JEE NEET GRAVITATION MCQS TEST

Q 1. The acceleration due to gravity g on earth is 9.8 ms^{-2}. What would the value of g for a planet whose size is the same as that of earth but the density in twice that of earth?

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

Q 2. If the radius of the earth suddenly decreases to 80% of its present value, the mass of the earth remaining the same, the value of the acceleration due to gravity will

(a) remain unchanged (b) become (9.8×0.8) ms^{-2}

(c) increase by 36% (d) increase by about 56%

Q 3. The mass of a planet is $l/10^{th}$ that of earth and its diameter is half that of earth. The acceleration due to gravity at the planet will be

(a) 1.96 ms^{-2} (b) 3.92 ms^{-2} (c) 9.8 ms^{-2} (d) 19.6 ms^{-2}

Q 4. The escape velocity of a body projected vertically upwards from the surface of the earth is v. If the body is projected in a direction making an angle θ with the vertical, the escape velocity would be

(a) v (b) v cos θ (c) v sin θ (d) v tan θ

Q 5. A small planet is revolving around a very massive star in a circular orbit of radius R with a period of revolution T. If the gravitational force between the planet and the star were proportional to $R^{-5/2}$, then T would be proportional to

(a) $R^{3/2}$ (b) $R^{3/5}$ (c) $R^{7/2}$ (d) $R^{7/4}$

Q 6. If g is the acceleration due to gravity on the surface of the earth, the gain in potential energy of an object of mass m raised from the earth's surface to a height equal to the radius R of the earth is

(a) mgR/4 (b) mgR/2 (c) mgR (d) 2mgR

Q 7. Two satellites of the same mass are orbiting round the earth at heights of R and 4R above the earth's surface: R being the radius of the earth. Their kinetic energies are in the ratio of

(a) 4 : 1 (b) 3 : 2 (c) 4 : 3 (d) 5 : 2

Q 8. A satellite is orbiting the earth in a circular orbit of radius r. Its period of revolution varies as

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

Q 9. If the gravitational force of attraction between any two bodies were to vary as $1/r^3$ instead of $1/r^2$, the period of revolution of a planet round the sun would vary as

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

Q 10. If both the mass and the radius of the earth decrease by 1%, the value of the acceleration due to gravity will

(a) decrease by 1% (b) increase by 1% (c) increase by 2% (d) remain unchanged.

Q 11. A geostationary satellite is orbiting the earth at a height of 6R above the surface of the earth; R being the radius of the earth. What will be the time period of another satellite at a height 2.5 R from the surface of the earth?

(a) $6\sqrt{2}$ hours (b) $6\sqrt{2.5}$ hours (c) $6\sqrt{3}$ hours (d) 12 hours

Q 12. The masses and radii of the earth and moon are M_1, R_1 and M_2, R_2 respectively. Their centres are a distance d apart. The minimum speed with which a particle of mass m should be projected from a point midway between the two centres so as to escape to infinity is given by

(a) $2\left[\frac{G(M_1+M_2)^2}{md}\right]^{1/2}$ (b) $2\left[\frac{G(M_1+M_2)}{d}\right]^{1/2}$

(c) $2\left[\frac{G(M_1-M_2)^2}{md}\right]^{1/2}$ (d) $2\left[\frac{G(M_1-M_2)}{d}\right]^{1/2}$

Q 13. The angular momentum of the earth revolving round the sun is proportional to R^n where R is the distance between the earth and the sun. The value of n is

(a) 0.5 (b) 1.0 (c) 1.5 (d) 2.0

Q 14. Two satellites of masses 3M and M orbit the earth in circular orbits of radii r and 3r respectively. The ratio of their speeds is

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

Q 15. For earth the escape velocity is 11.2 kms^{-1}. For a planet whose mass and radius are twice those of the earth, the escape velocity will be

(a) 44.8 kms^{-1} (b) 22.4 kms^{-1} (c) 11.2 kms^{-1} (d) 2.8 kms^{-1}

Q 16. An earth satellite is kept moving in orbit by the centripetal force provided by

(a) the burning of fuel in its engine (b) the ejection of hot gases from its exhaust

(c) the gravitational attraction of the sun (d) the gravitational attraction of the earth.

