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

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Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

(a) (i) speed at P, v $(=\sqrt{2gh})$ = $\sqrt{2 \times 9.81 \times 25}$ ✓

= 22(.1) (m s^{-1}) ✓

2

(ii) use of $F = k\Delta L$ gives $d\left(=\frac{F}{K}\right)=\frac{58 \times 9.81}{54}$ ✓

= 11 (10.5) (m) ✓

2

(b) (i) period $T = 2\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{58}{54}}$ ✓ (= 6.51 s)

time for one half oscillation = 3.3 (3.26) (s) ✓

2

(ii) frequency $f\left(=\frac{1}{T}\right)=\frac{1}{6.51}$ ✓ (= 0.154 (Hz))

use of $v = \pm 2\pi f\sqrt{A^2 - x^2}$ when x = 10.5 m and v = 22.1 m s^{-1} gives 22.1^2

$= 4\pi^2 \times > 0.154^2 (A^2 - 10.5^2)$ ✓

from which A = 25.1 (m) ✓

[alternatively, using energy approach gives $\frac{1}{2} mv_P^2 + mg\Delta L = \frac{1}{2} k(\Delta L)^2$ ✓

$\therefore (29 \times 22.1^2) + (58 \times 9.81 \times \Delta L) = 27 (\Delta L)^2$

solution of this quadratic equation gives ΔL = 35.7 (m) ✓

from which A = 25.2 (m) ✓]

3

(c) bungee cord becomes slack ✓

student's motion is under gravity (until she returns to **P**) ✓

has constant downwards acceleration **or** acceleration is not ∝ displacement ✓

2

(d) (i) when student is at **R** or at bottom of oscillation

1

(ii) at uppermost point **or** where it is attached to the railing ✓

because stress = *F/A* and force at this point includes weight of whole cord ✓

[accept alternative answers referring to mid-point of cord because cord will show thinning there as it stretches **or** near knots at top or bottom of cord where A will be smaller with a reference to stress = *F/A*]

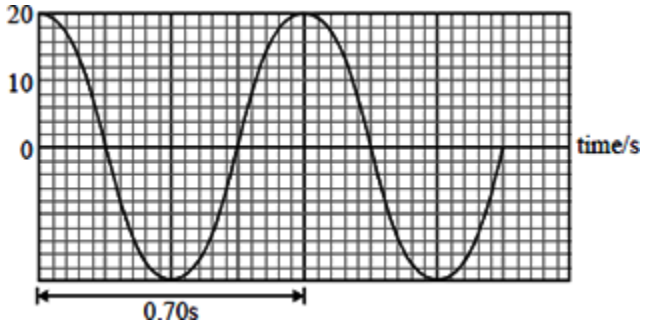
2

[14]

Q2.

(a) (i) $k = \frac{2.0}{50 \times 10^{-3}}$ **(1)** $T = 2\pi\sqrt{\frac{0.5}{40}}$ **(1)** = 0.70 s

(ii)



a correct (= 20mm) **(1)**

x = ±20 mm at *t* = 0 **(1)**

T correct (= 0.70 s)**(1)**

(5)

(b) (i) vibrates at 0.5 Hz with low amplitude **(1)**

(ii) vibrates with high amplitude **(1)**
at natural frequency **(1)**
resonates **(1)**

(max 3)

[8]