GCSE
PHYSICS
8463/1F

Paper 1F

Mark scheme

Specimen (set 2)

Version: 1.0

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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.

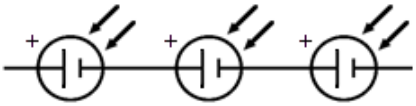
Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
01.1	0 to 25 cm^3		1	AO1 4.3.3.2 Low
01.2	control		1	AO2 WS2.2 4.3.3.2 Low
01.3	2 sets of data recorded from line of best fit to show that the product is the same in both cases (16 000)	allow for **1** mark one set of calculated data for one point on the line of best fit	2	AO2 4.3.3.2 Low
01.4	decreases increases increases		1 1 1	AO1 4.3.3.1 Low
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	to vary the current.		1	AO1 RP4 4.2.1.4 Low
02.2	the temperature of the filament increases	allow the filament heats up	1	AO1 RP4 4.2.1.4 Low
02.3	E = 12 × 8.5 E = 102 (J)	an answer of 102 (J) scores **2** marks	1 1	AO2 4.2.4.2 Low
02.4	(LED lamp) longer lifetime (per lamp) wastes less energy **or** lower input energy (for same light energy output)		1 1	AO2 WS1.4 4.1.2.2 Low
Total			**6**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	20 (°C)		1	AO2 RP2 4.1.2.1 Low
03.2	largest temperature increase	allow larger temperature increase	1	AO3 RP2 4.1.2.1 Low
03.3	insulation is thicker so temperature decrease will be lower (for all insulation types)		1 1	AO3 RP2 4.1.2.1 Low
03.4	higher lower		1 1	AO3 RP2 4.1.2.1 Low
03.5	polyurethane foam lowest thermal conductivity		1 1	AO3 AO1 RP2 4.1.2.1 Low
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	electrons		1	AO1 4.2.5.1 Low
04.2	a positive		1	AO1 4.2.5.1 Low
04.3	the forces are repulsive the forces are equal in size	allow the forces act in opposite directions allow the forces are the same (size)	1 1	AO1 4.2.5.1 Low
04.4	reproducible		1	AO1 WS3.7 4.2.5.1 Low
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	7		1	AO1 4.4.1.1 Low
05.2	3 number of <u>protons</u>	 reason only scores if 3 chosen	1 1	AO1 4.4.1.1 Low
05.3	levels		1	AO1 4.4.1.1 Low
05.4	$^{4}_{2}He$ $^{0}_{-1}e$	correct order only	1 1 1	AO1 4.4.2.2 Low
05.5	shorter half-life (than the other sources) exposure time to radiation is shorter		1 1	AO3 4.4.3.3 Low
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1			1	AO2 4.2.1.1 Low
06.2	current $= \frac{0.70}{2.5}$ current = 0.28 (A)	an answer of 0.28 (A) scores **2** marks	1 1	AO2 4.2.1.3 Low
06.3	0.60 (V) product of potential difference and current gives highest value		1 1	AO2 4.2.4.1 Low
06.4	efficiency $= \frac{\text{useful power output}}{\text{total power input}}$		1	AO1 4.1.2.2 Standard
06.5	$0.20 = \frac{\text{useful power output}}{2.4}$ useful power output = 0.20×2.4 useful power output = 0.48 (W)	an answer of 0.48 (W) scores **3** marks	1 1 1	AO2 4.1.2.2 Standard
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	gravitational potential kinetic chemical		1 1 1	AO1 4.1.1.1 Low
07.2	flying drones may damage aircraft **or** falling drones may injure people **or** damage buildings / vehicles	allow any sensible suggestion of a hazard caused by a flying / falling drone	1	AO3 WS1.3 Low
07.3	energy transferred = power × time	allow E = Pt	1	AO1 4.2.4.2 Standard
07.4	 t = 25 × 60 = 1500 (s) E = 65 × 1500 E = 97 500 (J)	an answer of 97 500 (J) scores **3** marks allow **2** marks for an answer of 1625 (J)	 1 1 1	AO2 WS 4.5 4.2.4.2 Standard
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	cosmic rays radon gas		1 1	AO1 4.4.3.1 Low
08.2	radioactive decay is a random process		1	AO1 4.4.2.3 Low
08.3	the lead lining absorbs the emitted radiation		1	AO3 Low
08.4	subtract the background count from 159		1	AO2 Low
08.5	beta beta is negatively charged (so is) attracted to positive plate **or** (so is) repelled by negative plate		1 1 1	AO2 AO3 4.4.2.1 4.2.5.1 Standard
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
09.1	changes	allow reverses	1	AO1 4.2.3.1 Low
09.2	dependent		1	AO2 4.2.4.2 Low
09.3	kettle **C** **or** 2.8 kW highest power (output)	 allow higher power (output)	1 1	AO3 4.2.4.2 Low
09.4	values for gradient calculation shown on graph or on answer lines power input = 3000 (W)		1 1	AO2 4.2.4.2 Low
09.5	charge flow = current × time	allow Q = It	1	AO1 4.2.1.2 Standard
09.6	 2400 = I × 250 $I = \frac{2400}{250}$ I = 9.6 (A)	an answer of 9.6 (A) scores **3** marks	 1 1 1	AO2 4.2.1.2 Standard
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
10.1	kinetic energy = 0.5 × mass × speed^2	allow $E_k = 1/2\ mv^2$	1	AO1 4.1.1.2 Standard
10.2	$E_k = 0.5 \times 0.058 \times 5^2$ $E_k = 0.725$ (J)	an answer of 0.725 (J) scores **2** marks	1 1	AO2 4.1.1.2 Standard
10.3	0.725 (J)	allow ecf from **10.2** allow the same amount of E_k as at A	1	AO1 4.1.1.2 Standard
10.4	gravitational potential energy = mass × gravitational field strength × height	allow $E_p = mgh$	1	AO1 4.1.1.2 Standard
10.5	$0.38 = 0.058 \times 9.8 \times h$ $h = \frac{0.38}{(0.058 \times 9.8)}$ 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
11.1	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
11.2	density = mass/volume	allow ρ = m / V	1	AO1 4.3.1.1 Standard
11.3	$1.2 = \frac{51\,000}{V}$ $V = \frac{51\,000}{1.2}$ $V = 42\,500$ $V = 43\,000$ 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
11.4	$2.4 \times 10^9 / 1.6 \times 10^6$ 1500	an answer of 1500 scores **2** marks	1 1	AO2 4.1.3 Standard
11.5	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
12.1	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

<table>
<tr><td rowspan="5">12.2</td><td>Level 3: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.</td><td>5–6</td><td rowspan="5">AO1
RP1
4.1.1.3
Standard</td></tr>
<tr><td>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.</td><td>3–4</td></tr>
<tr><td>Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.</td><td>1–2</td></tr>
<tr><td>No relevant content</td><td>0</td></tr>
<tr><td>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</td><td></td></tr>
</table>

12.3	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	allow not all of the energy (as measured by the joulemeter) is transferred to the block allow justification using the equation: $c = \frac{E}{m\theta}$	1 1	AO3 WS 2.7 RP1 4.1.1.3 Standard

Total			**11**