Q 17. An instrument package is released from an orbiting earth satellite by simply detaching it from the outer wall of the satellite. The package will

(a) go away from the earth and get lost in outer space

(b) fall to the surface of the earth

(c) continue moving along with the satellite in the same orbit and with the same velocity

(d) fall through a certain distance and then move in an orbit around the earth.

Q 18. Two satellites A and B are orbiting around the earth in circular orbits of the same radius. The mass of A is 16 times that of B. The ratio of the period of revolution of B to that of A is

(a) 1:16 (b) 1 : 4 (c) 1:2 (d) 1 : 1

Q 19. A satellite is moving around the earth in a stable circular orbit. Which one of the following statements will be wrong for such a satellite?

(a) It is moving at a constant speed. (b) Its angular momentum remains constant.

(c) It is acted upon by a force directed away from the centre of the earth which counter- balances the gravitational pull of the earth.

(d) It behaves as if it were a freely falling body.

Q 20. Astronauts in a stable orbit around the earth are said to be in a weightless condition. The reason for this is that

(a) the capsule and its contents are falling freely at the same rate

(b) there is no gravitational force acting on them

(c) the gravitational force of the earth balances that of the sun

(d) there is no atmosphere at the height at which they are orbiting.

Q 21. The escape velocity from the earth is v_e. What is the escape velocity from a planet whose radius is twice that of the earth and mean density is the same as that of the earth?

(a) $v_e/2$ (b) v_e (c) $2\ v_e$ (d) $4\ v_e$

Q 22. Choose the wrong statement. The escape velocity of a body from a planet depends upon

(a) the mass of the body (b) the mass of the planet

(c) the average radius of the planet (d) the average density of the planet

Q 23. Choose the wrong statement. The orbital velocity of a body in a stable orbit around a planet depends upon

(a) the average radius of the planet (b) the height of the body above the planet

(c) the acceleration due to gravity (d) the mass of the orbiting body

Q 24. Choose the correct statement. In planetary motion

(a) the speed along the orbit remains constant

(b) the angular speed remains constant

(c) the total angular momentum remains constant.

(d) the radius of the orbit remains constant.

Q 25. An object weighs W newton on earth. It is suspended from the lower end of a spring balance whose upper end is fixed to the ceiling of a space capsule in a stable orbit around the earth. The reading of the spring balance will be

(a) W (b) less than W (c) more than W (d) zero

Q 26. If M is the mass of the earth, R its radius (assumed spherical) and G the universal gravitational constant, then the amount of work that must be done on a body of mass m so that it completely escapes from the gravity of the earth, is given by

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

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Q 27. A rocket is fired from the earth to the moon. The distance between the earth and the moon is r and the mass of the earth is 81 times the mass of the moon. The gravitational force on the rocket will be zero, when its distance from the moon is

(a) $\frac{r}{20}$ (b) $\frac{r}{15}$ (c) $\frac{r}{10}$ (d) $\frac{r}{5}$

Q 28. Assuming that the earth is a sphere of radius R, at what altitude will the value of the acceleration due to gravity be half its value at the surface of the earth?

(a) $h=\frac{R}{2}$ (b) $h=\frac{R}{\sqrt{2}}$ (c) $h=(\sqrt{2}+1)R$ (d) $h=(\sqrt{2}-1)R$

Q 29. Assuming that the earth is a sphere of uniform mass density, what is the percentage decrease in the weight of a body when taken to the end of a tunnel 32 km below the surface of the earth? Radius of earth = 6400 km.

