

Mark Scheme Results

GCE

GCE Physics (6735/01)

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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 / Wes opposite direction to horizontal. May show direction by arrow. Do not acce minus sign in front of number as direction.]

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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 $g = 10 \text{ m s}^{-2}$ 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 $L \times W \times H$

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 | omitted and then answer fudged, do not give 3rd mark] [Bald answer scores 0, reverse calculation 2/3]

 \checkmark

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Example of answer:

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

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

 5040×10^{-3} kg × 9.81 N/kg

= 49.4 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.

6735 Unit Test PHY5

Question Number	Answer	Mark
1 (a)	Either:	
	$F = GMm/r^2$ (or equivalent form of equation) (1)	
	With all symbols (except G) defined (1)	
	Or:	
	Force is directly proportional to the <u>product</u> of the masses.	
	And inversely proportional to the square of their distance apart.	(2)
(b) (i)	Correct attempted use of above equation with given masses and distances (ignore powers of 10) (1)	
	Correct answer 0.59 (N) (1)	
	Example of answer:	
	$F = \frac{GMm}{2}$	
	r^2	(2)
	$=\frac{6.67\times10^{-11} \text{ N m}^2 \text{ kg}^{-2}\times1.0\times10^{10} \text{ kg}\times2.0\times10^4 \text{ kg}}{(150-1)^2}$	
	$(150 \mathrm{m})^2$	
	= 0.59(3) N	
(ii)	$F = ma \rightarrow a = F/m$	
	force value from part (i).] (1)	
	[OR use of 'g' = GM/r^2 , with 'M' being the mass of the <u>tractor</u> .]	
	Correct answer 5.9 x 10^{-11} m s ⁻² [or 6.0 x 10^{-11} m s ⁻²] (1)	
	Example of answer:	
	$F = 0593 \text{ N}$ 5.0 $\pm 10^{-11} \text{ m}^{-2}$	(2)
	$a = \frac{1}{m} = \frac{10 \times 10^{10} \text{ kg}}{1.0 \times 10^{10} \text{ kg}} = 5.9 \times 10^{10} \text{ m s}^2$	
	(iii) 2.0×10^4 kg / the same / unchanged.(1)	
	[Allow bald statement or calculation that demonstrates this, ecf their first	
		(1)
	Total	1

Question Number	Answer	Mark
2 (a)(i)	$V m^{-1}$ and $N C^{-1}$.	
	Substitution of J C ⁻¹ for V or Nm C ⁻¹ for V or kg m s ⁻² for N (1)	
	[Answers must be in terms of unit equivalences, not quantities]	
	Completion of valid substitution and manipulation to demonstrate equivalence. (1)	
	Example of answer:	(2)
	$V m^{-1} = J C^{-1} m^{-1} = N m C^{-1} m^{-1} = N C^{-1}$	
(ii)	Vertical line drawn mid-way between plates, <u>labelled</u> 3V (1)	
	Vertical line drawn just left of three-quarter distance, <u>labelled</u> $4V$ (1)	
	[Gauge by eye, ignore 'edge effects' at plate edges]	
		(2)
(b) (i)	E = V/d and $F = Eq$. (1) [Correct statement of <u>both</u> equations, or re-arrangements, or combination]	
	$E = 1.5 (V \text{ cm}^{-1}) \text{ or } 150 (V \text{ m}^{-1}) (\text{no u.e.})$ (1) [Correct use of first equation to get numerical field value]	
	Correct answer 2.4×10^{-17} N (1) [Correct use of second equation to get force value (ecf their E)] [Correct final answer gets 3/3]	(3)
	Example of answer:	
	$F = \frac{V \times q}{d} = \frac{6.0 \text{ V} \times 1.6 \times 10^{-19} \text{ C}}{4.0 \times 10^{-2} \text{ m}} = 2.4 \times 10^{-17} \text{ N}$	
(ii)	Correct answer $5.0 \ge 10^{10} (s^{-1})$ (1)	
	[Correct numerical value]	(1)
	Example of answer:	
	$n = \frac{8.0 \times 10^{-9} \text{ C s}^{-1}}{1.6 \times 10^{-19} \text{ C}} = 5.0 \times 10^{10} \text{ s}^{-1}$	
	Total	8

