GCSE
COMBINED SCIENCE: TRILOGY
8464/P/1F

Physics Paper 1F

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

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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 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 <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.

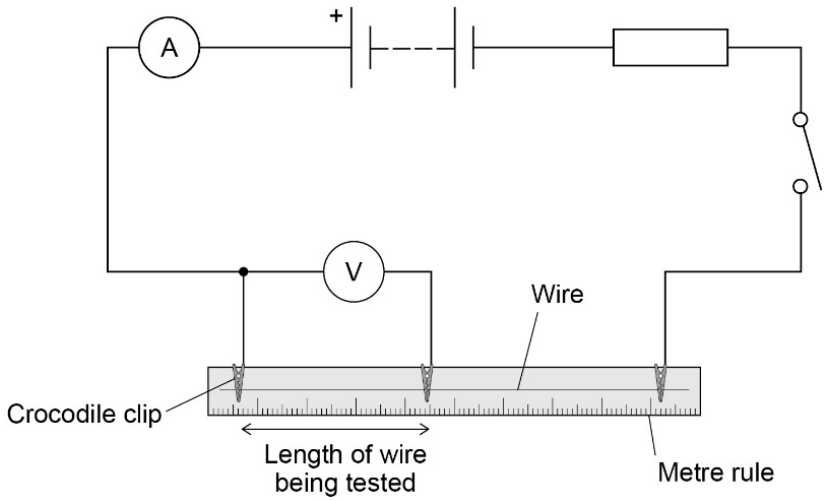
The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine 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	both symbols correct and in the correct position  		1	AO1 6.2.1.3 6.2.1.4 RPA 15
01.2	the length of the wire being tested		1	AO1 6.2.1.3 RPA 15
01.3	the resistance of the wire		1	AO1 6.2.1.3 RPA 15
01.4	mean p.d. = $\frac{0.16 + 0.17 + 0.15}{3}$ mean p.d. = 0.16 (V)		1 1	AO2 6.2.1.3 RPA 15
01.5	R = 0.32/0.50 R = 0.64 (Ω)		1 1	AO2/1 6.2.1.3 6.2.1.3 RPA 15

01.6	power = 0.32 × 0.50 power = 0.16 (W)		1 1	AO2 6.2.4.1
01.7	charge flow = 0.50 × 17 8.5 (C)		1 1	AO2 6.2.1.2
01.8	a straight line through the origin with a lower gradient		1	AO1/2 6.2.1.3 RPA 15
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	contamination		1	AO1 6.4.2.4
02.2	2007-1992 = 15 35 (Bq)	allow an indication of the student reading from 15 years on the graph allow an answer between 34 and 36 (Bq)	1 1	AO2 6.4.2.3
02.3	12.5 (years)		1	AO2 6.4.2.3
02.4	12.5 (years)	allow the same value as their answer to 02.3	1	AO1 6.4.2.3
02.5	$\frac{36\ 000\ 000\ 000}{45\ 000\ 000\ 000}$ (× 100) 80 (%)	allow $\frac{36}{45}$ (× 100)	1 1	AO2 6.4.2.3
02.6	radioactive decay is a random process		1	AO1 6.4.2.3
02.7	use long tongs to handle the materials		1	AO1 6.4.2.4
02.8	peer review		1	AO1 6.4.2.4
Total			**10**	

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>03.1</td><td>it can be replenished as it is used</td><td></td><td>1</td><td>AO1
6.1.3</td></tr>
<tr><td>03.2</td><td>biomass – renewable
nuclear – Non-renewable
natural gas – Non-renewable

<table><tr><th>Energy resource</th><th>Renewable</th><th>Non-renewable</th></tr><tr><td>Biomass</td><td>✓</td><td></td></tr><tr><td>Nuclear</td><td></td><td>✓</td></tr><tr><td>Natural gas</td><td></td><td>✓</td></tr></table></td><td>all 3 correct

allow 1 mark for two correct answers</td><td>2</td><td>AO1
6.1.3</td></tr>
<tr><td>03.3</td><td>kinetic

chemical</td><td>answers must be in the correct order</td><td>1

1</td><td>AO2
6.1.1.1</td></tr>
<tr><td>03.4</td><td>less energy is needed to heat the house