(a) 0.25% (b) 0.5% (c) 0.75% (d) 1%

Q 30. An extremely small and dense neutron star of mass M and radius R is rotating at an angular frequency ω. If an object is placed at its equator, it will remain stuck to it due to gravity if

(a) $M>\frac{R\omega}{G}$ (b) $M>\frac{R^2\omega^2}{G}$ (c) $M>\frac{R^3\omega^2}{G}$ (d) $M>\frac{R^2\omega^3}{G}$

Q 31. Two small and heavy spheres, each of mass M, are placed a distance r apart on a horizontal surface. The gravitational field intensity at the mid-point of the line joining the centres of the spheres is

(a) zero (b) $\frac{GM^2}{r^2}$ (c) $\frac{GM^2}{2r^2}$ (d) $\frac{GM^2}{4r^2}$

Q 32. In Q. 31, the gravitational potential at the mid-point of the line joining the centres of the spheres is

(a) zero (b) $-\frac{GM}{r}$ (c) $-\frac{2GM}{r}$ (d) $-\frac{4GM}{r}$

Q 33. Three particles, each of mass m, are placed at the vertices of an equilateral triangle of side a. The gravitational field intensity at the centroid of the triangle is

(a) zero (b) $\frac{Gm^2}{a^2}$ (c) $\frac{2Gm^2}{a^2}$ (d) $\frac{3Gm^2}{a^2}$

Q 34. In Q. 33, the gravitational potential at the centroid is

(a) zero (b) $-3\sqrt{3}\frac{Gm}{a}$ (c) $-2\sqrt{3}\frac{Gm}{a}$ (d) $-\sqrt{3}\frac{Gm}{a}$

Q 35. The distance between the sun and the earth is r and the earth takes time T to make one complete revolution around the sun. Assuming the orbit of the earth around the sun to be circular, the mass of the sun will be proportional to

(a) $\frac{r^2}{T}$ (b) $\frac{r^2}{T^2}$ (c) $\frac{r^3}{T^2}$ (d) $\frac{r^3}{T^3}$

Q 36. A rocket is launched vertically from the surface of the earth of radius R with an initial speed v. If atmospheric resistance is neglected, the maximum height attained by the rocket is given by

(a) $h = \frac{R}{\left(\frac{2gR}{v^2} - 1\right)}$ (b) $h = \frac{R}{\left(\frac{2gR}{v^2} + 1\right)}$ (c) $h = R\left(\frac{2gR}{v^2} - 1\right)$ (d) $h = R\left(\frac{2gR}{v^2} + 1\right)$

Q 37. The escape velocity of a body on the earth's surface is v_e. A body is thrown with a speed 3 v_e. Assuming that the sun and planets do not influence the motion of the body, its speed at infinity would be

(a) zero (b) v_e (c) $\sqrt{2}\, v_e$ (d) $2\sqrt{2}\, v_e$

Q 38. A body is released from a height equal to the radius (R) of the earth. The velocity of the body when it strikes the surface of the earth will be

(a) $\sqrt{gR}$ (b) $\sqrt{2gR}$ (c) $2\sqrt{2gR}$ (d) $2\sqrt{gR}$

Q 39. A satellite of mass m is orbiting the earth at a height h from its surface. If M is the mass of the earth and R its radius, the kinetic energy of the satellite is

(a) $\frac{GmM}{(R+h)^2}$ (b) $\frac{GmM}{2(R+h)^2}$ (c) $\frac{GmM}{(R+h)}$ (d) $\frac{GmM}{2(R+h)}$

Q 40. In Q. 39 the potential energy of the satellite is given by

(a) $\frac{GmM}{(R+h)^2}$ (b) $\frac{GmM}{2(R+h)^2}$ (c) $-\frac{GmM}{(R+h)}$ (d) $-\frac{GmM}{2(R+h)}$

Q 41. How much energy must be spent to pull the satellite in Q.39 out of the earth's gravitational field?