Question Number	Answer	Mark
3(a) (i)	Correct answer $\underline{31}$ (J) (or $\underline{31.25} / \underline{31.3} / \underline{31.2}$) (J). (1)	
	[Correct use of $E = \frac{1}{2}CV^2$ equation to find E to 2s.f. or better]	(1)
	Example of answer:	
	$E = \frac{CV^2}{2} = \frac{10 \text{ F} \times (2.5 \text{ V})^2}{2} = 31.3 \text{ J}$	
(ii)	(ii) Use of volume = $\pi r^2 h$, with r = 0.5 and h = 2 (1) [i.e. ignore powers of 10]	
	Correct answer $2.0 / 1.9 \times 10^7 (\text{J m}^{-3})$ (1)	
	$[31.3J \rightarrow 2.0 \times 10^7, 30J \rightarrow 1.9 \times 10^7]$	(2)
	Example of answer:	(2)
	$\frac{E}{V} = \frac{31.3 \text{ J}}{\pi \times (0.5 \times 10^{-2} \text{ m})^2 \times 2.0 \times 10^{-2} \text{ m}} = 2.0 \times 10^7 (\text{J m}^{-3})$	
(b) (i)	Use of $Q = CV$ and $Q = It$ or $\mathbf{O} = \mathbf{V}/\mathbf{I}$ and $\mathbf{t} = \mathbf{R}\mathbf{C}$	
	$Q = 25$ (C) (no u.e.) or R = 12.5 (Ω) (no u.e.) (1) [Correct use of first equation to get charge or resistance value]	
	Correct answer 125 s (1) [Correct use of second equation to get time value (ecf errors in their Q or R)] [Correct final answer gets both marks]	(2)
	Example of answer:	
	$Q = CV = 10 \text{ F} \times 2.5 \text{ V} = 25 \text{ C}$	
	$t = \frac{Q}{I} = \frac{25 \text{ C}}{0.2 \text{ A}} = 125 \text{ s}$	
	(ii) Why current not constant?	
	The potential difference/voltage will fall. (1)	(1)
	lotal	6

Question Number	Answer	Mark
4(a)	(i) Parallel, equally-spaced lines (minimum 3)between P and Q and perpendicular to them.[ignore edge effects]	
	with arrows on at least 2 of the lines to show direction towards Q. (1)	(2)
	 (ii) Field <u>is</u> uniform (along the line / between the centres of the magnets) (1) but <u>may</u> not be nearer the edges / away from the central line. but the experiment does not give information about the field nearer the edges / away from the central line. 	
		(2)
(b) (i)	Field pattern shows following features: Vertical 'cross' shape (no field lines drawn meeting or crossing, minimum 2 lines from each magnet) (1) Arrows on field lines so directions are downwards on lines from P and upwards on lines from Q [ecf direction in a(i)] 'Neutral point' clearly labelled approximately	(3)
	centrally between P and Q (1)	(3)
(ii)	Line (straight or curved) begins at positive value in range 2 to 4 units for distance = 0cm and ends at equal negative reading -2 to -4 units at distance = 3cm. [Line is straight or shows reasonable rotational symmetry]	
	Reading is 0 at distance = 1.5 cm but not elsewhere. (1)	(2)
	Total	9

Question Number	Answer		Mark
5(a)	 (a) <u>Fleming's Left</u> hand rule / (Fleming's / The) <u>motor</u> (b) Arrow, labelled <i>F</i>, acting on wire S, to right. [accept on figure 1] 	rule (1) (1)	
	(c) Arrow upwards on wire R	(1)	
	(d) Arrow, labelled <i>B</i> , acting up the page.	(1)	(5)
	Arrow length is (approximately) $\underline{4 x} B_{R/S} $, (acting up the page). (1)		(5)
		Total	5

Question Number	Answer	Mark
6(a)	QoWC (1)	
	And/or one mark each for any of:	
	The input voltage (or current) is <u>alternating</u> $/ \underline{a.c.}$ (1)	
	$ \rightarrow \text{alternating/changing (magnetic) field/flux} \\ [not] 'flux linkage' here] in primary/core. $ (1)	
	\rightarrow alternating/changing (magnetic) field/flux/flux linkage in secondary. (1)	
	$\rightarrow \underline{\text{Induced e.m.f.}}_{\text{or}} \text{ (in secondary) ['in secondary' stated or implicit]}_{\text{or}} $ $= \inf (\text{in secondary}) \operatorname{according to Faraday's}_{\text{law of electromagnetic induction}} $ (1)	
	$V_2 \le V_1$ because $N_2 \le N_1$; [link to turns values must be explicit]. (1)	(Max 5)
	Total	5
	Total for paper	40