GCSE

COMBINED SCIENCE: TRILOGY 8464/P/2F

Physics Paper 2F

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.

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.

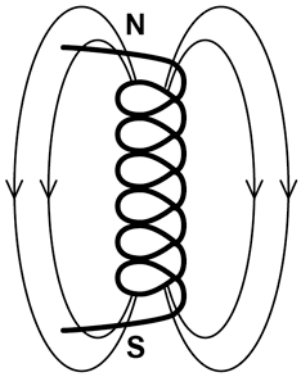
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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	the direction of the magnetic field		1	AO1 6.7.2.1 Low
01.2	decreases		1	AO1 6.7.2.1 Low
01.3	the distance between the field lines is smaller where the field is stronger	allow the closer the lines the stronger the field for **2** marks allow where the lines are close the field is strong for **1** mark	1 1	AO3 6.7.2.1 Low
01.4	straight line drawn within 1 mm of all points on the graph		1	AO2 6.7.2.1 Low
01.5	1.3 – 0.9 0.4 arbitrary units		1 1	AO3 6.7.2.1 Low
01.6	increase the current through the solenoid increase the potential difference across the solenoid	if more than 2 boxes are ticked deduct **1** mark for each extra box ticked	1 1	AO1 6.7.2.1 Low

01.7	at least one field line on each side of the solenoid an arrow to indicate the field going from North to South pole  		1 1	AO1 6.7.2.1 Low

01.8	add an <u>iron</u> core	allow a description of this, eg wrap the wire around an <u>iron</u> nail adding a core is insufficient	1	AO1 6.7.2.1 Low

Total			**12**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	light ionising		1 1	AO1 6.6.2.1 6.6.2.3 Low
02.2	x-rays have a longer wavelength and a lower frequency		1	AO1 6.6.2.1 Standard
02.3	$\frac{0.039 + 0.035 + 0.040}{3}$ = 0.038 (milllisieverts)	an answer of 0.038 scores **2** marks	1 1	AO2 6.6.2.3 Low
02.4	the dose decreases if you stand further from the machine		1	AO3 6.6.2.3 Low
02.5	$\frac{0.180}{0.012}$ = 15 days	an answer of 15 (days) scores **2** marks	1 1	AO2 6.6.2.3 Low
02.6	the benefit (of a correct diagnosis) outweighs the risk	allow the (increased) risk of cancer is very small for an x-ray allow for medical imaging, eg to see broken bones	1	AO3 6.6.2.3 Low

02.7	$20 \times \frac{40}{100}$ = 8 (millisieverts)	an answer of 8 (millisieverts) scores **2** marks allow 20 × 40%	1 1	AO2 6.6.2.3 Low

Total			**11**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	the arrows have different lengths the arrows point in different directions	allow forces can have different sizes allow forces can have different directions	1 1	AO1 6.5.1.1 Low
03.2	**D**		1	AO1 6.5.1.3 Low
03.3	**B**		1	AO1.1 6.5.1.2 Low
03.4	both variables are continuous		1	AO2 6.5.4.1.5 Low
03.5	it is moving at a constant velocity		1	AO1 6.5.4.1.5 Low
03.6	24.5 (m/s^2)		1	AO2 6.5.4.1.5 Low
03.7	5 g = 49 (m/s^2) 49 m/s^2 > 24.5 m/s^2 so the ride is safe	 allow ecf from **03.6** (ie if their answer to **03.6** was greater than 49, then the ride is unsafe)	1 1 1	AO3 6.5.4.2.2 Low Standard
03.8	force = 58 × 24.5 force = 1421 Newtons	allow ecf from **03.6** allow N	1 1 1	AO2 6.5.4.2.2 Low
Total			**13**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	distance = 2.4 m/s × 4.5 s distance = 10.8 (m)	an answer of 10.8 m scores **2** marks	1 1	AO2 6.5.4.1.2 Low
04.2	It started going uphill.		1	AO2 6.5.2 Low
04.3	**D** the line has the largest gradient	 allow it is steepest allow it travels the furthest distance in the shortest amount of time	1 1	AO2 6.5.4.1.3 Low
04.4	any **two** from: • the data logger records time more accurately • the data logger can take readings more frequently • there is less chance for human error when using a data logger • the data logger automatically records data	allow the converse of each argument, eg there is a human reaction time error when using a stopclock	2	AO3 6.5.4.1.4 Low
04.5	air resistance		1	AO1 6.5.1.2 Low
04.6	acceleration is zero because the resultant force is zero	 allow because the forward force equals the air resistance there is too much air resistance is insufficient	1 1	AO2 6.5.4.2.1 Standard

