AQA

GCSE

Physics

PH3FP

Mark scheme

4403

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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 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

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 / ; e.g. allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates 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)

Candidate	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)

Candidate	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate 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

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

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 are 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 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.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Quality of Written Communication and levels marking

In Question 9(b) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

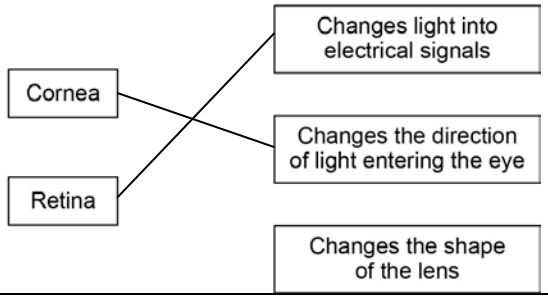
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed

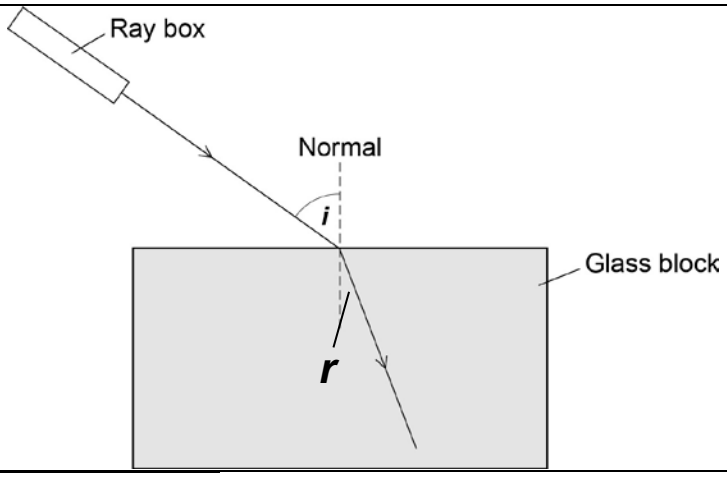
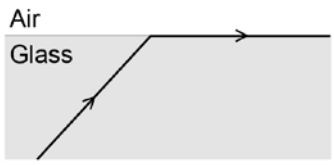
- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

Question	Answers	Extra information	Mark	AO / Spec. ref.
1(a)	turning		1	AO1 P3.2.2a
1(b)	420	allow **1** mark for correct substitution, ie 1400 x 0.30 provided no subsequent step shown	2	AO2 P3.2.2b, e
1(c)	**A** any **one** correct reason: the force is furthest away (from the pivot)	reason only scores if A is chosen accept distance (from the pivot) is the greatest accept it is further away (from the pivot) accept furthest away from the rock	1 1	AO1 AO2 P3.2.3b, e
Total			5	

Question	Answers	Extra information	Mark	AO / Spec. ref.
2(a)(i)	Iron		1	AO1 P3.3.2c
2(a)(ii)	50 there are more turns on the secondary coil (than the primary coil)	ignore references to current reason only scores if 50 chosen accept it is a step-up transformer not more coils	1 1	AO1 AO2 P3.3.2g P3.3.2e
2(b)(i)	200		1	AO1 P3.3.2i
2(b)(ii)	any **one** from: • Lighter • smaller • use very little power / current (when switched on with no load /phone attached)	accept more efficient. do not accept uses no power/current a disadvantage of a traditional transformer is insufficient on its own	1	AO1 P3.3.2j &k
Total			5	

Question	Answers	Extra information	Mark	AO / Spec. ref.
3(a)	lens iris	correct order only	1 1	AO1 P3.1.4a
3(b)	**Part of the eye** / **Function**  	allow **1** mark for each correct line if more than one line drawn from any part box then all of those lines are wrong	2	AO1 P3.1.4a
3(c)	5	allow **1** mark for correct substitution, ie 1 / 0.2 provided no subsequent step shown	2	AO2 P3.1.4e
3(d)	The potential benefit of the procedure is greater than the risk.		1	AO3 SaLoSE
3(e)(i)	6(.0)		1	AO2 P3.1.4
3(e)(ii)	increasing age decreases the ability of the lens to change power	accept as you get older, the change in (lens) power gets less	1	AO3 P3.1.4
3(e)(iii)	1 dioptre		1	AO3 P3.1.4
Total			10	

