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Mark Scheme (Results)

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

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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.

For example:

(iii) Horizontal force of hinge on table top

66.3 (N) or 66 (N) **and** correct indication of direction [no ue] [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.]	✓	**1**

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

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.

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 cause the final calculation mark to be lost.

2.2 Incorrect use of case e.g. 'Watt' or 'w' will **not** be penalised.

2.3 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.

2.4 The same missing or incorrect unit will not be penalised more than once within one question.

2.5 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.

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

3. Significant figures

3.1 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.

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.

4.6 Example of mark scheme for a calculation:

'Show that' calculation of weight

Use of L × W × H ✓

Substitution into density equation with a volume and density ✓

Correct answer [49.4 (N)] to at least 3 sig fig. [No ue] ✓
[If 5040 g rounded to 5000 g or 5 kg, do not give 3rd mark; if conversion to kg is omitted and then answer fudged, do not give 3rd mark] **3**
[Bald answer scores 0, reverse calculation 2/3]

Example of answer:

80 cm × 50 cm × 1.8 cm = 7200 cm^3

7200 cm^3 × 0.70 g cm^{-3} = 5040 g

5040 × 10^{-3} kg × 9.81 N/kg

= 49.4 N

5. Quality of Written Communication

5.1 Indicated by QoWC in mark scheme. QWC – Work must be clear and organised in a logical manner using technical wording where appropriate.

5.2 Usually it is part of a max mark.

6. Graphs

6.1 A mark given for axes requires both axes to be labelled with quantities and units, and drawn the correct way round.

6.2 Sometimes a separate mark will be given for units or for each axis if the units are complex. This will be indicated on the mark scheme.

6.3 A mark given for choosing a scale requires that the chosen scale allows all points to be plotted, spreads plotted points over more than half of each axis and is not an awkward scale e.g. multiples of 3, 7 etc.

6.4 Points should be plotted to within 1 mm.

- Check the two points furthest from the best line. If both OK award mark.
- If either is 2 mm out do not award mark.
- If both are 1 mm out do not award mark.
- If either is 1 mm out then check another two and award mark if both of these OK, otherwise no mark.

For a line mark there must be a thin continuous line which is the best-fit line for the candidate's results.

Question Number	Answer	Mark
1	D	**1**
2	C	**1**
3	B	**1**
4	B	**1**
5	D	**1**

Question Number	Answer	Mark
6	<u>Wire</u> Hazard and risk (1) Precaution (1) <u>Hanging weights</u> Hazard and risk (1) Precaution (1)	**4**

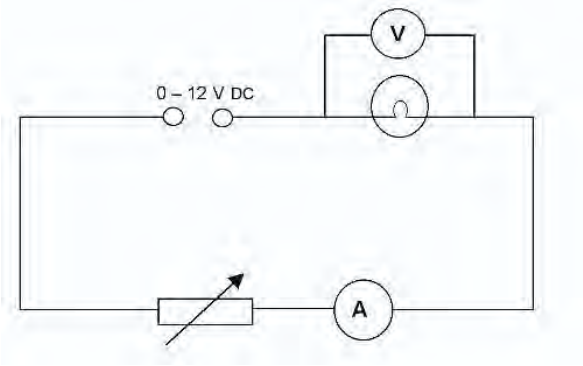
<u>Examples of answers</u>

Apparatus	**Hazard**	**Risk**	**Precaution**
Support	topples over	hits experimenter	secure support to bench with G-clamp
Wire	snaps/breaks	specific risk e.g. injury to eye	wear goggles
Hanging weights	falls	specific risk e.g. injury to feet	keep feet away from apparatus **Or** place box of sand under apparatus **Or** wear protective shoes

Accept any valid, relevant physics alternative
(Must be a specific injury and a specific precaution.)
(Hazard must refer to experimenter not surroundings)

	Total for Question 6	**4**

This question has to be marked holistically and in the context of the experiment described.

Question Number	Answer		Mark
7	(a) Correct circuit diagram with ammeter, voltmeter, power supply and bulb [accept symbol for a single cell]	(1)	
	Variable resistor Or potential divider Or variable power supply	(1)	**2**
			**1**
	(b) potential difference **and** current	(1)	
	(c) voltmeter or multimeter (to measure p.d.)	(1)	
	set on appropriate, identified range ≥12 V	(1)	
	ammeter or multimeter or milliammeter (to measure current)	(1)	
	set on appropriate, identified range ≥ 2 A	(1)	**4**
	(d) appropriate comment with justification e.g. No, as the bulb gets hot **Or** Yes, repeat experiment after bulb cooled	(1)	**1**
	(e) Describe determination of *R* values from *V* and *I* measurements	(1)	
	Draw graph of *R* against *V*	(1)	
	Sketch of graph – *R* increases as *V* increases and positive intercept on *R* axis (accept curve or straight line)	(1)	**3**
	(f) Zero error on meter if an analogue meter **Or** Difficulty of taking simultaneous measurements	(1)	**1**
	(*g*) Low voltage supply, so low risk **Or** hot bulb, do not touch (ignore reference to hot wire)	(1)	**1**
	Total for Question 7		**13**

Question Number	Answer		Mark
8(a)	$9\ mm^2$ **Or** $9 \times 10^{-6}\ m^2$	(1)	**1**
8(b)	**Max 2** Too few results Small range No repeats/means Lack of precision in radius Inconsistent sig figs in v	 (1) (1) (1) (1) (1)	**2**
8(c)	$v = (2g(\rho_s - \rho_g) / (9\eta) \times r^2$ Explicit or implicit comparison to $y = mx$ or $y = mx + c$ $(2g(\rho_s - \rho_g)/9\eta)$ is constant (dependent mark) **Or** g, ρ_s, ρ_g, and η are constant (dependent mark) **Or** m from $y = mx$ is constant (dependent mark) **Or** velocity directly proportional to radius squared (dependent mark)	 (1) (1)	**2**
8(d)	Axes labelled with quantities Axes labelled with units Sensible scales Correct plotting of candidate's data from table Line of best fit	(1) (1) (1) (1) (1)	**5**
8(e)	Gradient from triangle using more than half the drawn line in either direction Points read correctly from line on graph Correct calculation of gradient to at least 2 s.f.	(1) (1) (1)	**3**
8(f)	Substitution into equation for gradient Value for η in range 1.45-1.70 2 or 3 sig fig and appropriate unit (Pa s or N m^{-2} s or kg m^{-1} s^{-1}) <u>Example of calculation</u> $\eta = 2 \times 9.8 \times (7800 - 1200) \times 10^{-6} / (9 \times 0.0090) = 1.6$ Pa s	(1) (1) (1)	**3**
8(g)	**Max 2** Terminal velocity not reached Temperature (not constant) Spheres are thrown not dropped Accuracy of manufacturer's value for radius/diameter Allow any sensible physics alternatives – must be relevant to this experiment	 (1) (1) (1) (1)	**2**
	Total for Question 8		**18**

r / mm	r^2 / mm^2	v / ms^{-1}
1	1	0.0098
2	4	0.034
3	9	0.0781
4	16	0.15

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