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# Mark Scheme June 2009

GCE

## GCE 08 Physics (8PH07)
## International Supplement

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June 2009

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**Contents**


| | |
|---|---|
| Notes on the Mark Schemes | 1 |
| 6PH07 Mark Scheme | 3 |

**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] ✓ **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.

**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]
[Bald answer scores 0, reverse calculation 2/3] **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.

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

**Unit 1 6PH07_01**

| Question Number | Answer | Mark |
|---|---|---|
| **1** | C | **(1)** |
| | **Total for question** | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **2** | B | **(1)** |
| | **Total for question** | **1** |
| Question Number | Answer | Mark |
| **3** | D | **(1)** |
| | **Total for question** | **1** |
| Question Number | Answer | Mark |
| **4** | D | **(1)** |
| | **Total for question** | **1** |
| Question Number | Answer | Mark |

| Question Number | Answer | Mark |
|---|---|---|
| **5** | Means of measuring resistance or *V* and *I* **(1)**<br>Measure length of wire with metre rule **(1)**<br>Measure diameter **(1)**<br>Use of micrometer **(1)**<br>Calculate area (appropriate equation) **(1)**<br>Quote correct equation $\rho = \frac{RA}{l}$ **(1)**<br>Sensible precaution **(1)** | |
| | **Total** | **7** |

| Question Number | Answer | Mark |
|---|---|---|
| **6. (a)** | (YM =stress/strain =) gradient **(1)** | **(1)** |
| **(b)** | 14.7 GPa **(1)**<br>$\pm$ 0.5 GPa **(1)** u.e. once only | **(2)** |
| **(c)** | Value is in GPa, G means $10^9$, so yes **(1)**<br>$10^{10}$ can mean anything from 5.0 x $10^9$ to 4.9 x$10^{10}$ so my answer is within range **(1)**<br>Or value shown to be $10^{10}$ when written to one d.p **(2)** | **(2)** |
| **(d)** | Stiffness applies to a given sample (only)/YM applies to any sample of this material **(1)** | **(1)** |
| | **Total** | **6** |

| Question Number | Answer | Mark |
|---|---|---|
| **7(a)** | (0.5) metre rule/tape to measure height**(1)**<br>Correct comment on liquid level **(1)**<br>Stating/showing metre rule vertical or use of set square **(1)** | **(3)** |
| **(b)** | Moving up and down about correct position**(1)**<br>Take repeat readings of pin position and average values **(1)**<br>Eye level with rule/avoid parallax error when reading from rule**(1)** | **Max (2)** |
| **(c)** | Correct substitution **(1)**<br>answer 1.34, to 2 or 3 sig fig, no unit**(1)** | **(2)** |
| | **Total** | **7** |

| Question Number | Answer | Mark |
|---|---|---|
| **8 (a)** | Wave in fundamental mode **(1)** | **(1)** |
| **(b)** | Only 5 **(1)**<br>Inconsistent precision in length **(1)**<br>No repeats/average **(1)**<br>Valid comment on range**(1)** | **Max (2)** |
| **(c)** | Correct squaring and transposition**(1)**<br>Comparison with $y = mx + c$ **(1)**<br><br>Example:<br><br>$T = \left(4f^2\mu\right)l^2 \qquad l^2 = \frac{1}{4f^2\mu}T$ | **(2)** |
| **(d)** | Correct values of $l^2$ **(1)**<br>Suitable scales **(1)**<br>Axes labelled with quantity and unit **(1)**<br>Correct plotting **(2)**<br>Line of best fit **(1)** | **(6)** |
| **(e)** | Large triangle using at least half the drawn line **(1)**<br>Correct gradient calculation (0.16)**(1)**<br>Correct substitution into formula to find frequency **(1)**<br>Correct calculation of frequency with unit: 2 sig fig, 50 +/- 1 | **(4)** |

| | | |
|---|---|---|
| | Hz**(1)**<br>u.e**.**<br>Example:<br><br>Gradient (*m*) = 0.78/5 = 0.156($m^2$ $N^{-1}$) **(1)**<br><br>$f^2 = \frac{1}{4l^2}\frac{T}{\mu}$ $l^2 = \frac{1}{4f^2}\frac{T}{\mu}$<br><br>Gradient = $\frac{1}{4f^2\mu}$<br><br>$f^2 = \frac{1}{4m\mu}$ = 1/(4 x 0.156 x 6.2 x $10^{-4}$) = 1/(3.87 x $10^{-4}$) = 2585 ($Hz^2$) **(1)**<br><br>*f* = 50.8 = 51 Hz **(1)** | |
| | **Total** | **15** |

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