Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Further Mechanics

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Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Mark Schemes

Q1.

(a) (i) $E = \frac{V}{d} = \frac{10000}{40 \times 10^{-3}}$ **(1)** $= 2.5 \times 10^5$ V m^{-1} **(1)**

(ii) $F = Eq = 2.5 \times 10^5 \times 3.2 \times 10^{-19}$ **(1)** $= 8.0 \times 10^{-14}$ N **(1)**

(iii) $qV = \frac{1}{2}mv^2$ or $v = \sqrt{\frac{2qV}{m}} = \sqrt{\frac{2 \times 3.2 \times 10^{-19} \times 5000}{3.4 \times 10^{-26}}}$ **(1)**

$(= 3.1 \times 10^5$ m s$^{-1})$

(max 5)

(b) (i) field into paper **(1)**

(ii) force ⊥^{r} motion in B-field **(1)**
∴ directed towards centre of a *circular* path **(1)**

(iii) $\frac{mv^2}{r} = Bqvr = \frac{mv}{Bq}$ **(1)**

for B, q constant $r \propto mv$, momentum **(1)**

$r = \frac{3.4 \times 10^{-26} \times 3.1 \times 10^5}{0.10 \times 3.2 \times 10^{-19}} = 0.33$ m **(1)**

(6)

(c) greater mass, so smaller speed at Q **(1)**

greater momentum justified e.g. $E = \frac{p^2}{2m}$ (E const) **(1)**

∴ greater radius **(1)**

(max 2)

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Q2.

(a) (i) period = 1.8 or 1.9 s or $f = 1/T$

C1

0.56 (0.556)Hz or 0.53 (0.526) s if $T = 1.9$ s

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A1

(ii) 0.074 – 0.078 m

B1

(iii) frequency remains constant

B1

amplitude reduces

B1

5

(b) attempt shows understanding of π/2 phase difference

(lag or lead)

M1

constant phase difference and amplitude

(acceptable quality)

A1

2

(c) (i) maximum acceleration = $\omega^2 A$ or $\omega = 2\pi f$

C1

0.91(3) m s^{-2} or 0.83 if T = 1.9 s

(ecf from (a) (i)) and (a) (ii))

(not allowed if period given as answer in (i))

A1

(ii) (maximum) speed = ωA (0.267 m s^{-1})

C1

use of KE = ½ mv^2 with at least m (= 8×10^{-3}) substituted

C1

(2.5 to 3.0) × 10^{-4} J

A1

or

maximum restoring force = $8.0 \times 10^{-3} \times 0.91$

C1

oscillator energy = ½ × F × A or
$0.5 \times 8.0 \times 10^{-3} \times 0.91 \times 0.075$

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C1

(2.5 to 3.0) × 10^{-4} J

rA1

5

[12]

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