PRERNA EDUCATION
IIT-JEE | NEET | BOARDS | NTSE | KVPY | OLYMPIADS

Chapter : GRAVITATION

Assignment 3

Class 11

DPP

DAILY PRACTICE PROBLEMS

CLASS : XIth **SUBJECT : PHYSICS**

Date : **DPP No. :3**

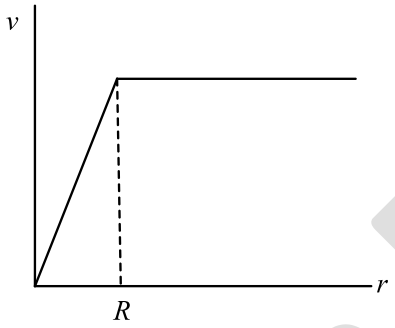
Topic :- GRAVITATION

1. A spherically symmetric gravitational system of particles has a mass density

$$\rho = \begin{cases} \rho_0 \text{ for } r \le R \\ 0 \text{ for } r > R \end{cases}$$

where ρ_0 is a constant. A test mass can undergo circular motion under the influence of the gravitational field of particles. Its speed v as a function of distance $r(0 < r < \infty)$ from the centre of the system is represented by

a)



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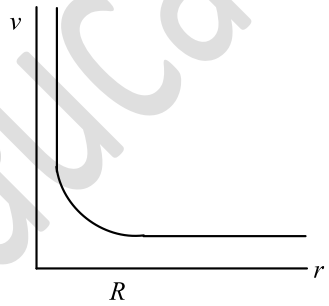

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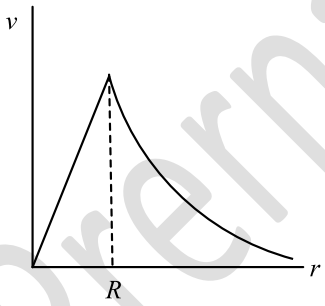

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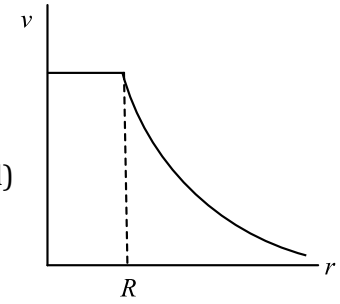


2. A spherical planet for out in space has a mass M_0 and diameter D_0. A particle of mass m falling freely new the surface of this planet will experience an acceleration due to gravity which is equal to

a) GM_0/D_0^2 b) $4mGM_0/D_0^2$ c) $4GM_0/D_0^2$ d) GmM_0/D_0^2

3. Two bodies of masses 2kg and 8kg are separated by a distance of 9 m. the point where the resultant gravitational field intensity is zero is at a distance of

a) 4.5 m from each mass b) 6 m from 2 kg c) 6 m from 8 kg d) 2.5 m from 2 kg

4. Suppose the law of gravitational attraction suddenly changes and becomes an inverse cube law i.e. $F \propto 1/r^3$, but still remaining a central force. Then
   a) Keplers law of areas still holds
   b) Keplers law of period still holds
   c) Keplers law of areas and period still hold
   d) Neither the law of areas, nor the law of period still holds

5. There are two planets. The ratio of radius of the two planets is K but ratio of acceleration due to gravity of both planets is g. What will be the ratio of their escape velocity
   a) $(Kg)^{1/2}$ b) $(Kg)^{-1/2}$ c) $(Kg)^2$ d) $(Kg)^{-2}$

6. The period of revolution of planet A around the sun is 8 times that B. The distance of a from the sun is how many times greater than that of B from the sun?
   a) 2 b) 3 c) 4 d) 5

7. What would be the velocity of earth due to rotation about its own axis so that the weight at equator become 3/5 of initial value. Radius of earth on equator is 6400 km
   a) $7.4 \times 10^{-4} rad/sec$ b) $6.7 \times 10^{-4} rad/sec$ c) $7.8 \times 10^{-4} rad/sec$ d) $8.7 \times 10^{-4} rad/sec$

