OXFORD
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INTERNATIONAL GCSE
Physics

9203/2 – Paper 2

Mark scheme

9203

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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.

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.
1.1	replaced as quickly as they are used	allow will not run out	1	AO1 3.2.3d
1.2	using solar panels produces less CO_2 compared to burning fuels CO_2 contributes to global warming	allow any named polluting gas allow climate change allow acid rain with correctly named gas	1 1	AO1 3.2.3c
1.3	Only produce power during the day		1	AO1 3.2.3d
1.4	6		1	AO3 3.2.3d
1.5	efficiency = 960 / 8000 efficiency = 0.12	an answer of 0.12 scores 2 marks allow 12% for 2 marks	1 1	AO2 3.2.2f
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2.1	correct symbol for ammeter in series **and** correct symbol for voltmeter in parallel		1	AO4 3.5.1g
2.2	Variable resistor		1	AO4 3.5.1g
2.3	all points plotted correctly	allow ± ½ a small square allow **1** mark for 3 correctly plotted points	2	AO2 3.5.1i
2.4	straight line of best fit		1	AO2 3.5.1i
2.5	 5.0 = 0.125 × R R = 5.0 / 0.125 40 Ω	an answer of 40 scores **3** marks allow a correct rearrangement using an incorrect value of I allow a correct calculation using an incorrect value of I	 1 1 1 1	3 AO2 1 AO1 3.5.1h
2.6	initially the resistance is constant as current increases temperature (of filament) increases amplitude of vibration of ions increases resistance increases	allow current is directly proportional to potential difference allow frequency of collisions of electrons with ions increases	1 1 1 1	AO2 3.5.1m
Total			**13**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	three correct rays including arrows in the correct direction		1	AO2 3.3.6b
03.2	focal length		1	AO1 3.3.6d
03.3	upright virtual		1 1	AO3 3.3.6e
03.4	magnification = 18 / 6 magnification = 3	an answer of 3 scores **2** marks allow **1** mark for correct calculation using one correct value	1 1	AO2 3.3.6g
03.5	the image is formed behind the retina because eyeball too short **or** lens not powerful enough **OR** distant objects can be seen clearly (1) close objects cannot be seen clearly (1)		1 1	AO1 3.3.6j
03.6	25cm		1	AO1 3.3.6i

03.7	pupil constricts to allow less light to enter eye lens gets thicker to focus light from nearby object on retina	allow pupil gets smaller allow lens becomes more powerful	1 1 1 1	AO3 3.3.6h

Total			**13**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4.1	$E_k = ½ \times 750 \times 80^2$ $E_k = 2\ 400\ 000$ (J)	an answer of 2 400 000 scores **2** marks allow 2.4×10^6	1 1	AO2 3.2.1e
4.2	15 000 W = 15 000 × 60 W = 900 000 (J)	an answer of 900 000 scores **3** marks allow a correct substitution of an incorrectly/not converted value of F allow 9.0×10^5 allow a correct calculation using an incorrectly/not converted value of F	1 1 1	2 AO2 1 AO1 3.2.1a
4.3	1 500 000 J	allow 1.5×10^6 allow their 4.1 – their 4.2	1	AO2 3.2.1b 3.1.5d
4.4	time = 10 – 8.2 time = 1.8 (s)	an answer of 1.8 gains **2** marks	1 1	AO3 3.5.1d
4.5	resolution = 0.1 (°C)		1	AO2 3.5.1d
4.6	630 000 = m × 900 × 140 m = 630 000 / (900 x 140) m = 5.0 kg	an answer of 5.0 gains 3 marks allow a correct rearrangement using an incorrectly/not converted value of E allow a correct calculation using an incorrectly/not converted value of E	1 1 1	AO2 3.4.1b
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5.1	they all point to the Earth's magnetic North pole	allow they align with the Earth's magnetic field	1	AO1 3.5.2d
5.2	current produces a magnetic field around wire which is circular each compass aligns with this magnetic field		1 1 1	2 AO1 AO2 3.5.2e
5.3	uniform		1	AO1 3.5.2f
5.4	increase current greater number of turns	allow 'increase pd of battery'	1 1	AO1 3.5.2g
5.5	 $0.125 = ½ \times 100 \times e^2$ $e = \sqrt{0.25 / 100}$ e = 0.050 (m) e = 50 (mm)	an answer of 50 gains **4** marks allow correct conversion of their calculated value of e	 1 1 1 1	AO2 3.2.1c

5.6	**Level 3:** The plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO4 3.1.1h
	Level 2: The plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content **measurements** • measure original length with a ruler • add a slotted mass • measure new length of spring • readings taken at eye level • calculate the extension by subtracting original length • calculate force applied • repeat with more masses • range 0 – 7 100g masses • suggests repeat readings • **analysis** • plot graph • line of best fit • how to obtain spring constant from the gradient		

Total			**17**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6.1	atoms with same number of protons but different numbers of neutrons	allow same atomic/proton number allow different mass number ignore reference to electrons	1 1	AO1 3.7.1f
6.2	argon has one more proton potassium has one more neutron	allow potassium has one fewer protons (than argon) allow argon has one fewer neutrons (than potassium)	1 1	AO2 3.7.2f
6.3	yes, because mean count from banana is only slightly above background **or** no, because mean count from banana is above background correct numerical comparison therefore small increase in hazard	allow total count is greater allow total count is greater allow comparison of mean values	1 1 1	AO3 3.7.2j
6.4	take the measurements for longer than one minute to increase the total count to increase the difference between the background count and the count from the banana to determine a better estimate of the count above background due to the banana	allow gather data from different bananas allow collect more data	1 1 1 1	2xAO3 2xAO4 3.7.2j
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	the observed increase in the wavelength	allow light is shifted towards the red end of the visible part of the electromagnetic spectrum	1	AO1 3.8.3b
07.2	there is a large amount of scatter data is not precise the line does not got through the origin	very few points are close to/on the line of best fit allow large number of points a long way from line of best fit	1 1 1	AO3 3.8.3b
07.3	gradient calculation e.g. (16 500 - 0 / 30- 0) gradient = 550 Age = 975 / 550 = 1.8 (billion years)	allow correct substitution of correct values read from graph allow gradient in the range 500-600 allow 1.625-1.95 allow correct calculation using calculated value of gradient	1 1 1	AO2 2xAO3 3.8.3b
07.4	improvement in technology/telescopes more accurate measurements		1 1	AO3 3.8.3b
07.5	a form of EM radiation filling the universe from EM radiation present shortly after the big bang	do **not** accept microwaves on its own for EM radiation	1 1	AO1 3.8.3c
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	because the resultant force on the helicopter is zero the force of air on helicopter blades must be (81 000 N) upwards	must use idea of newton's first/second law to score this mark	1	AO2 3.1.3g
	therefore the force on the air must be downward/opposite	must use idea of newton's third law to score this mark	1	
	the force on the air must be equal/81 000N	must use idea of newton's third law to score this mark	1	
08.2	81 000 = Δm × 26 / 1		1	AO2 3.1.4c
	Δm = 81 000 × 1 / 26		1	
	Δm = 3120 (kg)		1	
Total			**6**	