(a) $\frac{2GmM}{(R+h)^2}$ (b) $\frac{GmM}{2(R+h)^2}$ (c) $\frac{2GmM}{(R+h)}$ (d) $\frac{GmM}{2(R+h)}$

Q 42. How much energy would be spent to pull the satellite in Q. 39 out of the earth's gravitational field if the earth shrank suddenly to half its present size?

(a) $\frac{GmM}{2(R+h)^2}$ (b) $\frac{GmM}{4(R+h)^2}$ (c) $\frac{GmM}{2(R+h)}$ (d) $\frac{GmM}{4(R+h)}$

Q 43. The radius of the earth is R. For a satellite to appear stationary, it must be placed in orbit around the earth at a height of about (given R = 6380 km)

(a) 5.6 R (b) 6.6 R (c) 7.6 R (d) 8.6 R

Q 44. What is the minimum energy required to launch a satellite of mass m from the surface of the earth of radius R in a circular orbit at an altitude of 2R?

(a) $\frac{5GmM}{6R}$ (b) $\frac{2GmM}{3R}$ (c) $\frac{GmM}{2R}$ (d) $\frac{GmM}{3R}$

Q 45. Two stars, each of mass m and radius R are approaching each other for a head-on collision. They start approaching each other when their separation is r >> R. If their speeds at this separation are negligible, the speed with which they collide would be

(a) $v=\sqrt{Gm\left(\frac{1}{R}-\frac{1}{r}\right)}$ (b) $v=\sqrt{Gm\left(\frac{1}{2R}-\frac{1}{r}\right)}$

(c) $v=\sqrt{Gm\left(\frac{1}{R}+\frac{1}{r}\right)}$ (d) $v=\sqrt{Gm\left(\frac{1}{2R}+\frac{1}{r}\right)}$

Q 46. Choose the only incorrect statement from the following:

(a) The equivalence of inertial and gravitational mass has provided a clue to the deeper understanding of gravitation.

(b) At poles, the effect of rotation of earth on the value of g is the minimum.

(c) Very massive rockets and extremely tiny particles, such as the molecules of a gas, require the same initial velocity to escape from the earth.

(d) A geostationary satellite, if imparted the necessary velocity, can be put in orbit at any height above the earth.

Q 47. An artificial satellite is moving in a circular orbit around the earth with a speed equal to half the escape velocity from the earth of radius R. What is the height of the satellite above the surface of the earth?

(a) $\frac{R}{2}$ (b) R (c) 3R (d) 6R

Q 48. In Q 47, if the satellite is stopped suddenly in its orbit and allowed to fall freely on the earth, the speed with which it will hit the surface of the earth will be

(a) $\sqrt{gR}$ (b) $\sqrt{2gR}$ (c) $\sqrt{3gR}$ (d) $2\sqrt{gR}$

Q 49. A body is projected vertically upward from the surface of the earth with a velocity equal to half the escape velocity. If R is the radius of the earth, the maximum height attained by the body is

(a) $\frac{R}{6}$ (b) $\frac{R}{3}$ (c) $\frac{2R}{3}$ (d) R

Q 50. Infinite number of masses, each of mass m, are placed along a straight line at distances of r, 2r, 4r, 8r, etc. from a reference point O. The gravitational field intensity at point O will be

(a) $\frac{5Gm}{4r^2}$ (b) $\frac{4Gm}{3r^2}$ (c) $\frac{3Gm}{2r^2}$ (d) $\frac{2Gm}{r^2}$

Q 51. In Q. 50, the magnitude of the gravitational potential at point O will be

(a) $\frac{Gm}{2r}$ (b) $\frac{Gm}{r}$ (c) $\frac{3Gm}{2r}$ (d) $\frac{2Gm}{r}$

Q 52. A meteor of mass M breaks up into two parts. The mass of one part is m. For a given separation r the mutual gravitational force between the two parts will be the maximum if

