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Mark Scheme (Results)

October 2017

Pearson Edexcel
International Advanced Subsidiary Level
in Physics (WPH03)
Paper 01 Exploring Physics

edexcel

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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.

Physics Specific Marking Guidance

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.

For example:

(iii) Horizontal force of hinge on table top

66.3 (N) or 66 (N) **and** correct indication of direction [no ue] ✓ **1**
[Some examples of direction: acting from right (to left) / to the left / West / opposite direction to horizontal. May show direction by arrow. Do not accept a minus sign in front of number as direction.]

This has a clear statement of the principle for awarding the mark, supported by some examples illustrating acceptable boundaries.

Mark scheme format

• Bold lower case will be used for emphasis.
• Round brackets ( ) indicate words that are not essential e.g. "(hence) distance is increased".
• Square brackets [ ] indicate advice to examiners or examples e.g. [Do not accept gravity] [ecf].

Unit error penalties

• A separate mark is not usually given for a unit but a missing or incorrect unit will normally cause the final calculation mark to be lost.
• Incorrect use of case e.g. 'Watt' or 'w' will not be penalised.
• There will be no unit penalty applied in 'show that' questions or in any other question where the units to be used have been given.
• The same missing or incorrect unit will not be penalised more than once within one question but may be penalised again in another question.
• Occasionally, it may be decided not to penalise a missing or incorrect 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.
• The mark scheme will indicate if no unit error penalty is to be applied by means of [no ue].

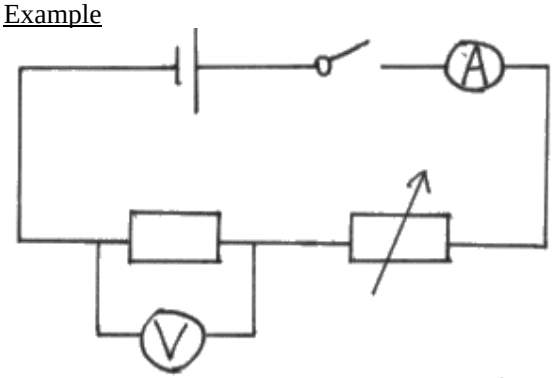
Significant figures

• Use of an inappropriate number of significant figures in the theory papers will normally only be penalised in 'show that' questions where use of too few significant figures has resulted in the candidate not demonstrating the validity of the given answer.
• Use of an inappropriate number of significant figures will normally be penalised in the practical examinations or coursework.
• Using $g = 10\ m\ s^{-2}$ **will** be penalised.

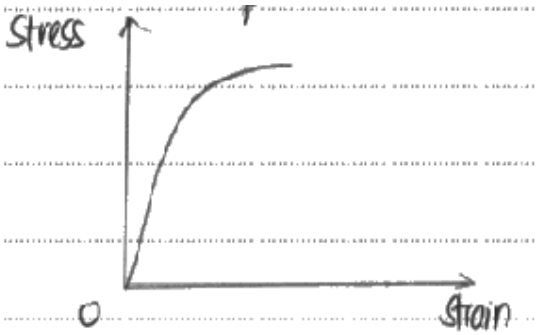
Calculations

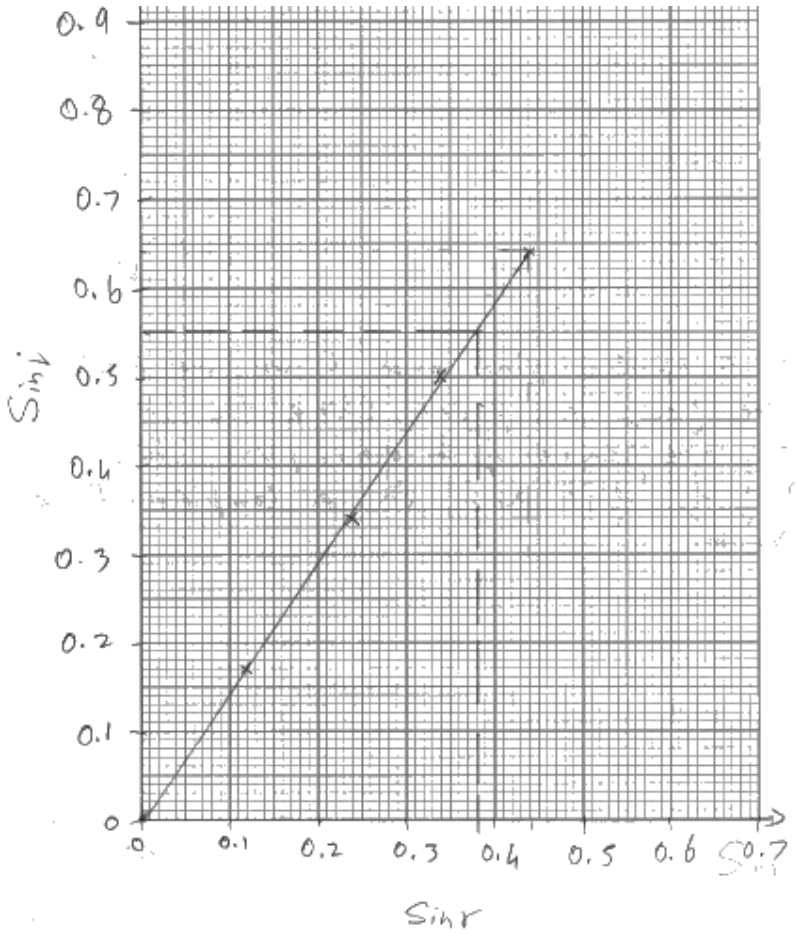
• Bald (i.e. no working shown) correct answers score full marks unless in a 'show that' question.
• Rounding errors will not be penalised.
• If a 'show that' question is worth 2 marks then both marks will be available for a reverse working; if it is worth 3 marks then only 2 will be available.
• use 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.
• recall of the correct formula will be awarded when the formula is seen or implied by substitution.
• The mark scheme will show a correctly worked answer for illustration only.

