GCSE
COMBINED SCIENCE: TRILOGY

8464/P/2F - PHYSICS PAPER 2 FOUNDATION TIER

Mark scheme

8464

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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 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.

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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 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.

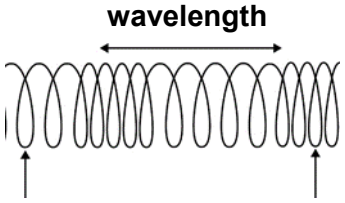
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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	distance		1	AO1 6.5.1.1
01.2	BC		1	AO3 6.5.4.1.5
01.3	DE		1	AO3 6.5.4.1.5
01.4	5.0 (s)	allow 5 (s)	1	AO2 6.5.4.1.5
01.5	6.0 (m/s)	allow 6 (m/s)	1	AO2 6.5.4.1.5
01.6	6.0 / 5.0 = 1.2 (m/s^2)	an answer of 1.2 scores **2** marks allow ecf from questions **01.4** and **01.5**	1 1	AO2 6.5.4.1.5
01.7	about four times faster		1	AO2 6.5.4.1.2
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	 **rarefaction** **compression**		3	AO1 6.6.1.1
02.2	longitudinal		1	AO1 6.6.1.1

Question	Answers	Mark	AO / Spec. Ref.
02.3	**Level 2:** The method would lead to the production of a valid outcome. Key steps are identified and logically sequenced.	3–4	AO2
	Level 1: The method would not necessarily lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	AO1
	No relevant content	0	
	Indicative content • measure the distance between the student with the bricks and the wall • trundle wheel or tape measure • measure the time taken from banging the bricks to the echo • double the measured distance to give the distance travelled or half the time • use: speed = $\frac{\text{distance travelled}}{\text{time}}$ • repeat timings • remove anomalies • calculate a mean		6.6.1.2
Total			**8**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	equal to		1	AO1 6.5.4.2.3
03.2		an answer of 833 (N) **or** 830 (N) scores **2** marks		AO2 6.5.1.3
	weight = 85 × 9.8		1	
	weight = 833 (N)	allow weight = 830 (N)	1	
03.3		an answer that rounds to 525 (J) scores **2** marks		AO2 6.5.2
	work done = 833 × 0.63	allow their calculated value from question **03.2** × 0.63	1	
	work done = 525 (J)	allow an answer that is consistent with their calculated value from question **03.2**	1	
03.4	work done = 0 (J)		1	AO2 6.5.2
03.5		an answer of 682 (N) **or** 680 (N) scores **2** marks		AO2 6.5.4.2.2
	force = 62 × 11		1	
	force = 682 (N)	allow force = 680 (N)	1	
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	R		1	AO1 6.6.2.1
04.2	they have the same wave speed as visible light they have a lower frequency than gamma rays		1 1	AO1 6.6.2.1
04.3	any **two** from: • ageing of the skin • skin cancer • eye damage	 allow sunburn burn unqualified is insufficient cancer is insufficient allow mutation of genes in skin cells allow blindness	2	AO1 6.6.2.3
04.4	any **two** from: • gamma (rays) • X-rays • ultraviolet		2	AO1 6.6.2.4
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	increases		1	AO1 6.5.3
05.2	the band returns to its original shape because there is an elastic force	allow band gets shorter allow because the stretching force has been removed if no other mark has been scored, allow for **1** mark the elastic potential energy decreases	1 1	AO1 6.5.3
05.3	any **two** from: • initially the band does not stretch when a force is applied • (when extending) as force increases the extension increases • the relationship is non-linear	allow a certain force is needed before the band extends allow the increase is not proportional do **not** accept directly proportional	2	AO3 6.5.3
05.4	straight diagonal line from bottom left to top right straight line through the origin	allow the line to curve upwards beyond the elastic limit	1 1	AO1 6.5.3
05.5	force = spring constant × extension	allow F = *k e*	1	AO1 6.5.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6		an answer of 120 (N) scores **3** marks an answer of 12 000 (N) scores **2** marks		AO2 6.5.3
	7.5 cm = 0.075 m		1	
	$F = 1\,600 \times 0.075$	this mark may be awarded if e is incorrectly / not converted	1	
	$F = 120$ (N)	allow an answer that is consistent with their value of e	1	
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	thinking distance stays the same		1	AO1 6.5.4.3.3
	braking distance increases		1	
06.2	reaction time is increased by using a mobile phone		1	AO3 6.5.4.3.2
	hand-held mobile phones increase the thinking distance more than hands-free phone	allow thinking distance is increased by using a mobile phone	1	
	by 4 m more than the hands-free phone	allow **2** marks for a hand-held mobile phone doubles the increase of the thinking distance	1	
	so overall stopping distance increases		1	
Total			**6**	

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.1	its acceleration would decrease to zero the resultant force on it would decrease to zero		1 1	AO3 6.5.4.2.2
07.2	any **one** from: • move the second light gate closer to the first • shorten the string length	allow use a taller table	1	AO3 6.5.4.2.2
07.3		each mistake and its correction may be given in any order		AO3 6.5.4.2.2
	1.26667 (m/s^2) (is wrong)	allow (mean value calculated at) 0.20 (N)	1	
	give value to 2 significant figures	allow give value to 1 decimal place allow 1.3 (m/s^2)	1	
	6.7 (m/s^2) (is wrong)	allow (mean value calculated at) 0.98 (N) allow test 2 for 0.98 (N) or 7.2 is an anomaly	1	
	discard the anomalous result and recalculate the mean	allow repeat the anomalous test result and re-calculate the mean allow 6.4 (m/s^2)	1	
07.4	(resultant) force is directly proportional to acceleration	allow the larger the (resultant) force, the greater the acceleration allow positive correlation between (resultant) force and acceleration allow mass / weight (of the holder) for (resultant) force	1	AO3 6.5.4.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.5	all points correctly plotted within ½ small square curved line of best fit	allow **1** mark for 3 or 4 points correctly plotted	2 1	AO2 6.5.4.2.2
07.6	inversely proportional	allow as mass increases, acceleration decreases	1	AO3 6.5.4.2.2
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	1st box ticked		1	AO1 6.7.1.2
08.2	(permanent magnet) has no effect on the aluminium iron is attracted (to the permanent magnet) (only) the (permanent) magnet can be repelled (by the permanent magnet)		1 1 1	AO2 6.7.1.1 6.7.1.2

Question	Answers	Mark	AO / Spec. Ref.
08.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to give a clear account.	5–6	AO2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content • completing the circuit • turns the electromagnet on • there is a current in the coil • a magnetic field is produced around the coil • the iron core becomes magnetised • move electromagnet towards the blocks • the block is attracted to the electromagnet • moving the crane moves the block • switching off the current switches off the electromagnet • releasing the block		6.7.2.1
Total		**10**	