(a) $m = \frac{M}{2}$ (b) $m = \frac{M}{3}$ (c) $m = \frac{M}{\sqrt{2}}$ (d) $m = \frac{M}{2\sqrt{2}}$

Q 53. A body of mass m is raised to a height h above the surface of the earth of mass M and radius R until its gravitational potential energy increases by $\frac{1}{3}mgR$. The value of h is

(a) $\frac{R}{3}$ (b) $\frac{R}{2}$ (c) $\frac{mR}{(M+m)}$ (d) $\frac{mR}{M}$

Q 54. A satellite of mass m is moving in a circular orbit of radius R above the surface of a planet of mass M and radius R. The amount of work done to shift the satellite to a higher orbit of radius 2R is (here g is the acceleration due to gravity on planet's surface)

(a) mgR (b) $\frac{mgR}{6}$ (c) $\frac{mMgR}{(M+m)}$ (d) $\frac{mMgR}{6(M+m)}$

Q 55. The change in the gravitational potential energy when a body of mass m is raised to a height nR above the surface of the earth is (here R is the radius of the earth)

(a) $\left(\frac{n}{n+1}\right)mgR$ (b) $\left(\frac{n}{n-1}\right)mgR$ (c) nmgR (d) $\frac{mgR}{n}$

Q 56. A body of mass m is dropped from a height nR above the surface of the earth (here R is the radius of the earth). The speed at which the body hits the surface of the earth is

(a) $\sqrt{\frac{2gR}{(n+1)}}$ (b) $\sqrt{\frac{2gR}{(n-1)}}$ (c) $\sqrt{\frac{2gRn}{(n-1)}}$ (d) $\sqrt{\frac{2gRn}{(n+1)}}$

Q 57. Two balls A and B are thrown vertically upwards from the same location on the surface of the earth with velocities $2\sqrt{\frac{gR}{3}}$ and $\sqrt{\frac{2gR}{3}}$ respectively, where R is the radius of the earth and g is the acceleration due to gravity on the surface of the earth. The ratio of the maximum height attained by A to that attained by B is

(a) 2 (b) 4 (c) 8 (d) $4\sqrt{2}$

Q 58. Two solid spheres of radii r and 2r, made of the same material, are kept in contact. The mutual gravitational force of attraction between them is proportional to

(a) $\frac{1}{r^4}$ (b) $\frac{1}{r^2}$ (c) r^2 (d) r^4

Q 59. A comet is moving in a highly elliptical orbit round the sun. When it is closest to the sun, its distance from the sun is r and its speed is v. When it is farthest from the sun, its distance from the sun is R and its speed will be

(a) $v\left(\frac{r}{R}\right)^{1/2}$ (b) $v\left(\frac{r}{R}\right)$ (c) $v\left(\frac{r}{R}\right)^{3/2}$ (d) $v\left(\frac{r}{R}\right)^{2}$

Q 60. The value of the acceleration due to gravity at the surface of the earth of radius R is g. It decreases by 10% at a height h above the surface of the earth. The gravitational potential at this height is

(a) $-\frac{gR}{\sqrt{10}}$ (b) $-\frac{2gR}{\sqrt{10}}$ (c) $-\frac{3gR}{\sqrt{10}}$ (d) $-\frac{4gR}{\sqrt{10}}$

Q 61. Two stars of masses m and 2m are co-rotating about their centre of mass. Their centres are at a distance r apart. If r is much larger than the sizes of the stars, their common period of revolution is proportional to

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(a) r (b) $r^{3/2}$ (c) r^2 (d) r^3

Q 62. In Q. 61 above, the kinetic energies of stars of masses m and 2m are in the ratio

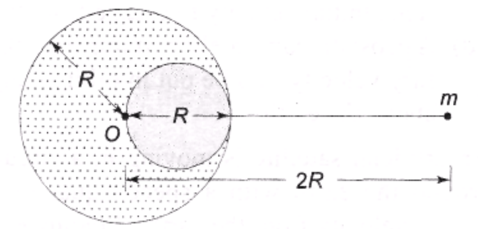
(a) $1:\sqrt{2}$ (b) $\sqrt{2}:1$ (c) 1 : 2 (d) 2 : 1

