Mark Scheme (Results)

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Pearson Edexcel
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Paper 01 Exploring Physics

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark scheme notes

Underlying principle

The mark scheme will clearly indicate the concept that is being rewarded, backed up by examples. It is not a set of model answers.

1. Mark scheme format

1.1 You will not see 'wtte' (words to that effect). Alternative correct wording should be credited in every answer unless the MS has specified specific words that must be present. Such words will be indicated by underlining e.g. 'resonance'

1.2 Bold lower case will be used for emphasis e.g. '**and'** when two pieces of information are needed for 1 mark.

1.3 Round brackets ( ) indicate words that are not essential e.g. "(hence) distance is increased".

1.4 Square brackets [ ] indicate advice to examiners or examples e.g. [Do not accept gravity] [ecf].

2. Unit error penalties

2.1 A separate mark is not usually given for a unit but a missing or incorrect unit will normally mean that the final calculation mark will not be awarded.

2.2 This does not apply in 'show that' questions or in any other question where the units to be used have been given, for example in a spreadsheet.

2.3 The mark will not be awarded for the same missing or incorrect unit only once within one clip in epen.

2.4 Occasionally, it may be decided not to insist on a unit e.g the candidate may be calculating the gradient of a graph, resulting in a unit that is not one that should be known and is complex.

2.5 The mark scheme will indicate if no unit error is to be applied by means of [no ue].

3. Significant figures

3.1 Use of too many significant figures in the theory questions will not be prevent a mark being awarded if the answer given rounds to the answer in the MS.

3.2 Too few significant figures will mean that the final mark cannot be awarded in 'show that' questions where one more significant figure than the value in the question is needed for the candidate to demonstrate the validity of the given answer.

3.3 The use of one significant figure might be inappropriate in the context of the question e.g. reading a value off a graph. If this is the case, there will be a clear indication in the MS.

3.4 The use of g = 10 m s^{-2} or 10 N kg^{-1} instead of 9.81 m s^{-2} or 9.81 N kg^{-1} will mean that one mark will not be awarded. (but not more than once per clip). Accept 9.8 m s^{-2} or 9.8 N kg^{-1}

3.5 In questions assessing practical skills, a specific number of significant figures will be required e.g. determining a constant from the gradient of a graph or in uncertainty calculations. The MS will clearly identify the number of significant figures required.

4. Calculations

4.1 Bald (i.e. no working shown) correct answers score full marks unless in a 'show that' question.

4.2 If a 'show that' question is worth 2 marks. then both marks will be available for a reverse working; if it is worth 3 marks then only 2 will be available.

4.3 **use** of the formula means that the candidate demonstrates substitution of physically correct values, although there may be conversion errors e.g. power of 10 error.

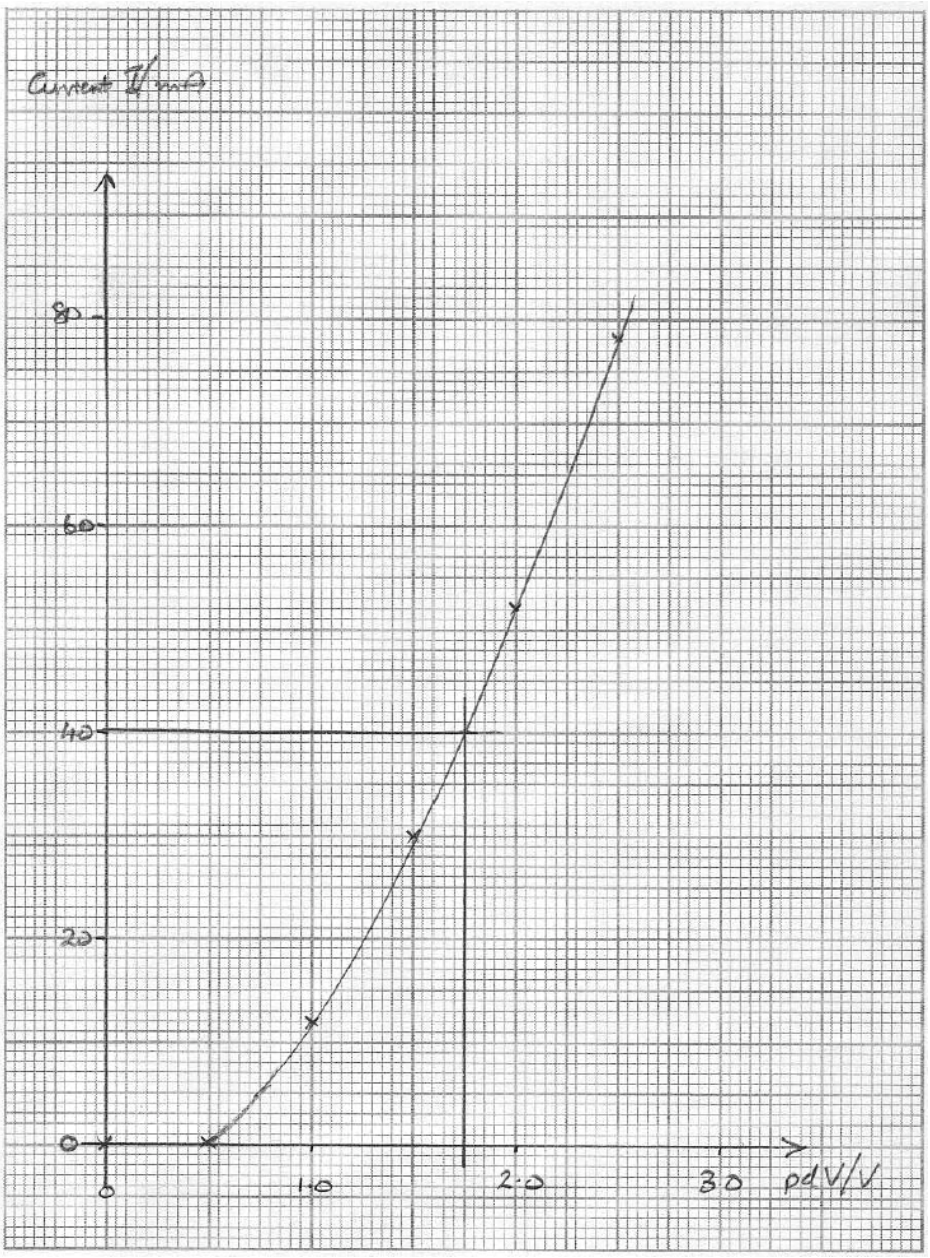
4.4 **recall** of the correct formula will be awarded when the formula is seen or implied by substitution.