04.7	$v^2 - u^2 = 2as$ $1.5^2 (- 0^2) = 2 \times a \times 2$ $a = \frac{1.5^2}{2 \times 2}$ $a = 0.56(25)\ m/s^2$	an answer of $0.56(25)\ (m/s^2)$ scores **3** marks	 1 1 1	AO2 6.5.4.1.5 Standard

Total			**13**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	the forces of the bike on the trailer and the trailer on the bike are equal in size and opposite in direction	allow the force of tension acts on the bike and the trailer	1 1	AO1 6.5.4.2.3 Standard
05.2	any **two** from: • the same trailer should be used • the weather conditions should be the same • the same road (surface) should be used • the same gradient road should be used • the same speed should be used • the cyclist should be at the same level of alertness throughout the experiment	allow a description of this, eg the wind should be the same allow a description of a cause of this eg the cyclist should not drink coffee between experiments	2	AO3 6.5.4.3.3 Standard
05.3	straight line drawn above the original line, sloping upwards		1	AO3 6.5.4.3.3 Standard
05.4	the cyclist's reaction time increased so the thinking distance increased stopping distance is thinking distance plus braking distance		1 1 1	AO1 6.5.4.3.1 6.5.4.3.2 Standard
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	sound waves are longitudinal		1	AO1 AO2
	in longitudinal waves, the oscillations / vibrations are parallel to the direction of energy transfer	allow direction that the wave is travelling for direction of energy transfer	1	6.6.1.1 Standard
	water waves are transverse		1	
	in transverse waves, the oscillations / vibrations are at 90 degrees to the direction of energy transfer		1	
		ignore references to wave speed, wavelength or frequency		
		an answer stating that sound waves travel in all directions but water waves don't is insufficient.		
06.2		an answer of 120(.481…) scores **3** marks		AO2 6.6.1.2 Standard
	$0.0083 = \frac{1}{\text{frequency}}$		1	
	$\text{frequency} = \frac{1}{0.0083}$		1	
	frequency = 120 (Hz)	an answer of 0.12 scores **2** marks	1	

06.3	**Level 3**: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 AO2 6.6.1.2 Standard
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logically 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 thinking.	1–2	
	No relevant content	0	
	Indicative content **equipment** • a stopclock / stopwatch should be used to time the waves • a metre rule should be used to measure distance **determining the frequency of the waves** • the frequency could be determined by finding the time for several waves to pass a point • the frequency could be determined by finding the how many waves pass a point in a fixed time • frequency is the average time for one wave to pass a point • frequency = $\frac{\text{no.of waves}}{\text{total time for waves to pass}}$ **determining the speed of the waves** • the speed can be determined by measuring the distance travelled by a wave and the time taken to travel that distance • the distance used to determine speed should be as long as possible • speed = distance/time **determining the wavelength of the wave** • the wavelength can be calculated using the speed and frequency of the wave • wavespeed = frequency × wavelength • wavelength = $\frac{\text{wavespeed}}{\text{frequency}}$ • wavelength = $\frac{\left(\frac{\text{distance}}{\text{time}}\right)}{\left(\frac{\text{no. of waves}}{\text{second}}\right)}$		

Total			**13**