Q 63. In Q. 61 above, the angular momenta of the stars of masses m and 2m about their centre of mass are in the ratio

(a) 1 : 2 (b) 2 : 1 (c) 1 : 4 (d) 4 : 1

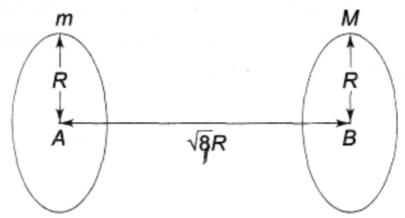
Q 64. A uniform sphere of mass M and radius R exerts a force F on a small mass m situated at a distance of 2R from the centre O of the sphere. A spherical portion of diameter R is cut from the sphere as shown in Fig. The force of attraction between the remaining part of the sphere and the mass m will be

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

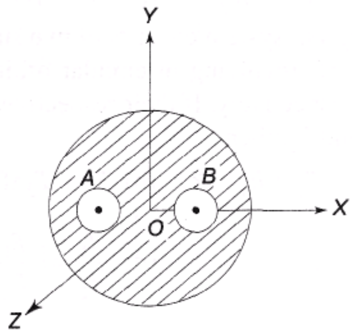


Q 65. The centres of a ring of mass m and a sphere of mass M of equal radius R, are at a distance $\sqrt{8}$ R apart as shown in Fig. The force of attraction between the ring and the sphere is

(a) $\frac{2\sqrt{2}}{27}\frac{GmM}{R^2}$ (b) $\frac{GmM}{8R^2}$ (c) $\frac{GmM}{9R^2}$ (d) $\frac{\sqrt{2}}{9}\frac{GmM}{9R^2}$



Q 66. A solid sphere of uniform density and radius 4 units is located with its centre at origin O of coordinates. Two spheres of equal radii 1 unit, with their centres at A (- 2, 0, 0) and B (2, 0, 0) respectively are taken out of the solid sphere leaving behind spherical cavities as shown in Fig. 6.20. Choose the incorrect statement from the following.



(a) The gravitational force due to this object at the origin is zero.

(b) The gravitational force at point 5(2,0,0) is zero.

(c) The gravitational potential is the same at all points of the circle $y^2 + z^2 = 36$.

(d) The gravitational potential is the same at all points of the circle $y^2 + z^2 = 4$.

Q 67. Two bodies of masses m_1 and m_2 are initially at rest at infinite distance apart. They are then allowed to move towards each other under mutual gravitational attraction. Their relative velocity of approach at a separation distance r between them is

(a) $\left[\frac{2G(m_1+m_2)}{r}\right]^{1/2}$ (b) $\left[\sqrt{\frac{2G}{r}}\frac{(m_1+m_2)}{2}\right]^{1/2}$

(c) $\left[\frac{r}{2G(m_1m_2)}\right]^{1/2}$ (d) $\left(\frac{2G}{r}m_1m_2\right)^{1/2}$

Q 68. Two objects of masses m and 4m are at rest at infinite separation. They move towards each other under mutual gravitational attraction. Then, at a separation r, which of the following is true?

(a) The total energy of the system is not zero. (b) The force between them is not zero.

(c) The centre of mass of the system is at rest. (d) All the above are true.

Q 69. A satellite is launched into a circular orbit of radius R around the earth. A second satellite is launched into an orbit of radius 1.01 R. The period of the second satellite is longer than that of the first by approximately

(a) 0.5% (b) 1.0% (c) 1.5% (d) 3.0%

Q 70. If the distance between the earth and the sun were half its present value, the number of days in a year would have been

(a) 64.5 (b) 129 (c) 182.5 (d) 730

Q 71. An artificial satellite moving in a circular orbit around the earth has a total (kinetic + potential) energy E_0. Its potential energy is

(a) $-E_0$ (b) $1.5\ E_0$ (c) $2E_0$ (d) E_0

Q 72. A satellite S is moving in an elliptical orbit around the earth. The mass of the satellite is very small compared to the mass of the earth. Which of the following statements is correct?