4.5 The mark scheme will show a correctly worked answer for illustration only.

Question Number	Answer	Mark
1	**C correct answer** B is not a base unit A and D are quantities not base units	**1**
2	**B correct answer as the anomalous reading has been omitted and the uncertainty is correct** A has the wrong uncertainty C and D do not have the anomalous reading omitted	**1**
3	**A correct answer as it does not appear in the required relationship** B, C and D all appear in the required relationship	**1**
4	**C correct answer as a micrometer has sufficient precision for the measurement of the diameter a wire** A, B and D do not have sufficient precision for the measurement of the diameter a wire	**1**
5	**C is the required SI unit for the Young Modulus** A, B and D are not the accepted SI units for the Young Modulus	**1**

Question Number	Answer	Mark
6(a)	**This question has to be marked holistically and in the context of the experiment described.** Suspend the bat **Or** place bat on a knife edge **(1)** Move the bat until it hangs level **Or** until it balances **(1)** Mark/calculate the position of the centre of gravity **(1)** Repeat (with the bat in a different orientation) **(1)**	**4**
6(b)	Correct explanation of relevant physics of their method: e.g. When balanced C of G must be vertically below support. When balanced C of G must be vertically above knife edge. When in equilibrium clockwise moment = anti-clockwise moment. **(1)** Assumption: e.g. Cross-section of bat is symmetrical **(1)** Centre of gravity is at centre of cross-section	**2**
	Total for question 6	**6**

Question Number	Answer	Mark
7	**This question has to be marked holistically and in the context of the experiment described.** (a) *outline the experimental procedure* Separate microphones **(1)** Measure distance between microphones **(1)** Measure difference in time **(1)** between peaks on oscilloscope traces **(1)**	**4**
	(b) *list any additional apparatus required not shown in the diagram* Metre rule **Or** tape measure **(1)** Means of making short sound **(1)**	**2**
	(c) *state the quantities to be measured, identifying the independent and dependent variables* Distance and time **(1)** Correctly identifies distance as independent variable and time as dependent variable **(1)**	**2**
	(d) *comment on whether repeat readings are appropriate,* (Yes) So a mean can be calculated **(1)** To reduce random errors (accept to reduce anomalous results) **(1)**	**2**
	(e) *state how the data collected will be used to determine the speed of sound* Use of $v = s/t$ **(1)**	**1**
	(f) *identify the main sources of uncertainty and/or systematic error and explain how you would minimise these,* Time interval is very small so maximise distance between microphones **(1)** Measuring difference in distance travelled by the sound to each microphone **(1)** **(1)**	**3**
	(g) *comment on safety* Identifies this as a low risk experiment **Or** sound not too loud to avoid ear damage **(1)**	**1**
	Total for question 7	**15**

Question Number	Answer	Mark
8(a)	**Max 3** Inconsistent/insufficient sig fig in p.d. **(1)** Small range (in p.d.) **(1)** Needs more readings in range 0.5 to 1.0 V **(1)** Only 6 sets of readings **(1)** No negative values **(1)** No repetition shown **(1)**	**3**
8(b)	Axes labelled with quantities (*V* on *x*-axis) **(1)** Axes labelled with units **(1)** Sensible scales **(1)** Correct plotting of data **(1)** Line of best fit **(1)** 	**5**

8(c)(i)	Student value of *V* from their line of best fit Use of *V/I* at 40 mA (not gradient) Answer in range 42.5 to 44.0 (dependent on MP2) Answer to 2 or 3 sig fig with unit	**(1)** **(1)** **(1)** **(1)**	**4**
8(c)(ii)	Resistance is very high (accept infinite) **Or** Component/diode only conducts when (forward) p.d. reaches a specific value So current is zero /negligible (accept too small to be measured)	 **(1)** **(1)**	 **2**
	Total for question 8		**14**

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