edexcel
advancing learning, changing lives

Mark Scheme (Results)
January 2007

GCE

GCE Salters Horners Physics (6752/01)

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH

A PEARSON COMPANY

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 but may be penalised again in another 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.

3.2 Use of an inappropriate number of significant figures will normally be penalised in the practical examinations or coursework.

3.3 Using $g = 10\ m\ s^{-2}$ will **not** be penalised.

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] ✓
[Allow 50.4(N) for answer if 10 N/kg used for g.]
[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:

$80 \text{ cm} \times 50 \text{ cm} \times 1.8 \text{ cm} = 7200 \text{ cm}^3$

$7200 \text{ cm}^3 \times 0.70 \text{ g cm}^{-3} = 5040 \text{ g}$

$5040 \times 10^{-3} \text{ kg} \times 9.81 \text{ N/kg}$

$= 49.4 \text{ N}$

5. Quality of Written Communication

5.1 Indicated by QoWC in mark scheme, placed as first mark.

5.2 Usually it is part of a max mark.

5.3 In SHAP marks for this are allocated in coursework only but this does not negate the need for candidates to express themselves clearly, using appropriate physics terms. Likewise in the Edexcel A papers.

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.

6752 Unit Test PSA2

1.	**(a)(i)**	Type of airflow: Laminar / streamline	✓	**1**
	(ii)	Airflow diagram: At least two streamlines drawn in front of the skier At least two streamlines continuous around and behind the skier [Maximum of 1 mark if the streamlines cross or touch]	✓ ✓	**2**
	(iii)	Skier's equipment: Smooth / tight-fitting / not baggy / elastic	✓	**1**
	(b)(i)	Desirable property: Elastic **or** Tough	✓	
		Reason: Correct reasoning in line with property, ie.		
		Will return to original shape (once load removed) **or** Can withstand shock / impact (without breaking)	✓ **or** ✓	**2**
	(ii)	Undesirable property: Plastic	✓	
		Reason: Will remain deformed (once load removed)	✓	**2**
				8

2. **(a)(i)** Pulse-echo technique:

- Distance = velocity × time between transmitted and reflected signals ✓
- Time / 2 ✓ **2**

(Allow 1 mark for - Distance to object determined if speed of soundwave and time between transmitted and reflected signals is known)

(ii) Why concrete produces weaker signal:

Wave partially reflected ✓

The greater the change in density (between the two mediums), the more is reflected ✓

2

(b)(i) Maximum force:

Use $F = \sigma \times A$ ✓

Correct answer [1.6×10^{10} N] ✓ **2**

[accept 2.0×10^{10} N]

eg. $F = \sigma \times A = 800 \times 10^{6} \times 20$

$= 1.6 \times 10^{10}$ N

(ii) Breaking strain:

Use of $\varepsilon = \sigma / E$ ✓

Correct answer [0.16 or 16%] ✓ **2**

eg. $\varepsilon = \sigma / E = 800 \times 10^{6} / 5 \times 10^{9}$

$= 0.16$

[do not penalise incorrect use of M twice]

(iii) Material property:

Brittle ✓ **1**

9

3. **(a)(i)** Energy level diagram:

- Arrow showing electron moving from lower level to a higher level ✓
- Arrow downwards from higher to lower level [must show smaller energy change than upward arrow] ✓ **2**

(ii) Missing energy:

Causes a rise in temperature of a named item ✓ **1**

(iii) Range of energies:

Minimum energy when $\lambda = 400 \times 10^{-9}$ m ✓
Use of $f = c/\lambda$ ✓
Use of $E = hf$ ✓
Correct answer [3.1 eV] ✓
[allow 3.0 – 3.3 eV for rounding errors] [no u.e]

4

eg. $f = 3 \times 10^{8} / 400 \times 10^{-9}$
$= 7.5 \times 10^{14}$ Hz

$E = hf = 5.0 \times 10^{-19}$ J
$E = 3.1$ eV

(b) Detecting forgeries:

Forgery would glow / old painting would not glow ✓ **1**

8

4. **(a)(i)** Critical angle calculation:

