total			**10**	