1. The two planets have radii r_1 and r_2 and their densities ρ_1 and ρ_2 respectively. The ratio of acceleration due to gravity on them will be

a) $r_1\rho_1 : r_2\rho_2$ b) $r_1\rho_1^2 : r_2\rho_2^2$ c) $r_1^2\rho_1 : r_2^2\rho_2$ d) $r_1\rho_2 : r_2\rho_1$

2. The escape velocity of a body from the surface of earth is 11.2 km/sec. It is thrown up with a velocity 4 times this escape velocity. The velocity of the body when it has escaped the gravitational pull of earth is (neglecting the presence of all other heavenly bodies)

a) 4 x 11.2 km s^{-1} b) 3 x 11.2 km s^{-1} c) $\sqrt{15}\times 11.2\, kms^{-1}$ d) zero

3. A research satellite of mass 200 kg circles the earth in an orbit of average radius $\frac{3R}{2}$ where R is the radius of the earth. Assuming the gravitational pull on the satellite will be

a) 880 N b) 889 N c) 950 N d) 910 N

4. A body is projected vertically upward from the surface of a planet of radius R with a velocity equal to half of the escape velocity for that planet. The maximum height attained by the body is directly proportional to

a) $\frac{R}{3}$ b) $\frac{R}{2}$ c) $\frac{R}{4}$ d) $\frac{R}{5}$

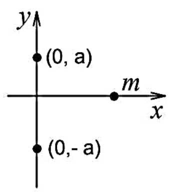
5. Two spherical bodies of mass M and 5M and radii R and 2R respectively are released in free space with initial separation between their centres equal to 12R. If they attract each other due to gravitational force only, then the distance covered by the smaller body just before collision is

a) 1.5 R b) 2.5 R c) 4.5 R d) 7.5 R

6. A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height 2R above the earths surface where R is the radius of the earth. The value of T_1/T_2 is

a) $\frac{1}{9}$ b) $\frac{1}{3}$ c) $\sqrt{3}$ d) 9

7. Two particles of same mass m are placed at A(0,a) and B(0,-a). Another particle, of mass m, is placed on the *x*-axis. If the position of the particle is changed along the *x* axis, then the magnitude of the maximum force experienced by it is



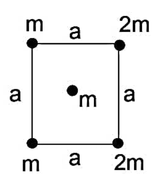
a) $\frac{2GM^2}{3\sqrt{3}a^2}$ b) $\frac{4GM^2}{3a^2}$ c) $\frac{4GM^2}{3\sqrt{3}a^2}$ d) $\frac{GM^2}{a^2}$

8. The time period of a satellite in a circular orbit around a planet is independent of

a) the mass of planet b) the radius of the orbit

c) the mass of the satellite d) all the three parameters given in a,b and c

9. Four particles having mass *m, m,* 2*m* and 2*m* are placed at the four corners of a square of edge a as shown. The magnitude of gravitational force acting on a particle of *m* placed at the centre is



a) $\frac{2Gm^2}{a^2}$ b) $\frac{Gm^2}{\sqrt{2}a^2}$ c) $\frac{Gm^2}{2a^2}$ d) $\frac{2\sqrt{2}Gm^2}{a^2}$

10. The kinetic energy of a satellite in its orbit around the earth is E. What should be the kinetic energy of the satellite as to enable it to escape from the gravitational pull of the earth ?

a) 4E b) 2E c) $\sqrt{2}$ E d) E

11. The earth's radius is R and acceleration due to gravity at its surface is g. If a body of mass m is sent to a height R/4 from the earth's surface, the potential energy increases by

a) $mg\frac{R}{3}$ b) $mg\frac{R}{4}$ c) $mg\frac{R}{5}$ d) $\frac{3mgR}{16}$

12. Two spherical balls of 2kg and 4kg are separated by a distance of 12 cm. The distance of a point from the 1kg mass at which the gravitational force on any mass becomes zero is

a) 1 cm b) 2 cm c) 3 cm d) 4 cm

13. The escape speed of a body from earth depends on

a) the mass of the body b) the location from where it is projected

c) the direction of projection d) the height of the location where the body is launched

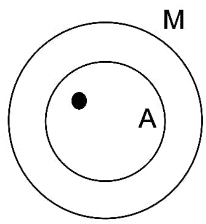
14. If three uniform sphere, each having mass M and radius R, are kept in such a way that each touches the other two, the magnitude of the gravitational force on any sphere due to the other two is

a) $\frac{GM^2}{4r^2}$ b) $\frac{2GM^2}{r^2}$ c) $\frac{2GM^2}{4r^2}$ d) $\frac{\sqrt{3}GM^2}{4r^2}$

