Gravitation

1 Two objects of equal masses placed at certain distance from each other attracts each other with a force of F. If one-third mass of one object is transferred to the other object, then the new force will be

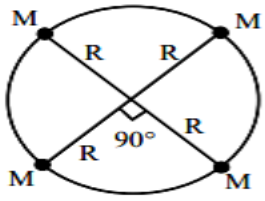
(a) 2 F / 9 (b) 16 F / 9 (c) 8 F / 9 (d) F

2 Two point-masses m and α m are separated by a distance r. Another mass m_0 is placed on the line joining them at a distance x from the mass m such that it experiences no gravitational force. Find the value of x as a function of r and α.

3 Three identical point masses m are placed at the vertices of an equilateral triangle of side a. The net gravitational force on any of them will be:

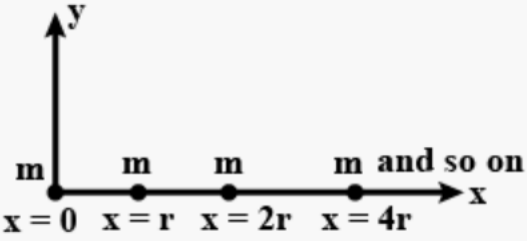
(a) Zero (b) Gm^2 / a^2 (c) $(\sqrt{2}\, Gm^2) / a^2$ (d) $(\sqrt{3}\, Gm^2) / a^2$

4 Four particles each of mass M, move along a circle of radius R under the action of their mutual gravitational attraction as shown in figure. The speed of each particle is



A $\frac{GM}{R}$ B $\sqrt{2\sqrt{2}\frac{GM}{R}}$ C $\sqrt{\frac{GM}{R}(2\sqrt{2}+1)}$ D $\sqrt{\frac{GM}{R}\left(\frac{2\sqrt{2}+1}{4}\right)}$

5 Consider an infinite distribution of point masses (each of mass m) placed on x -axis as shown in the diagram. What is the gravitational force acting on the point mass placed at the origin?



A $\frac{4Gm^2}{3r^2}$ B $\frac{Gm^2}{3r^2}$ C $\frac{4Gm^2}{r^2}$ D $\frac{Gm^2}{r^2}$

6 At the surface of a certain planet acceleration due to gravity is one-quarter of that on the earth. If a brass ball is transported on this planet, then which one of the following statements is not correct?

Gravitation

(a) The brass ball has same mass on the other planet as on the earth.
(b) The mass of the brass ball on this planet is a quarter of its mass as measured on the earth.
(c) The weight of the brass ball on this planet is a quarter of the weight as measured on the earth.
(d) The brass ball has the same volume on the other planet as on the earth.

7 Imagine a new planet having the same density as that of earth but it is 3 times bigger than the earth in size. If the acceleration due to gravity on the surface of earth is g and that on the surface of the new planet is g', then

(a) g' = g / 9 (b) g' = 27 g (c) g' = 9 g (d) g' = 3 g

8 Consider a planet in some solar system which has a mass double the mass of earth and density equal to the average density of earth. If the weight of an object on earth is W, the weight of the same object on that planet will be

(a) 2 W (b) W (c) $2^{1/3}$ W (d) $\sqrt{2}$ W

9 If the radius of earth shrinks by 2% while its mass remains same. The acceleration due to gravity on the earth's surface will approximately

(a) decrease by 2 % (b) decrease by 4 %
(c) increase by 2 % (d) increase by 4 %

10 A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth?

(a) 32 N (b) 30 N (c) 36 N (d) Zero