Question	Answers	Extra information	Mark	AO / Spec. ref.
4(a)	motor		1	AO1 P3.3.1b
4(b)	increase the strength of the magnetic field	accept use a stronger magnet use a larger / bigger magnet is insufficient do **not** accept move magnets closer	1	AO1 P3.3.1c
	increase the (size of the) current	accept use a current greater than 2 (A) accept increase the p.d./voltage (of the power supply) increase the power supply is insufficient	1	
4(c)	any **one** from: • (reverse the) direction of the current	accept swap the wires at the power supply connections swap the wires around is insufficient	1	AO1 P3.3.1e
	• (change the) direction of the magnetic field	accept turn the magnet around do **not** accept use an a.c. supply		
4(d)	The wire is parallel to the direction of the magnetic field.		1	AO1 P3.3.1d
Total			5	

Question	Answers	Extra information	Mark	AO / Spec. ref.
5(a)(i)			1	AO1 P3.1.3c
5(a)(ii)	1 degree		1	AO3 P3.1.3c
5(a)(iii)	1.6	allow **1** mark for correct substitution, ie 0.80 / 0.5 provided no subsequent step shown working showing 1.59(9…..) scores zero	2	AO2 P3.1.3c
5(b)	2nd diagram ticked  ✓		1	AO1 P3.1.5a
5(c)(i)	any **one** correct description: • upright • virtual • diminished	treat multiple words as a list	1	AO1 P3.1.3d

Question 5 continued . . .

Question	Answers	Extra information	Mark	AO / Spec. ref.
5(c)(ii)	0.25	allow **1** mark for correct substitution, ie 1 / 4 or 5/20 provided no subsequent step shown ignore any unit	2	AO2 P3.1.3i
5(c)(iii)	Correcting short sight		1	AO1 P3.1.4b
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. ref.
6(a)	induced		1	AO1 P3.3.2b
6(b)	any **two** from: • use the same (strength) magnet • the speed that the magnet is moved • the area of the turns • the magnetic pole being moved towards the coil (of wire)	same size magnet is insufficient accept movement of the magnet same type/length of wire is insufficient use the same voltmeter is insufficient	2	AO3 P3.3.2b
6(c)(i)	voltmeter misread **or** number of turns miscounted	result misread is insufficient human error is insufficient allow the magnet was moved at a (slightly) different speed (into the coil) than for the other readings allow spacing between the turns had changed	1	AO2 P3.3.2
6(c)(ii)	line of best fit passing through all points except (100, 0.034)	line does not need to go back to origin	1	AO3 P3.3.2
6(d)	any **one** from: • can re-check data / readings • can take more readings (in a given time) • easier to identify maximum value	accept can go back to data can store data is insufficient automatically records data is insufficient accept is more accurate accept eliminates human error	1	AO3 P3.3.2b
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. ref.
7(a)	1.25	accept 1.3 for **2** marks allow **1** mark for correct substitution ie $\frac{1}{0.8}$ provided no subsequent step shown	2	AO2 P3.2.1d
7(b)(i)	increasing the length (of the pendulum) decreases the number of oscillations / swings made (in 20 seconds)	accept increasing the length (of the pendulum) increases the time (of 1 oscillation / swing) accept increasing the length (of the pendulum) decreases the speed/frequency (of 1 oscillation / swing) answers must refer to the effect of increasing/decreasing length ignore references to time being proportional to length	1	AO3 P3.2.1e
	changing the mass (of the pendulum bob) does not change the number of oscillations / swings made (in 20 seconds)	accept changing the mass does not change the time/speed/frequency/results accept weight for mass	1	

Question 7 continues on the next page . . .