Question Number	Answer	Mark
1	**The only correct answer is C** ***A*** *is not correct because force is a derived quantity* ***B*** *is not correct because newton is a unit not a quantity* ***D*** *is not correct because ampere is a unit not a quantity*	**1**
2	**The only correct answer is C** ***A*** *is not correct because 0.001 has too many decimal places* ***B*** *is not correct because 0.005 has too many decimal places* ***D*** *is not correct because 0.05 is too large*	**1**
3	**The only correct answer is D** ***A*** *is not correct because 0.0378 the anomalous time has not been omitted* ***B*** *is not correct because 0.38 the anomalous time has not been omitted* ***C*** *is not correct because although 0407 the anomalous time has been omitted there are too many significant figures*	**1**
4	**The only correct answer is A** ***B*** *is not correct because a micrometer screw gauge does not have sufficient range* ***C*** *is not correct because the scale is calibrated in millilitres not millimetres* ***D*** *is not correct because vernier calipers do not have sufficient range*	**1**
5	**The only correct answer is B** ***A*** *is not correct because metre rule is not sufficiently precise* ***C*** *is not correct because the scale is calibrated in millilitres not millimetres* ***D*** *is not correct because vernier calipers are not sufficiently precise*	**1**
	Total for multiple choice questions	**5**

Question Number	Answer		Mark
6 (a)	Correct symbol for unknown resistor connected in series with ammeter Variable resistor or variable power supply Voltmeter connected in parallel with unknown resistor (allow ecf for resistor symbol) <u>Example</u>  	(1) (1) (1)	**3**
6 (b)	No parallax **Or** (often) higher **sensitivity** **Or** can change range easily	(1)	**1**
6 (c)	Switch off between readings To avoid temperature rise **Or** Check for zero error And correct readings to take any error into account [ignore references to parallax or to graphical method/anomalous readings as in stem]	(1) (1) (1) (1)	**2**
	Total for question 6		**6**

Question Number	**This question must be marked holistically, so award marks for any valid points wherever they appear.**		Mark
7	(a) *draw a diagram of the apparatus to be used,* Appropriate set up, either horizontal or vertical including wire and suspended masses	(1)	**1**
	(b) *list any measuring instruments and apparatus needed that are not shown in the diagram,* **Either on diagram or list or elsewhere in answer**, (Clamp to hold wire), micrometer **and** metre rule / tape	(1)	**1**
	(c) state the quantities to be measured, original length **and** extension/length **and** diameter, (mass/force)	(1)	**1**
	(d) state which is the independent variable and which is the dependent variable, Independent variable is mass/force Dependent variable is extension/length	(1) (1)	**2**
	(e) for two quantities stated in (c) explain your choice of measuring instrument, 1st quantity: Instrument Justification, including indication of precision related to expected measurement 2nd quantity: Instrument Justification, including indication of precision related to expected measurement	(1) (1) (1) (1)	**4**
	(f) for one quantity comment on whether repeat readings are appropriate in this case, For 1 quantity: Justification <u>Examples</u> Diameter; repeat at various places/orientations to determine average If wire stretched beyond elastic limit do not repeat length/extension measurement	(1)	**1**

	(g) explain how the measurements will be used to determine stress and strain and include a sketch of the expected graph, Stress = Force / Area **and** Strain = Extension / Original length Force = mg **and** Area = $\pi d^2/4$ Sketch of graph (graph should have a straight line section; accept graph that is only a straight line, not reaching curved section)  	(1) (1) (1)	**3**
	(h) identify the main sources of uncertainty and/or systematic error, **Max 2** Diameter – small measurement so large percentage uncertainty Extension – small measurement so large percentage uncertainty Parallax error when measuring length/extension	(1) (1) (1)	**2**
	(i) comment on safety. Sensible identification of risk with precaution <u>Example:</u> Risk of falling weight hurting foot, so wear (protective) shoes Risk of breaking wire hurting eye, wear goggles	(1)	**1**
	Total for question 7		**16**

Question Number	Answer	Mark
8(a)	**Max 2** Small range (1) No repetition shown (1) Only 4 sets (1)	**2**
8(b)	sin *i* values (1) sin *r* values (1) to 2 sig fig (1) Angle of incidence *i*/^{o} | Angle of refraction *r*/^{o} | sin *i* | sin *r* 10 | 7 | 0.17 | 0.12 20 | 14 | 0.34 | 0.24 30 | 20 | 0.50 | 0.34 40 | 26 | 0.64 | 0.44	**3**
8(c)	Axes labelled, with no units (1) Sensible scales (1) Correct plotting of data (1) Best fit line (1)  	**4**
8(d)	Large triangle - at least half of **drawn** line (1) 1.44 -1.48 to 3 sig fig (1)	**2**

8(e)	Sensible suggestion (1) with explanation (1) <u>Example</u> Use a dark room so that beam is easy to see Use a laser/thin ray so that ray is clearly defined	**2**
	Total for question 8	**13**

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