SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: TRILOGY

PAPER 5: PHYSICS 1F

Mark scheme

Specimen 2018

Version 1.0

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

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 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 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 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are 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 as well, will still mean that the mark is not awarded.

Level of response marking instructions

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 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. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in 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 and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 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	230 V		1	AO1/1 6.2.3.1
01.2	Earth Neutral	must be in the correct order	1 1	AO1/1 6.2.3.2
01.3	It is easy to identify each wire.		1	AO3/1a 6.2.3.2
01.4	current shock	must be in the correct order	1 1	AO1/1 6.2.3.2
01.5	50 Hz		1	AO1/1 6.2.3.1
01.6	output = 25 x 16 400 (kV)	allow 400 (kV) with no working shown for **2** marks	1 1	AO2/1 6.2.4.3
01.7	It reduces the energy lost due to heating		1	AO2/1 6.2.4.3
01.8	It is safer for consumers		1	AO2/1 6.2.4.3
Total			**11**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	The nucleus will emit a neutron.		1	AO1/1 6.4.2.1
02.2	**Similarity** same mass number **difference** different atomic number	allow same number of nucleons (protons + neutrons) allow different number of protons	1 1	AO1/1 6.4.2.2
02.3	Radioactive decay is random.		1	AO1/1 6.4.2.3
02.4	1.3 (billion years)	allow 1.2-1.4 (billion years) allow **1** mark for horizontal line drawn from ~ 550	2	AO2/1 6.4.2.3
02.5	alpha		1	AO1/1 6.4.2.1
Total			**7**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	1 x 10^{-10} m		1	AO1/1 6.4.1.1
03.2	(a helium atom) has 2 electrons	accept it has more mass allow it is not charged	1	AO2/1 6.4.1.1
03.3	2		1	AO2/1 6.4.1.2
03.4	neutral (because) protons have positive charge and electrons have negative charge (and) there are equal numbers of protons and electrons	accept 0 or 'no charge'	1 1 1	AO2/1 6.4.1.2
03.5	helium will one day run out there will be none left for medical uses so balloons waste helium		1 1	AO3/1b 6.4.1.2
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	thermometer stopclock/stopwatch	 accept measuring cylinder accept top pan balance	1 1	AO1/2 6.1.1.4 WS2.3
04.2	independent: type of oil dependent: temperature rise in °C		1 1	AO1/2 6.1.1.4 WS2.4
04.3	wear safety goggles oil not heated directly	 accept any reasonable comment about not handling hot apparatus.	1 1	AO1/2 6.1.1.4 WS2.4
04.4	repeat the experiment and calculate the mean temperature rise **OR** heat the oil for a longer period of time (1) to get a wider range of temperatures (1)		1 1	AO3/3b 6.1.1.4 WS2.7
04.5	(17 + 17 + 18) / 3 (= 17.33) temperature rise = 17 (°C)	accept 17 (°C) with no working shown for **2** marks allow 17.33 with no working shown for **1** mark	1 1	AO3/1a 6.1.1.4
04.6	E = 0.025 x 1800 x 20 (J) E = 900 (J) Joule	allow 900 without working shown for the **2** calculation marks	1 1 1	AO2/1 AO2/1 AO1/1 6.1.1.3
Total			**13**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	**Level 3:** A clear, logical explanation containing accurate ideas presented in the correct order with links between ideas.	5–6	6	2 AO2/1
	Level 2: Key ideas presented with some linked together to form a partial explanation.	3–4		2 AO2/1
	Level 1: Fragmented ideas, some may be relevant, insufficient links to form an explanation.	1–2		2 AO1/1 6.3.1.1 6.2.4.2
	No relevant content.	0		
	Indicative content • current in the wire causes heating • increases temperature of the metal wires / ice <u>Solid</u> • arrangement of particles is regular • particles vibrate about a fixed position <u>Melting</u> • internal energy of the ice increases, increasing the temperature to melting point • so (as the temperature increases) particles vibrate faster • eventually particles vibrate fast enough to break free from the (strong) bonds • therefore the arrangement of particles becomes irregular <u>Liquid</u> • arrangement of particles is irregular • particles movement (translational) is random			
05.2	The current in the heating element The mass of ice		1 1	AO3/3a 6.3.1.1
05.3	latent heat of fusion		1	AO1/1 6.3.2.3
05.4	45 / 120 = 0.375 0.38	allow 0.38 with no working shown for **2** marks allow 0.375 with no working shown for **1** mark	1 1	AO2/1 AO2/1 6.1.2.2
Total			**11**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	0.093 A		1	AO2/1 6.2.2
06.2	0.093 A		1	AO2/1 6.2.2
06.3	(increasing the resistance) decreases the current therefore (the lamp will be) dimmer		1 1	AO1/1 6.2.1.3
06.4	potential difference = current × resistance	accept correct rearrangement with R as subject	1	AO1/1 6.2.1.3
06.5	3.3 = 0.15 x R R = 3.3 / 0.15 (Ω) R = 22 (Ω)	allow 22 (Ω) without working shown for **3** marks	1 1 1	AO2/1 6.2.1.3
06.6	line drawn from the origin with a decreasing gradient.		1	AO1/1 6.2.1.4
Total			**9**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	the store of chemical energy (in the battery) decreases the internal energy of the surrounding air increases.	accept description of energy becoming less usefully stored for **2** marks	1 1	AO1/1 6.1.2.1
07.2	kinetic energy = ½ mass x velocity^2		1	AO1/1 6.1.1.2
07.3	$E_K = ½ \times 0.8 \times 12^2$ $E_K = 57.6$ (J)	allow 57.6 (J) without working shown for **2** marks	1 1	AO2/1 6.1.1.3
07.4	lower proportion of wasted energy higher proportion of energy is converted into <u>kinetic</u> energy	accept less energy is wasted accept more kinetic energy	1 1	AO2/1 6.1.2.1

Question	Answers	Mark	AO / Spec. Ref.
7.5	**Level 2:** A relevant and coherent argument which demonstrates processing and numerical analysis of the information presented and draw a conclusion which is logically consistent with the reasoning and refers to payback time for the vehicles.	3–4	AO3/2b 6.1.3
	Level 1: Simple comparisons are made which demonstrate a basic ability to numerically analyse the information presented. The conclusion, if present, may not be consistent with the calculations.	1–2	
	No relevant content	0	
	Indicative content • The electric car costs £12 000 more to buy • Running cost of electric car = £3 000 • Running cost of petrol engine car = £24 000 • Total cost of electric car = £30 000 • Total cost of petrol engine car = £39 000 • The electric car cost £1 750 less to run each year • The electric car will save £9 000 • Additional cost is covered in 6.9 years • So the electric car will be cheaper over the 12 year lifetime **or** Electric 27000 / 12 = 2250 Annual cost = 2250 + 250 = 2500 Petrol 15000 / 12 = 1250 Annual cost = 1250 + 2000 = 3250 So electric is £750 cheaper per year		
Total		**11**	