Practice Question Set For A-Level
**Subject : Physics**
**Paper-2 Topic: Fields And Their Consequences(Gravitational Field)**

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**Name of the Student**:______________________________

**Max. Marks : 21 Marks** **Time : 21 Minutes**

Mark Schemes

## Q1.

(a) (i) –31 MJ $kg^{-1}$ **(1)**

(ii) increase in potential energy = $m\Delta V$ **(1)**
= 1200 × (62 – 21) × $10^6$ **(1)**
= 4.9 × $10^{10}$ J **(1)**

**(4)**

(b) (i) $g = -\dfrac{\Delta V}{\Delta x}$ **(1)**

(ii) $g$ is the gradient of the graph = $\dfrac{62.5 \times 10^6}{4 \times 6.4 \times 10^6}$ **(1)**

= 2.44 N $kg^{-1}$ **(1)**

(iii) $g \propto \dfrac{1}{R^2}$ and $R$ is doubled **(1)**

expect $g$ to be $\dfrac{9.81}{4}$ = 2.45 N $kg^{-1}$ **(1)**

[*alternative (iii)*

$g \propto \dfrac{1}{R^2}$ and $R$ is halved **(1)**

expect $g$ to be 2.44 × 4 = 9.76 N $kg^{-1}$ **(1)**]

**(5)**

**[9]**

## Q2.

(a) (i) $\left(g = -\dfrac{\Delta V}{\Delta x}\right)$ 19 = (–) $\dfrac{\Delta V}{10}$ gives $\Delta V$ = 190 **(1)** J $kg^{-1}$ **(1)**

(ii) $W(= m\Delta V)$ = 9.0 × 190 = 1710J [or $mgh$ = 9.0 × 19 × 10 = 1710J] **(1)**

(iii) on mountain, required energy would be less
because gravitational field strength is less **(1)**

**max 3**

(b) $g \propto \frac{1}{r^2}$ (or $F \propto \frac{1}{r^2}$ or correct use of $F = \frac{GMm}{r^2}$) **(1)**

$\therefore g' = \frac{19}{2^2} = 4.75(\text{N kg}^{-1})$ **(1)**

2

**[5]**

## Q3.

(a) attractive force between two particles (or point masses) **(1)**
proportional to product of masses and inversely proportional to square of separation [or distance] **(1)**

2

(b) (for mass, $m$, at Earth's surface) $mg = \frac{GMm}{R^2}$ **(1)**

rearrangement gives result **(1)**

2

(c) $M_{\text{moon}}\left(=\frac{gR^2}{G}\right) = \frac{1.62 \times (1.74 \times 10^6)^2}{6.62 \times 10^{24}}$ **(1)**

$= 7.35 \times 10^{22}$ kg **(1)**

$\frac{M_{\text{moon}}}{M_{\text{earth}}} = \frac{7.35 \times 10^{22}}{6.00 \times 10^{24}}$ (= 0.0123) $\therefore$ 1.23%

3

**[7]**