Use of sin $C = 1/_d\mu_a$ ✓

Correct answer [24.4^o – only acceptable answer] [no u.e] ✓ **2**

eg. Sin $C = 1/_d\mu_a = 1/2.42$

$C = 24.4^o$

(ii) Ray diagram:

Small angle ray shown passing into air, away from the normal ✓

Large angle ray showing T.I.R. with angles equal [by eye] ✓ **2**

(iii) Labelling of angles:

An incident angle correctly labelled between normal and ray in diamond ✓

An angle of refraction correctly labelled between normal and ray in air ✓ **2**

(iv) Amount of trapped light:

Any 3 of the following:

- The higher the refractive index the greater the amount of trapped light
- The higher the refractive index the lower the critical angle
- T.I.R occurs at angles greater than the critical angle
- So, if critical angle is smaller, more light is reflected ✓✓✓ **Max 3**

(b) Comment on angle:

Lower critical angle so more sparkle ✓ **1**

10

5. **(a)(i)** Continuous power problem:

Any **one** of:

- Overheating of car / risk of fire
- Water needs frequent replacing
- Environmentally unfriendly ✓ **1**

(ii) Amount of Uranium needed:

Calculation to determine ratio of 35 kW to 2.0×10^{-6} W ✓

Correct answer [1.75×10^{9} kg] ✓ **2**

[allow 1.7, 1.8 or 2.0×10^{9} kg]

eg. $(35 \times 10^{3} / 2.0 \times 10^{-6}) \times 100$

$= 1.75 \times 10^{12}$ g / 1.75×10^{9} kg

(iii) Comment:

Large amount ✓

[can be implied] **1**

(b) Safety precautions:

- Lead shielding ✓
- Minimise exposure time ✓ **2**

(c)(i) Background radiation:

Radiation present all around us / from surroundings / in the atmosphere ✓

(ii) Would not increase background level if

radiation trapped by (lead / concrete) shielding ✓

or **or**

Would increase background level if:

gamma emitted as could not be shielded/ car involved in an accident (which damaged any shielding) ✓

[or other sensible answer linked to range/shielding] **2**

8

6. **(a)** Graph scale:

Log scale ✓ **1**

(b)(i) Choice of material:

Any 2 of the following:

- (almost) all of the voltage is dropped across the carbon rod
- gives the greatest speed variation
- others need to be longer (to have same resistance as carbon)
- others need to be thinner (to have same resistance as carbon) ✓✓ **Max 2**

(b)(ii) Resistance calculation:

Use of $R = \rho L/A$ ✓

Correct units used for all terms [all in **cm** or all in **m**] ✓

Correct answer [1.9 Ω] ✓ **3**

[allow 1.8 Ω for rounding errors – no u.e]

eg. $R = 1.4 \times 10^{-5} \times 0.4 / 3.0 \times 10^{-6}$

$= 1.9\ \Omega$

(iii) Available voltage:

X – 12 V Y – 0 V ✓ **1**

(iv) Effect of connecting wires:

Less voltage available for train set as some wasted across wires ✓

0.5 Ω is (relatively) large % of total resistance, so effect is high / not negligible ✓

or **or**

Calculation of potential difference available now ✓

[9.5 V] [allow 9.5 – 9.6 V]

Significant drop from 12 V ✓ **2**

$V_{xy} = (R_{xy} / R_{Total})$ x $V_{supply} = (1.9/ (1.9+0.5)) \times 12$

$= 9.5$ V

9

7. **(a)** Graph:

(i) Line of best fit completed curving between 5.0 and 5.5 mm ✓

(ii) **X** marked correctly on line (by eye) between 5.0 - 5.5 mm ✓ **2**

(b)(i) Energy stored calculation:

Energy = ½ Fx or area under graph to intercept line ✓

Correct reading of x from graph ✓

Correct answer from graph in Joules ✓ **3**

eg. Energy = ½ Fx

= ½ × 20 × 4 ×10^{-3}

= 0.04 J

(ii) Gradient of graph:

Stiffness of wire ✓ **1**

(c) Thicker wire:

Any 2 of the following:

- Steeper gradient
- More force required to produce the same extension
- Limit of proportionality at a larger force

✓✓ **Max 2**

8