Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 7_ Magnetic Field

Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	• use of $s = ut + \frac{1}{2}at^2$ (1) • a = 7.4 m s^{-2} (1)	Example of calculation: $s = ut + \frac{1}{2}at^2 \quad \therefore a = \frac{2 \times 0.75\,\text{m}}{(0.45\,\text{s})^2} = 7.41\,\text{m s}^{-2}$	**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
* **(b)**	This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The following table shows how the marks should be awarded for indicative content.	Guidance on how the mark scheme should be applied: The mark for indicative content should be added to the mark for lines of reasoning. For example, an answer with five indicative marking points which is partially structured with some linkages and lines of reasoning scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning). If there are no linkages between points, the same five indicative marking points would yield an overall score of 3 marks (3 marks for indicative content and no marks for linkages).	

Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points
6	4
5 - 4	3
3 - 2	2

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1	1
0	0

The following table shows how the marks should be awarded for structure and lines of reasoning.

	Number of marks awarded for structure of answer and sustained line of reasoning
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2
Answer is partially structured with some linkages and lines of reasoning	1
Answer has no linkages between	0

(1)

(1)

(1)

(1)

(1)

(1)

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	points and is unstructured		

Indicative content:

- when the magnet falls there is a rate of change of magnetic flux linked with the tube
- the change in flux linkage for the copper tube induces an emf (Faraday's law)
- the induced emf causes a current to flow in the tube
- the induced emf (and current) are in such a direction as the oppose the change in flux linkage (Lenz's law)
- a force is exerted on the magnet opposing its motion
- plastic is not a conductor so no current is induced, shorter time to fall through the tube so teacher is correct

(6)

Question Number	Acceptable Answer	Additional Guidance	Mark
(c)	An explanation that makes reference to the following: • the slit will limit the size of the induced current (1) • hence a smaller force will oppose the motion of the magnet (1) • so the time taken to fall will be less (1)		**(3)**

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Question Number	Acceptable Answer	Additional Guidance	Mark
(d)	An explanation that makes reference to the following: • manual timing will be affected by reaction time (1) • the shorter the time being measured the greater the effect that reaction time will have (1)		**(2)**

Q2.

Question Number	Answer		Mark
(a)	Use of $\Phi = BA$ Converts cm to m Or mT to T $\Phi = 1.1 \times 10^{-4}$ Wb Example of calculation $\Phi = 6.0 \times 10^{-2}$ m $\times$ 2.4×10^{-2} m $\times$ 74×10^{-3} T $\Phi = 1.07 \times 10^{-4}$ Wb	(1) (1) (1)	3
(b)	Use of $\mathcal{E} = \Delta\Phi/\Delta t$ Use of time = distance/speed $\mathcal{E} = 5.3$ mV (5.0 mV or 5.5 mV depending on value of Φ used, ecf value of Φ from (a)) **Or** Quotes $\mathcal{E} = Blv$ $l = 6.0 \times 10^{-2}$m used $\mathcal{E} = 5.3$ mV Example of calculation Time = 0.024 m / 1.2 m s^{-1} $t = 0.020$ s $\mathcal{E} = 1.1 \times 10^{-4}$ Wb / 0.02 s = 5.5 mV	(1) (1) (1) (1) (1) (1)	3

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(c)	Use of $I = V/R$ Use of $F = BIl$ $F = 9.8 \times 10^{-5}$ N (ecf value of $\mathcal{E}$ from (b)) This force is too small to be felt. (this comment must be consistent with their value of force) Example of calculation $I = 5.5$ mV/ /0.25 Ω = 0.022 A $F = 74 \times 10^{-3}$ T × 0.022 A × 0.060 m $F = 9.8 \times 10^{-5}$ N	(1) (1) (1) (1)	4
	Total for question		**10**

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