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

Mark Schemes

Q1.

(a) direction changing, velocity vector

B1

1

(b) Newton's law equation

M1

centripetal force equation

M1

cancel mass of Triton

A1

3

(c) $\omega = 2\pi f$ or $\omega = 2\pi/T$

M1

$\omega^2 r^3$ = constant or $\omega^2 = \frac{GM}{r^3}$

M1

$\frac{T_T^2}{T_P^2} = \frac{r_T^3}{r_P^3}$ **or** statement of Kepler III for B3

$\frac{T_T}{T_P} = \sqrt{\frac{(3.55\times10^8)^3}{(1.18\times10^8)^3}}$ = 5.2(2)

M1

4

[8]

Q2.

(a) (i) force per unit mass (allow equation with defined terms)

B1

(1)

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(ii) diagram of method that will work
(pendulum / light gates / solenoid and mechanical gate / strobe photography / video)

B1

pair of measurements (eg length of pendulum and (periodic) time / distance and time of fall – could be shown on diagram)

M1

instruments to measure named quantities (may be on diagram)

A1

correct procedure (eg calculate period for range of lengths, measure the time of fall for range of heights)

B1

good practice – series of values and averages / use of gradient of graph

B1

appropriate formula and how g calculated

B1

(6)

(b) (i) evidence of gr^2 being used

C1

values of 0.25, 0.11, 0.06(25)
no s.f. penalty here unless values given as fractions

A1

(2)

(ii) points correctly plotted on grid (e.c.f.)

B1

smooth curve of high quality at least to 10×10^7 m, no intercept on r axis

B1

(2)

(iii) attempt to use area under curve

B1

evidence of × 800 kg

B1

$(4.3 – 5.3) \times 10^9$ J

B1

or
use of equation for potential $\Delta E_G = m(g_1r_1 – g_2r_2)$

B1

evidence of × 800 kg

B1

$(4.7 – 4.9) \times 10^9$ J

B1

max 2 if assumed values of G and M used

allow calculation of GM from graph followed by substitution into $\Delta E_G = M_G(m / r_1 – m / r_2)$ for 3 marks

(3)

[14]

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