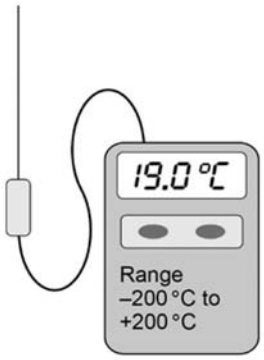
the roof is a better insulator</td><td></td><td>1

1</td><td>AO3
6.1.2.1</td></tr>
<tr><td>03.5</td><td>E = 26 000 × 30

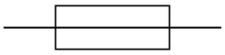
780 000 (J)</td><td></td><td>1

1</td><td>AO2
6.1.1.4
6.2.4.2</td></tr>
<tr><td>03.6</td><td>$\text{efficiency} = \frac{\text{useful power output}}{\text{total power input}}$</td><td></td><td>1</td><td>AO1
6.1.2.2</td></tr>
</table>

03.7	$0.15 = \frac{\text{useful power output}}{26000}$ useful power output = 26000 × 0.15 useful power output = 3900 (W)		1 1 1	AO2 6.1.2.2
03.8	sometimes it is not sunny/windy so there's more chance of electricity being generated at any time **OR** more electricity is generated (1) which reduces the running costs (of the eco-home) (1)	if no other mark scored, allow a reference to reduced greenhouse gas emissions or reduced global warming for 1 mark	1 1	AO3 6.1.3
Total			**15**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	at random speeds in random directions		1	AO1 6.3.3.1
04.2	3rd thermometer ticked  ☐		1	AO2 6.3.2
04.3	to prevent (frost/cold) burns **or** to prevent injury from the cold nitrogen	allow to prevent frostbite	1	AO3 6.3.2.2
04.4	decreased decreased		1 1	AO1 6.3.2.1 6.3.3.1
04.5	860 = 0.00320 × c × 215 $c = \frac{860}{0.00320 \times 215}$ c = 1250 (J/kg°C)		1 1 1	AO2/1 4-5 6.3.2.2 6.1.1.3

04.6	temperature stays the same		1	AO2 6.3.2.3
04.7	a change of state from liquid to gas		1	AO1 6.3.2.3
04.8	1440 = 0.0072 × L $L = \frac{1440}{0.0072}$ L = 200 000 (J/kg)		1 1 1	AO2 6.3.2.3
Total			**13**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	swap the blue wire and the green and yellow wire	allow connect the blue wire to the neutral pin and the yellow and green wire to the earth pin. allow swap the earth and neutral wires ignore the earth wire and neutral wire are wrongly connected	1	AO2 6.2.3.2
05.2	230 (V) 50 (Hz)		1 1	AO1 6.2.3.1 6.2.3.2
05.3	0 (V)		1	AO1 6.2.3.2
05.4			1	AO1 6.2.1.1
05.5	the person could get an electric shock because there is a current in the person	allow so the person could be electrocuted allow because the person provides a connection (from the washing machine) to earth allow because there is a potential difference across the person	1 1	AO3 6.2.3.2

05.6	the charge flows through the earth wire (instead of the person) because the resistance of the earth wire is much less than that of a person	 allow so the case does not become live allow so the fuse will break / melt / blow	1 1	AO3 6.2.3.2
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	A = 206		1	AO2 6.4.2.2
06.2	Z = 82		1	AO2 6.4.2.2
06.3	89 39	numbers must be in this order	1 1	AO2 6.4.2.2
06.4	electromagnetic waves		1	AO1 6.4.2.1

Question	Answers	Mark	AO / Spec. Ref.
06.5	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 6.4.1.2 6.4.2.1 6.4.2.2
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content <u>alpha radiation</u> • an alpha particle is the same as a helium nucleus • alpha is the least penetrating • alpha is stopped by paper or skin • alpha has the shortest range in air • alpha will travel a few cm in air • because alpha is most ionising • because alpha has a charge of +2 <u>beta radiation</u> • a beta particle is an electron (emitted from the nucleus) • beta penetrates less than gamma and more than alpha • beta is stopped by a thin sheet of aluminium • beta has a shorter range than gamma • beta will travel up to 1m in air • because beta is more ionising that gamma and less ionising than alpha • because beta has a charge of -1 <u>gamma radiation</u> • gamma radiation is an electromagnetic wave • gamma is the most penetrating • gamma is reduced/stopped by several cm of lead or thick concrete • gamma has the largest range in air • gamma will travel very large distances in air • because gamma is least ionising • because is uncharged to access level 3 the answer should compare alpha, beta and gamma radiation and provide some explanation of their properties		

Total			11