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

Mark Schemes

Q1.

(a) (i) Maximum **displacement** (of carriage/pendulum from rest position)

B1 **1**

(ii) 6.0 (m)

B1 **1**

(iii) Clear evidence of what constitutes period

C1

4.8–4.9 (s)

A1 **2**

(b) (i) Use of $v = 2\pi fA$

C1

7.07 (ms^{-1})

A1 **2**

(ii) Use of $a = 4\pi^2 f^2 A$

C1

11.1 (ms^{-2}) ecf

A1 **2**

(iii) Substitution into or rearrangement of $T = 2\pi\sqrt{l/g}$

C1

3.98 (m)

A1 **2**

(c) Applied frequency = natural frequency

B1

Mention or clear description of resonance

B1

2

(d) Resistive/frictional/damping/air resistance forces

C1

due to friction in named place (eg in bearings)/air resistance acting on named part (allow ride/gondola here)

A1

low friction/large mass or inertia /streamline/smooth surface etc.

B1

3

[15]

Q2.

(a) attractive **force** between point masses **(1)**
proportional to (product of) the masses **(1)**
inversely proportional to square of separation/distance apart **(1)**

3

(b) $m\omega^2 R = (-)\ \frac{GMm}{R^2}\left(\text{or} = \frac{mv^2}{R}\right)$ **(1)**

(use of $T = \frac{2\pi}{\omega}$ gives) $\frac{4\pi^2}{T^2} = \frac{GM}{R^3}$ **(1)**

G and M are constants, hence $T^2 \propto R^3$ **(1)**

3

(c) (i) (use of $T^2 \propto R^3$ gives) $\frac{365^2}{(1.50\times10^{11})^3} = \frac{T_m^2}{(5.79\times10^{10})^3}$ **(1)**

T_m = 87(.5) days **(1)**

(ii) $\frac{1^2}{(1.50\times10^{11})^3} = \frac{165^2}{R_N^3}$ **(1)** (gives $R_N = 4.52 \times 10^{12}$ m)

ratio = $\frac{4.51\times10^{12}}{1.50\times10^{11}}$ = 30(.1) **(1)**

4

[10]