

1) How does the force of gravitation between two objects change when the distance between them is reduced to half.

Ans. The force of gravitation is inversely proportional to the square of the distance between them. So, when the distance between them is reduced to half the gravitational force will be four times.

2) Gravitational force acts on all objects in proportion to their masses. Why then a heavy object does not fall faster than a light object.

Let mass of the heavy object = m_1
mass of the lighter object = m_2

According to 2nd law's of motion $F = Ma$.

when so $M \propto \frac{1}{a}$

So as in case of heavier object mass is more so acceleration will be less.

and in case of lighter object mass is less so acceleration will be more.

So, heavier object does not fall faster than light object.

3) The earth and the moon are attracted to each other by gravitational force. Does the earth attract the moon with a force ~~with~~ that is greater or smaller or the same as the force with the moon attracts the earth? why?

Ans. Yes, the earth attract the moon with a force same as the force with the moon attracts the earth because according to the Newton's 3rd law every action has ~~an~~ equal and opposite direction.

4) what happens to the force between two objects if (i) the mass of one object is doubled? (ii) the distance between the objects is doubled and tripled? (iii) the masses of both objects are doubled?

Ans) when the mass of one object is doubled then the force will also be doubled as $F \propto M$

when the distance between two objects is doubled then the ~~force~~ force become $\frac{1}{4}$.

$$F = \frac{Gm_1m_2}{(2R)^2} = \frac{1}{4} \times \frac{Gm_1m_2}{R^2} = \frac{1}{4} F = \frac{F}{4}$$

When the distance between two objects is tripled then the force becomes $\frac{1}{9}$.

$$F = \frac{Gm_1m_2}{(3R)^2} = \frac{1}{9} \times \frac{Gm_1m_2}{R^2} = \frac{1}{9} \times F = \frac{F}{9}$$

(iii) If the masses of both of the objects are doubled then the force between two objects becomes 4 times.

$$F = \frac{G(2m_1)(2m_2)}{R^2} = \frac{4 \times Gm_1m_2}{R^2} = 4F$$

4) Acceleration of due to gravity can be defined as acceleration of any body due to gravitational force of some another body.

5) Earth attracts falling apple & that the apple also attracts the earth but the earth does not move because as $m \propto \frac{1}{a}$ and mass of earth is very large than of apple & the apple ~~not~~ for which acceleration is very ~~not~~ less or negligible.

87) what is the importance of universal law of gravitation

8) At what height above the surface, the value of the gravity would be half of what it is on the surface of the earth. Take radius of the earth as $R_e = 6400 \text{ km}$.

$$\frac{g}{2} = \frac{Gm}{(R+h)^2}$$

$$g = \frac{Gm}{R^2}$$

$$\frac{1}{2} = \frac{R^2}{(R+h)^2}$$

$$2R^2 = (R+h)^2$$

$$\sqrt{2}R = R+h$$

$$\cancel{R} \cancel{+} \cancel{R} \cancel{+} \cancel{R} \cancel{+} \cancel{R} \cancel{+} \cancel{R} \quad 0.41R = R$$

$$= 0.41 \times 6400 = 2624.$$

9) Changes with change of place.

10) ~~8000~~ 80N