Mark Scheme (Results)
January 2011

GCE

GCE Physics (6PH07) 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:

<u>'Show that' calculation of weight</u>

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.

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

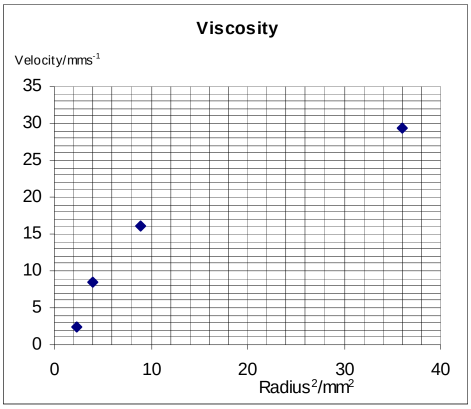
Question Number	Answer	Mark
1	B	**1**
2	D	**1**
3	A	**1**
4	B	**1**
5	D	**1**

Question Number	Answer	Mark
6	1 mark for each appropriate idea explained. Do not credit converse for a second mark: see table for examples. Do not penalise incorrect comments. 1 mark for each correct row to a maximum of 4	**Max 4**
	Total for question 6	**4**

Idea	**Datalogger/light gates**		**Stopwatch**	**Mark**
Comparison of errors	Advantage – fewer errors	or	Disadvantage – more errors e.g. random, systematic or parallax (not just human error)	1
Reaction time	No need to account for reaction time	or	Disadvantage – effect of reaction time	1
Precision	e.g. readings to nearest millisecond	or	e.g. insufficient precision for shortest times	1
Power supply	Disadvantage – power supply (or electricity) needed.	or	Advantage – no power supply required	1
Complexity	Needs 'training' setting up, alignment issues, time needed to set up	or	Simple to operate or to set up	1
Graph	Advantage – any graph could be drawn automatically	or	Any graph would have to be drawn manually	1
Availability, cost or transport	Not easily available Expensive Not easily transportable	or	Readily available Cheaper Easily transportable	1

Question Number	Answer	Mark
7	Credit must be given for correct physics in the context of the experiment described. (a) wire, support, weights, method of measuring length [credit can be given for apparatus mentioned anywhere, **not** just in diagram] (b) micrometer screw gauge/vernier callipers/digital vernier (c) length, extension /extended length, diameter, mass/weight/force (d) Credit two instruments Examples • original length - metre rule, (1) long length, 1 mm appropriate (1) • extension –metre rule/travelling microscope/vernier scale, (1) small length, appropriate precision (1) • diameter – micrometer, small length, (1) measures to1/100 mm (1) • mass – use of appropriate balance for size of mass (2) [for the second mark in each case the precision of the measuring instrument is expected] (e) independent - weight/force, dependent – extension/extended length [allow mass as independent, or stress, strain, **in context**] (f) Answers should give **all** details including definitions of strain and stress if relevant. • use of $\pi d^2/4$ [allow πr^2] (1) • use of YM equation and graph (1) (g) extension/diameter (h) identifies hazard/risk and gives appropriate precaution Examples falling weights and toe protection (1) snapping wires and safety glasses (1)	**1** **1** **1** **1** **Max 4** **1** **2** **1** **1**
	Total for question 7	**12**

Question Number	Answer	Mark
8(a)	Answer **C** **(1)**	**1**
8(b)	Rearranged into form *y* = *mx* + *c* or *y* = *c* + *mx* $\frac{1}{v} = -\frac{1}{u} + \frac{1}{f}$ or $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$ (1) comparison to show that gradient = -1 (1) comparison to show intercept on y-axis is 1/f (1) Example $\frac{1}{v} = -\frac{1}{u} + \frac{1}{f}$ (1) This is comparable to *y* = *mx* + *c*, where *y* = 1/*v* and *x* = 1/*u*, so *m* = -1 (1) and when *x* = 0, *c* = 1/*f* (1) [does not need to be in words, allow if links between terms are clear]	**3**
8(c)	Intercept 9.4 (1) Inverse of intercept value e.g. 0.11 or 0.106 [allow ecf] (1) Correct answer to 2 sig figs and metres (1) Example 9.4 (1) 0.106 (1) 0.11 m (1)	**3**
	Total for question 8	**7**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>9(a)</td><td>Max 2
Too few (1)
Inconsistent precision/significant figures (1)
No repeats/average for diameter (1)
Inconsistent intervals for diameter (1)</td><td>Max 2</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><td>Diameter /mm</td><td>Radius/mm</td><td>Radius^2/mm^2</td><td>Average time/s</td><td>Velocity /mm s^{-1}</td></tr>
<tr><td>3</td><td>1.5</td><td>2.3</td><td>28</td><td>2.4</td></tr>
<tr><td>4</td><td>2.0</td><td>4.0</td><td>8.08</td><td>8.4</td></tr>
<tr><td>6.01</td><td>3.0</td><td>9.0</td><td>4.25</td><td>16.0</td></tr>
<tr><td>12.03</td><td>6.0</td><td>36.0</td><td>2.32</td><td>29.3</td></tr>
</table>
Correct radius and radius squared values (1)
Velocity value of 16.0 or 16 (1)
Correct unit for velocity (1)
Radius given to 2 sig figs (1)
Note
Accept correct r and r^2 to any sf for first mark</td><td>4</td></tr>
<tr><td>(c)</td><td>Axes labelled with quantity and unit (ecf for unit of velocity) (1)
Suitable scales (1)
Correct plotting (1)
Curved line (1)
Smooth curve of best fit (do not credit if forced through origin) (1)
Example below would gain first 3 marks


</td><td>5</td></tr>
<tr><td>(d)</td><td>One mark for valid reason
Examples
Didn’t reach terminal velocity/is not falling at constant velocity (1)
Distance between markers is too small (1)
Tube too narrow (1)
Misreading of stop-watch or micrometer (1)
Allow temperature changes in context (1)
(Ignore parallax and reaction time alone)</td><td>max 1</td></tr>
<tr><td></td><td>Total for question 9</td><td>12</td></tr>
</table>

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