15. A particle is thrown vertically upwards from the surface of earth and it reaches to a maximum height equal to the radius of earth. The ratio of the velocity of projection to the escape velocity on the surface of earth is

a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{2}$ c) $\frac{1}{4}$ d) $\frac{1}{2\sqrt{2}}$

16. The figure shows a spherical shell of mass M. The point A is not at the centre but away from the centre of the shell. If a particle of mass m is placed at A, then



a) it remains at rest

b) it experiences a net force towards the centre

c) it experiences a net force away from the centre

d) none of the above

17. The potential energy of interaction due to a thin spherical shell of mass M and radius R is

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

18. If the gravitational field is zero in some region, the gravitational potential in that region

a) must be zero b) may be zero c) must be constant d) may be variable

19. The distance from the surface of earth at which the gravitational potential energy of a ball of mass m is half of that at the centre of the earth is (where R is the radius of earth)

a) $\frac{R}{4}$ b) $\frac{R}{3}$ c) $\frac{3R}{4}$ d) $\frac{4R}{3}$

20. A planet has twice the density of earth but the acceleration due to gravity on its surface is exactly the same as on the surface of earth. Its radius in terms of earth's radius R will be

a) $\frac{R}{4}$ b) $\frac{R}{2}$ c) $\frac{R}{3}$ d) $\frac{R}{8}$

21. If the density of the earth is doubled keeping its radius constant, then acceleration due to gravity will be ($g = 9.8\ ms^{-2}$)

a) $2.45\ ms^{-2}$ b) $4.9\ ms^{-2}$ c) $9.8\ ms^{-2}$ d) $19.6\ ms^{-2}$

22. If a man weighs 90 kg on the surface of the earth, the height above the surface of the earth where his weight is 30 kg is (Assume radius of earth to be R)

a) 0.41 R b) $\sqrt{2}R$ c) $\frac{R}{\sqrt{2}}$ d) $\frac{R}{2}$

23. A sky lab of mass m kg is first launched from the surface of the earth in a circular orbit of radius 2R (from the centre of the earth) and then it is shifted from this circular orbit to another circular orbit of radius 3R. The minimum energy required to place the lab in the first orbit is

a) $\frac{3}{4}mgR$ b) mg R c) 2mgR d) $\frac{mgR}{4}$

24. A thin rod of length 10 cm is bent to form a circle. Its mass is 1kg. The force that acts on the mass of 10 g placed at the centre of the circle is

a) $4\pi^2G$ b) $\frac{G}{4\pi^2}$ c) $2\pi G$ d) zero

25. A satellite is orbiting around the earth with a period T. If the earth suddenly shrinks to half its radius without change in mass, the period of revolution of the satellite will be

a) $\frac{T}{\sqrt{2}}$ b) $\frac{T}{2}$ c) T d) 2T

26. The orbital velocity of a satellite very near to the surface of the earth is V. The orbital velocity at an altitude 7 times the radius of the earth is

a) $\frac{V}{\sqrt{2}}$ b) $\frac{V}{2}$ c) $\frac{V}{2\sqrt{2}}$ d) $\frac{V}{4}$

27. Two satellites are moving in orbits $R_1 > R_2$, then the velocities associated with them are

a) $V_1 < V_2$ b) $V_1 > V_2$ c) $V_1 = V_2$ d) $V_1 = 2V_2$

28. Two point masses 9m and 16m are separated by a distance d. The distance to the point from 9m where the gravitational field intensity is zero is

a) $\frac{3d}{7}$ b) $\frac{4d}{7}$ c) $\frac{d}{2}$ d) $\frac{d}{9}$

29. A satellite A of mass m revolves in a circular orbit of radius r and another satellite B of mass 2m revolves in a circular orbit of radius 2r around the earth. The ratio of time periods of A and B is

a) 1 : 2 b) 2 : 1 c) $1 : 2\sqrt{2}$ d) $2\sqrt{2} : 1$

30. A satellite, of mass m, is revolving around the earth in a circular orbit of radius R. The work done by the gravitational force in one revolution is (M is the mass of the earth)

a) 0 b) $\frac{GMm}{R}$ c) $\frac{-GMm}{R}$ d) $\frac{-GMm}{2R}$

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