AQA

GCSE
PHYSICS
8463/1H

Paper 1H

Mark scheme

Specimen (set 2)

Version: 1.1

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Please be aware that not all schools and colleges will be using these tests at the same time.

Help us to maintain the security of these papers by ensuring they are not distributed on social media or other platforms.

Important – please note

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers.

It must be stressed that a mark scheme is a working document. This mark scheme has **not** been through the full standardisation process. 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.

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.

The Information to Examiners is included as a guide to how the mark scheme will function as an operational document.

The layout has been kept consistent so that future operational mark schemes do not appear different from these test materials.

If the printing process in your school alters the scale of a diagram, measure the values on your printed papers and mark the scripts accordingly.

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 <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. / Demand
01.1	kinetic energy = 0.5 × mass × speed^2	allow $E_k = 1/2\ mv^2$	1	AO1 4.1.1.2 Standard
01.2	$E_k = 0.5 \times 0.058 \times 5^2$ $E_k = 0.725$ (J)	an answer of 0.725 (J) scores **2** marks	1 1	AO2 4.1.1.2 Standard
01.3	0.725 (J)	allow ecf from **01.2** allow the same amount of E_k as at A	1	AO1 4.1.1.2 Standard
01.4	gravitational potential energy = mass × gravitational field strength × height	allow $E_p = mgh$	1	AO1 4.1.1.2 Standard
01.5	$0.38 = 0.058 \times 9.8 \times h$ $h = \frac{0.38}{(0.058 \times 9.8)}$ h = 0.67 (m)	an answer that rounds to 0.67 scores **3** marks	1 1 1	AO2 4.1.1.2 Standard
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	minimum distance between wind turbines is at least 500 m in all directions	turbines can rotate to face into wind and still maintain the minimum distance	1	AO3 4.1.3 Standard
02.2	density = mass/volume	accept ρ = m / V	1	AO1 4.3.1.1 Standard
02.3	$1.2 = \frac{51\,000}{V}$ $V = \frac{51\,000}{1.2}$ V = 42 500 V = 43 000 m^3	an answer of 43 000 scores **4** marks an answer of 42 500 scores **3** marks	1 1 1 1 1	AO2 4.3.1.1 Standard
02.4	$2.4 \times 10^9 / 1.6 \times 10^6$ 1500		1 1	AO2 4.1.3 Standard
02.5	wind power is unreliable (very) large numbers of wind turbines would need to be constructed	allow calculation of this (15 625)	1 1	AO1 AO2 4.1.3 Standard
Total			**11**	

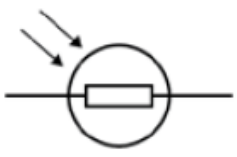
Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	apparatus diagram to show: • aluminium block (surrounded by insulation) • thermometer and immersion heater inside (or in contact with) aluminium • joulemeter connected to immersion heater **or** ammeter and voltmeter connected correctly around immersion heater	full credit can be given for a correct alternative method ignore position or absence of stopclock ignore position or absence of electric balance	1 1 1	AO1 RP1 4.1.1.3 Standard

03.2	**Level 3:** The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 RP1 4.1.1.3 Standard
	Level 2: The design/plan 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 design/plan 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 **measurements:** • energy (transferred) using joulemeter **or** ammeter, voltmeter and stopclock • mass using electric balance • temperature change using thermometer **SHC calculation:** E = mcθ **or** $c = \frac{E}{m\theta}$ **valid results:** • repeat practical and calculate a mean • plot a graph of temperature against time and use linear section of graph for temperature change • small (eg 10 °C) temperature change (so cylinder isn't significantly hotter than surroundings) **safety:** immersion heater gets very hot so avoid touching (heating element) with bare hand		

03.3	some thermal energy transferred to the surroundings (not to the metal block) (so) temperature increase not as high as it should be for the total energy transferred	accept not all of the energy (as measured by the joulemeter) is transferred to the block accept justification using the equation: $c = \frac{E}{m\theta}$	1 1	AO3 RP1 WS 2.7 4.1.1.3 Standard