8. The period of a satellite in a circular orbit of radius R is T, the period of another satellite in a circular orbit of radius $4R$ is
   a) $4T$ b) $T/4$ c) $8T$ d) $T/8$

9. The escape velocity for a body projected vertically upwards from the surface of the earth is 11.2 kms^{-1}. If the body is projected in a direction making an angle of 45° with the vertical, the escape velocity will be
   a) 11.2 kms^{-1} b) $11.2 \times \sqrt{2}\ \text{kms}^{-1}$ c) $11.2 \times 2\ \text{kms}^{-1}$ d) $11.2/\sqrt{2}\ \text{kms}^{-1}$

10. A body is at rest on the surface of the earth. Which of the following statement is correct?
    a) No force is acting on the body
    b) Only weight of the body acts on it
    c) Net downward force is equal to the net upward force
    d) None of the above statement is correct

11. If orbital velocity of planet is given by $v = G^a M^b R^c$, then
    a) $a = 1/3, b = 1/3, c = -1/3$ b) $a = 1/2, b = 1/2, c = -1/2$
    c) $a = 1/2, b = -1/2, c = 1/2$ d) $a = 1/2, b = -1/2, c = -1/2$

12. The escape velocity of a body on the earth's surface is v_e. A body is thrown up with a speed $\sqrt{5}\ v_e$. Assuming that the sun and planets do not influence the motion of the body, velocity of the body at infinite distance is
    a) Zero b) v_e c) $\sqrt{2}v_e$ d) $2v_e$

13. A point mass is placed inside a thin spherical shell of radius R and mass M at a distance $R/2$ from the centre of the shell. The gravitational force exerted by the shell on the point mass is

a) $\frac{GM}{2R^2}$ b) $-\frac{GM}{2R^2}$ c) Zero d) $\frac{GM}{4R^2}$

14. A solid sphere is of density ρ and radius R. The gravitational field at a distance r from the centre of the sphere, where $r < R$, is

a) $\frac{\rho\pi GR^3}{r}$ b) $\frac{4\pi G\rho r^2}{3}$ c) $\frac{4\pi G\rho R^3}{3r^2}$ d) $\frac{4\pi G\rho r}{3}$

15. Three or two planets. The ratio of radius of the two planets is K but ratio of acceleration due to gravity of both planets is g. What will be the ratio of their escape velocity?

a) $(Kg)^{1/2}$ b) $(Kg)^{-1/2}$ c) $(Kg)^2$ d) $(Kg)^{-2}$

16. Out of the following, the only correct statement about satellites is

a) A satellite cannot move in a stable orbit in a plane passing through the earth's centre
b) Geostationary satellites are launched in the equatorial plane
c) We can use just one geostationary satellite for global communication around the globe
d) The speed of satellite increases with an increase in the radius of its orbit

17. If a planet consists of a satellite whose mass and radius were both half that of the earth, the acceleration due to gravity at its surface would be (g on earth $= 9.8\ m/\sec^2$)

a) $4.9m/\sec^2$ b) $8.9m/\sec^2$ c) $19.6m/\sec^2$ d) $29.4m/\sec^2$

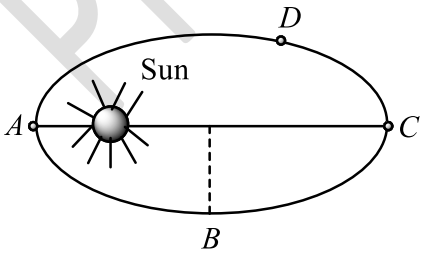
18. The escape velocity of a particle of mass m varias as

a) m^2 b) m c) m^0 d) m^{-1}

19. The mass of diameter of a planet are twice those of earth. The period of oscillation of pendulum on this planet will be (if it is a second's pendulum on earth)

a) $\frac{1}{\sqrt{2}}s$ b) $2\sqrt{2}\,s$ c) $2s$ d) $\frac{1}{2}s$

20. A planet revolves around the sun in an elliptical orbit. The linear speed of the planet will be maximum at



a) D b) B c) A d) C