Home Assignment

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(1) According to the Newton's law of gravitation the magnitude of force is inversely proportional to the square of the distance b/w them.

A/q, $r = \frac{r}{2}$ $\left[F \propto \frac{1}{r^2}\right]$

So $F = \frac{G m_1 m_2}{\left(\frac{r}{2}\right)^2} = \frac{G m_1 m_2}{\frac{r^2}{4}} = \frac{4 G m_1 m_2}{r^2}$

$\Rightarrow F = \frac{4 G m_1 m_2}{r}$

So, if the distance between them, reduced to half, then the force of gravitation between two objects is its 4 times

(2) Gravitational force acts on all objects in proportion to their masses. A heavy object doesn't fall faster than a light object

We know that Force = Mass x Acceleration and $F \propto m$

And, thus acceleration in gravitation force remains constant in any mass.

(3) The earth & the moon are attracted to each other by gravitational force. According to the universal law of Gravitation, two objects apply the same force but in opposite direction. So, the earth attract the moon same as the force with which the moon attracts the earth.

CW

④ (i) The force will be ~~reduced to one fourth~~ doubled if the mass of the object is doubled as

$$F \propto m$$

(ii) If the distance will be doubled then the force will be one fourth times
If the distance will be tripled then the force will be one nineth times
As, $F \propto \frac{1}{r^2}$

(iii) If the masses of both objects are doubled then the force will become 4 times

⑤ (i) Statement 1 & Statement 2 are true and Statement 2 is the correct explanation for Statement 1

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① The acceleration produced in a freely falling body under the gravitational pull of the earth is called acceleration due to gravity. It is denoted by g. It is a vector quantity

② The earth attracts falling apple and the apple also attract the earth. The mass of the earth is more. So it produces very less acceleration. So it seems that the earth doesn't move towards the apple but actually it moves

Ans

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③. The universal law of gravitation successfully explained several phenomena which were believed to be unconnected:
→ The force that binds us to the earth:
→ The motion of the moon around the earth
→ The motion of planets around the Sun;
→ The tides due to the moon & the Sun.

④. Here $g_h = \frac{g}{2}$

But $g_h = g\left(\frac{R}{R+h}\right)^2$

$\therefore \frac{g}{2} = g\left(\frac{R}{R+h}\right)^2$ or $\frac{R}{(R+h)} = \frac{1}{2}$

or, $\frac{R+h}{2} = \sqrt{2}$

or $h = (\sqrt{2}-1)R = 0.414R$
$= 0.414 \times 6400$
$= 2649.6$ km

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MCQ

1. Does not change from place to place
2. 80 N
3. Statement 1 & statement 2 is true and statement 2 is the correct explanation of statement 1.