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Edexcel GCE

Physics
Unit no. 6732

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Mark Scheme (Results)

Edexcel GCE Physics 6732

Mark scheme notes June 2006

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 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.

6732 Unit Test PHY2

1

(a)(i)	Potential difference = work (done)/(unit) charge OR Potential difference = Power/current	✓	
			1
(ii)	$J = kg\ m^2\ s^{-2}$	✓	
	$C = A\ s$ or $W = J\ s^{-1}$	✓	
	$V = kg\ m^2\ A^{-1}\ s^{-3}$	✓	
			3
(b)	Converts 2 minutes to 120 seconds	✓	
	Multiplication of $VI\Delta t$ or $V\Delta Q$	✓	
	Energy = 1440 J	✓	
			3
	Example of answer: Energy = 6.0 V × 2.0 A × 120 s = 1440 J		**7**

2

(a) n = number of charge carriers per unit volume **OR**
n = number of charge carriers m^{-3} **OR**
n = charge carrier density ✓

v = drift speed/average velocity/drift velocity (of the charge carriers) ✓

2

(b) n is greater in conductors / n less in insulators. [There must be some comparison] ✓
larger current flows in a conductor. Dependant on having referred to n ✓
(statement that n large in conductor and so current large max1) **2**

(c) (In series), so same current and same n and Q ✓
v_B greater v_A ✓
v_A/v_B = ¼ // 0.25 ✓ **3**

7

3

(a) pd = 3.6 V ✓

1

Example of answer;
p.d. = 0.24 A × 15 Ω = 3.6 V

(b) Calculation of pd across the resistor ✓
[6.0 – 3.6 = 2.4 V]
Recall V = IR ✓
I_1 calculated from their pd / 4Ω ✓
[correct answer is 0.60 A. Common ecf is 6V/4Ω gives 1.5 A]

3

Example of answer:
I_1 = 2.4 V / 4.0 Ω = 0.6 A

(c) Calculation of I_2 from I_1 – 0.24 [0.36 A] ✓
[allow ecf of their I_1. common value = 1.26 A]
Substitution V = 3.6 V ✓
R = 10 Ω ✓

3

7

4

(a)(i)	(- gradient =) r = 1.95 - 2 Ω	✓	
	E = 8.9 - 9 V	✓	
			2
(ii)	I = 2.15 – 2.17 A	✓	
			1
(iii)	Use of V = IR	✓	
	R = 2.1 – 2.2 Ω	✓	
			2
(b)(i)	Battery or cell with one or more resistive component	✓	
	Correct placement of voltmeter and ammeter	✓	**2**
(ii)	Vary R e.g. variable resistor, lamps in parallel	✓	
	Record valid readings of current and pd (consequent mark)	✓	
			2
	[Do not give these marks if the candidate varies the voltage as well]		
			9

5

(a)

p	pressure	N m $^{-2}$// Pa	✓
V	volume	m ^{3}	✓
n	number of moles /amount of substance	mol	✓
T	temperature	K	✓

4

[accept words for the units]

(b)

use of $V_1/ T_1 = V_2/ T_2$ ✓
conversion of ^{o}C to K ✓
final volume = 1.5×10^{-4} m ^{3} ✓
answer 167 (^{o}C) ✓

4

Example of answer:

$$\frac{1.0\times10^{-4}\,\boldsymbol{m}^3}{293\boldsymbol{K}} = \frac{1.5\times10^{-4}\,\boldsymbol{m}^3}{\boldsymbol{T}_2}$$

$T_2 = 439 .5\,\text{K}$ **8**

6

(a)	L = energy /unit mass or /kg	✓	
	during a change of state, solid – liquid	✓	
	at constant temperature	✓	
			3

(b)(i)			
	Increasing temperature starting at 600 ^{o}C finishing at 700 ^{o}C	✓	
	Any horizontal section	✓	
	Horizontal section at 660^{o}C	✓	
			3

(ii)	Initially KE of molecules/atoms increases	✓	
	Horzt part: PE of molecules/atoms increases	✓	
	During change of state		
	Temperature remains constant OR kinetic energy unchanged	✓	
	Bonds break OR molecules move further apart	✓	
			4

10

7

(a)(i) energy = 7.5 MJ ✓
conservation of energy ✓
2

(ii) energy source needed because (thermal) energy is moving from cold to hot **OR** moving up a (temperature) gradient **OR** moving against the (temperature) gradient ✓
[Do not penalise heat used for energy]
1

(iii) recall of $P = E / t$ ✓
power = 52 W // 187500 J h^{-1} // 3125 J min^{-1} ✓
2

(b) use of $E = m c \Delta\theta$ and correct $\Delta\theta$ (20K) ✓
use of $E = m L$ ✓
answer = 1.4×10^5 J [1.449×10^5 J] ✓
3

Example of answer:
Energy temp drop = $0.35 \text{ kg} \times 4.2 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1} 20 \text{ K}$
$= 29400$ J
Energy for change of state = $0.35 \text{ kg} \times 3.3 \times 10^5 \text{ J kg}^{-1}$
$= 115\,500$ J
Total energy = 29400 + 115500 = 144900 J

(c)
- Qowc ✓
- Fins remove thermal energy / cool the air ✓
- Hot air rises **OR** cold air sinks **OR** hot air less dense **OR** cold air more dense ✓
- Fins at top cause convection, fins at bottom do not cause convection ✓

4

12