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

Merit Minds
www.merit-minds.com
Exam Preparation and Free Resources

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

Mark Schemes

Q1.

(a) force is needed toward the centre or there is acceleration toward the centre

B1

movement to the left/toward A/away from the centre (or indicated on diagram)

M1

right hand spring (attached to **B)** has to stretch to provide force

A1

3

(b) (i) acceleration = v^2/r or speed = 12.5 m s^{-1}
or a = $r\omega^2$ and $v = r\omega$ or ω = 0.52 rad s^{-1} or $45^2/0.024$

C1

6.5 m s^{-2} 8.4 × 10^4 km h^{-2} unit essential

A1

2

(ii) Force on mass = 0.35 × (i) (2.28 N if correct)
or use of F = $mr\omega^2$ (0.35 × 24 × 0.52^2)

C1

0.82mm or 0.83 mm if (i) is correct;
Movement = 12.6 × (i) mm

A1

2

(c) (i) $T = 2\pi\sqrt{\frac{M}{k}}$ or $a = (2\pi f)^2 A$ or f = 1.4Hz or ω = 8.9 rad s^{-1}

C1

k = 27.8 N m^{-1} use of $T = 1/f$ or $2\pi/\omega$

Downloaded from www.merit-minds.com

C1

0.71 s (allow 0.70 s to 0.72 s)

A1

3

(ii) sketch showing amplitude reducing with time
starting at max ignore changing period

B1

labelled consistently with answers to (b)(ii) and (c)(i).
(0.71 s and initial displacement 82 mm)
condone only one period shown correctly

B1

2

[12]

Q2.

(a) (i) free oscillation:

there is no force acting other than internal forces

or only internal forces are involved or there are no external forces acting

or no energy input (following initial displacement)

do **not** allow a free oscillation is not forced to oscillate

B1

forced oscillation:

oscillator is acted on by a periodic external force
(condone acted on by external varying force)

or energy is given periodically by an external source

or made to oscillate at the frequency of another oscillator

B1

(2)

(ii) $T = 2\pi\sqrt{(l / g)}$ or $8 = 2\pi\sqrt{(l / 9.8)}$

C1

15.9 (16) m

A1

(2)

(iii) a(max) = $\omega^2 A$ (**not** x, s or r)

C1

$\omega = 2\pi f$ **or** $2\pi / T$ or $\pi / 4$ or 0.785 (0.79) (radian s^{-1})

C1

3.08 – 3.12 m s^{-2}

A1

(3)

(iv) $F = ma$ or $F = 1.5 \times 10^3 \times$ (iii)

Downloaded from www.merit-minds.com

C1

4 600 N to 4700 N (but allow e.c.f. for a from (iii))

A1

(2)

(b) graph showing two cycles of energy change in a time of 8 s;
peak at 12 kJ; shape always positive

M1

approx. $\sin^2$ shape; clearly curved at each zero value

(condone any extension beyond 8 s)

A1

(2)

[11]

Downloaded from www.merit-minds.com