Question	Answers	Extra information	Mark	AO / Spec. ref.
7(b)(ii)	any **two** suitable improvements: • measure (the number of swings) over a wider range of (pendulum) lengths • measure (the number of swings) over a wider range of (bob) masses • measure the number of swings made over a greater period of time • repeat each measurement & calculate mean / average (number of oscillations in 20 seconds) • measure (the total number of swings &) the fraction of swings made • start the swings at the same height	accept repeat measurements & discard anomalous measurements repeat measurements is insufficient use a computer / datalogger to make measurement (of number of oscillations) is insufficient measuring time period is insufficient using a stop clock with greater resolution is insufficient	2	AO3 P3.2.1
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. ref.
8(a)(i)	D		1	AO2 P3.2.4b
8(a)(ii)	friction		1	AO1 P3.2.4b
8(a)(iii)	any **two** from: • the speed / velocity • the radius of the bend • the mass (of the car)	 the radius is insufficient accept curvature of the road size of the bend is insufficient accept distance of car from centre (of bend) accept weight for mass	2	AO1 P3.2.4c
8(b)	the car has a wide base the car has a low centre of mass / gravity	accept any description of a wide base e.g. the wheels are far apart accept wide wheel base do **not** accept long wheel base a large surface area is insufficient wide tyre(s) is insufficient accept any description of low centre of mass e.g. mass is close to the ground a down force is insufficient	1 1	AO2 P3.2
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. ref.
9(a)	20,000	accept 20 kilo **or** 20 k **or** 20 001	1	AO1 P3.1.2a
	an atom		1	AO1 P3.1.1a

Question 9 continues on the next page . . .

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(b)			6	AO1 P3.1 P3.1.1c

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
no relevant content	At least one relevant statement is given for either type of wave	**either** a use, risk and precaution is given for one type of wave **or** A medical use is given for both types of wave **plus** a risk or precaution for one type of wave	At least one medical use is given for both types of wave linked to the risks and any precautions necessary

examples of the points made in the response	extra information
<u>Medical use of X-rays</u> Any one from: • Detecting bone fractures • Detecting dental problems • Killing cancer cells • CT scanning	Ignore details about how X-rays/ultrasound work accept any specific use of X-rays, eg • detecting heart/lung disorders (with chest X-rays) • mammograms / breast cancer detection • detecting stones / bowel disease (with abdominal X-rays)
<u>Risks with X-rays</u> X-rays pose a risk / danger / hazard	accept are harmful
X-rays cause ionisation / damage to cells **or** mutate cells / cause mutations / increase chances of mutations **or** turn cells cancerous / produce abnormal growths / produce rapidly growing cells **or** kill cells	accept a description of what ionising is instead of cell, any of these words can be used: DNA / genes / chromosomes / nucleus accept (may) cause cancer

Operator precautions with X-rays The X-ray operator should go behind a (metal / glass) screen / leave the room when making an X-ray / wear a lead lined apron	accept appropriate precautions for the patient e.g. limit the total exposure/dose (in one year) wear a radiation badge is insufficient	
Medical use of ultrasound Any one from: • Pre-natal scanning • Imaging (a named body part). • removal / destruction of kidney / gall stones • removing plaque from teeth • repair of damaged tissue / muscle	cleaning teeth is insufficient accept examples of repair, eg alleviating bruising, repair scar damage, ligament / tendon damage, joint inflammation accept physiotherapy accept curing prostate cancer **or** killing prostate cancer cells	
Risks with ultrasound Ultrasound poses no risk / danger / hazard (to the user / patient). Ultrasound is not ionising **or** Ultrasound does not damage (human) cells	accept ultrasound is safer than using X-rays	
Precautions with ultrasound The operator needs to take no precautions when making an ultrasound scan.	this can be assumed if it is stated that ultrasound is harmless or it is safer than using x-rays or it is non-ionising	

Total		**8**