(a) The acceleration of S is always directed towards the centre of the earth.

(b) The angular momentum of S about the centre of the earth changes in direction, but its magnitude remains constant.

(c) The total mechanical energy of S remains constant.

(d) The linear momentum of S remains constant in magnitude.

Q 73. A simple pendulum has a time period T_1 when on the earth's surface, and T_2 when taken to a height R above the earth's surface, where R is the radius of the earth. The value of T_2/T_1 is

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

Q 74. An ideal spring with spring-constant k is hung from the ceiling and a block of mass M is attached to its lower end. The mass is released with the spring initially unstretched. Then the maximum extension in the spring is

(a) 4 Mg/k (b) 2 Mg/k (c) Mg/k (d) Mg/2k

Q 75. A geo-stationary satellite orbits around the earth in a circular orbit of radius 36000 km. Then, the time period of a spy satellite orbiting a few hundred kilometers above the earth's surface (R_{Earth} h = 6400 km) will approximately be

(a) (1/2) h (b) 1h (c) 2h (d) 4h

Q 76. A mass M is divided into two parts xm and (1 - x) m. For a given separation, the value of x for which the gravitational attraction between the two pieces becomes maximum is

(a) $\frac{1}{2}$ (b) $\frac{3}{5}$ (c) 1 (d) 2

Q 77. The height of the point vertically above the earth's surface at which the acceleration due to gravity becomes 1% of its value at the surface is (R is the radius of the earth)

(a) 8R (b) 9R (c) 10 R (d) 20R

Q 78. A body is projected up with a velocity equal to $\frac{3}{4}$ of the escape velocity from the surface of the earth. The height it reaches is: (Radius of the earth = R)

(a) $\frac{10R}{9}$ (b) $\frac{9R}{7}$ (c) $\frac{9R}{8}$ (d) $\frac{10R}{3}$

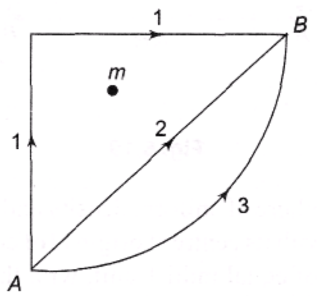
Q 79. Two bodies of masses $M_1 = m$ and $M_2 = 4m$ are placed at a distance r. The gravitational potential at a point on the line joining them where the gravitational field is zero is

(a) zero (b) $-\frac{4Gm}{r}$ (c) $-\frac{6Gm}{r}$ (d) $-\frac{9Gm}{r}$

Q 80. The radius of the earth is R and g is the acceleration due to gravity on its surface. What should be the angular speed of the earth so that bodies lying on the equator may appear weightless?

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

Q 81. If W_1, W_2 and W_3 represent the work done in moving a particle from A to B along three different paths 1, 2 and 3 (as shown in Fig.) in the gravitational field of a point mass m, find the correct relation between W_1, W_2 and W_3.



(a) $W_1 > W_3 > W_2$ (b) $W_1 = W_2 = W_3$ (c) $W_1 < W_3 < W_2$ (d) $W_1 < W_2 < W_3$

Q 82. A binary star system consists of two stars of masses M_1 and M_2 revolving in circular orbits of radii R_1 and R_2 respectively. If their respective time periods are T_1 and T_2, then

(a) $T_1 > T_2$ if $R_1 > R_2$ (b) $T_1 > T_2$ if $M_1 > M_2$ (c) $T_1 = T_2$ (d) $\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{3/2}$

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