Total			**11**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	a uranium <u>nucleus</u> absorbs a neutron (uranium-236 nucleus) splits into two smaller nuclei **or** Kr and Ba nuclei **or** krypton and barium nuclei and releases 3 neutrons and energy		1 1 1 1	AO1 AO2 4.4.4.1 Standard
04.2	light nuclei join to form a heavier nucleus (some of the) mass of the nuclei is converted to energy	 allow hydrogen nuclei for light nuclei allow helium nucleus for heavier nucleus allow particles for nuclei	1 1 1	AO1 4.4.4.2 Std./High
04.3	any **two** from: • easy to obtain / extract • available in (very) large amounts • releases more energy (per kg)	 do **not** accept figures **only** naturally occurring is insufficient seawater is renewable is insufficient less cost is insufficient allow produces little / no radioactive waste	2	AO3 4.4.4.1 Std./High
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	current		1	AO1 4.2.1.2 Standard
05.2	$4.2 = 3.5 \times 10^{-3} \times R$ $R = 4.2 / 3.5 \times 10^{-3}$ $R = 1200\ (\Omega)$	an answer of 1200 (Ω) scores **3** marks an answer of 1.2 scores **2** marks	 1 1 1	AO2 4.2.1.3 Std./High
05.3	conversion from minutes to seconds (300 s) $Q = 0.0035 \times (5 \times 60)$ $Q = 1.05$ C	an answer of 1.05 (C) scores **3** marks an answer of 17.5 scores **1** mark an answer of 1050 or 0.0175 scores **2** marks	1 1 1	AO2 4.2.1.2 Std./High
05.4	(potential difference) increases (because thermistor) resistance increases	 2nd mark dependent on scoring 1st mark	1 1	AO1 4.2.1.4 Std./High
05.5			1	AO1 4.2.1.1 Standard
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	most alpha particles pass straight through the atom which shows that the atom is mostly empty space very few alpha particles are deflected through a large angle which shows the atom contains a nucleus where the mass / charge of the atom is concentrated		1 1 1 1	AO1 AO2 4.4.1.3 Std./High High
06.2	electron may absorb electromagnetic radiation (and) move further from the nucleus to a higher energy level	full credit may be scored for a description of an electron emitting electromagnetic radiation	1 1 1	AO1 4.4.1.1 High
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	current at 0.5 V = 0.91 (A) P = 0.91 × 0.5 P = 0.455 (W)	an answer of 0.455 (W) scores **3** marks	1 1 1	AO2 4.2.4.1 Std./High
07.2	straight line with positive gradient positive y-axis intercept	allow for **1** mark a straight line that passes through (0.1, 0) ignore any values on y-axis	1 1	AO2 4.2.4.1 Std./High
07.3	$0.15 = \frac{0.52}{\text{total P}}$ total P = 3.47 (W) $\text{area} = \frac{3.47}{450}$ area = 7.7×10^{-3} (m^2)	an answer of 7.7×10^{-3} (m^2) scores **4** marks allow use of student's calculated incorrect total power for last 2 marking points	1 1 1 1	AO2 4.1.2.2 High
07.4	connect the solar cells in parallel (so that) the current has multiple paths it can take **or** the total resistance is less than the resistance of one solar cell		1 1	AO1 4.2.2 Std./High
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	80 (°C)		1	AO3 RP2 4.1.2.1 Standard
08.2	**C** temperature after 10 minutes was lowest **or** final temperature was lowest	 reason only scores if material **C** is chosen allow temperature after 10 minutes was lower	1 1	AO3 RP2 4.1.2.1 Standard
08.3	lower total temperature rise (for all materials) (because) the rate of temperature increase would be lower	allow lower final temperature (for all materials) allow lower gradient lines	1 1	AO3 RP2 4.1.2.1 Standard
08.4	higher resolution reduced risk of misreading instrument		1 1	AO3 RP2 4.1.2.1 Std./High
08.5	polyurethane foam (because it has the) lowest rate of energy transfer	no marks if polyurethane foam not chosen	1 1	AO3 AO1 RP2 4.1.2.1 Std./High
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
09.1	1 (cm^3)		1	AO3 4.3.3.2 Standard
09.2	pressure is inversely proportional to volume data to prove inversely proportional relationship	 eg 8 × 200 = 1600 and 10 × 160 = 1600 if no other marks score allow for **1** mark: as volume decreases pressure increases	1 2	AO3 4.3.3.2 Std./High High
09.3	(as the gas is compressed) the volume of gas decreases (so there are) more frequent collisions of gas particles with container walls (and) each particle collision with the wall causes a force (so there is a) greater force on walls		1 1 1 1	AO1 4.3.3.2 Std./High High
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
10.1	**Level 2:** Relevant reasons are identified, given in detail and logically linked to form a clear account.		3-4	AO3 AO1 4.1.3 Std./High
	Level 1: Relevant reasons are identified, and there are attempts at logically linking. The resulting account is not fully clear.		1-2	
	No relevant content		0	
	Indicative content **nuclear** • no carbon dioxide released (when generating electricity) **or** doesn't release greenhouse gases • reliable • high energy density • power stations already built • other power stations being built **wind** • no carbon dioxide released (when generating electricity) **or** doesn't release greenhouse gases • renewable energy resource • no fuel cost			
10.2	wind power is unreliable (so) will be unable to meet demand when wind speed is low **or** when there is no wind **or** unable to maintain base load at all times		1 1	AO1 4.1.3 Std./High

10.3	electricity generation will need to increase (to meet higher demand) (using) nuclear power **or** wind power **or** other renewables so that carbon dioxide emissions don't increase **or** reference to Paris Climate agreement		1 1 1	AO3 AO2 AO1 4.1.3 Std./High

Total			**9**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
11.1		an answer of 1500 (s) scores **3** marks		AO2 4.2.4.2 Std./High
	97 500 = 65.0 × t		1	
	$t = \frac{97\ 500}{65.0}$		1	
	t = 1500 (s)	an answer of 1.5 scores **2** marks	1	
11.2		an answer of 14 (A) scores **4** marks		AO2 4.2.4.1 4.2.2 High
	$19.6 = I^2 \times 1.60$		1	
	$I^2 = \frac{19.6}{1.60}$		1	
	I = 3.5 (A)	allow **1** mark for a correct value for I correctly multiplied by 4	1	
	current through battery = 14 (A)		1	
Total			**7**	