PHYSICS

BOOKS - TARGET PHYSICS (MARATHI ENGLISH)

Gravitation

Exercise

1. Which of the following is NOT the characteristic of gravitational force ?

A. Gravitational force is always attractive.

B. Gravitational force has a finite range.

C. Gravitational force does not depend upon intervening medium.

D. Gravitational force is a weak force.

Answer:

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2. The tidal waves in the sea are primarily due to

A. earth on the sea.

B. sun on the earth.

C. earth on the moon

D. moon on the earth

Answer:

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3. A satellite is moving in an orbit around the earth due to

A. burning of fuel

B. gravitational attraction between sun and earth.

C. ejection of gases from the exhaust of the satellite.

D. gravitational attraction between earth and the satellite.

Answer:

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4. The atmosphere is held to the earth by

A. winds

B. gravity

C. clouds.

D. nature

Answer:

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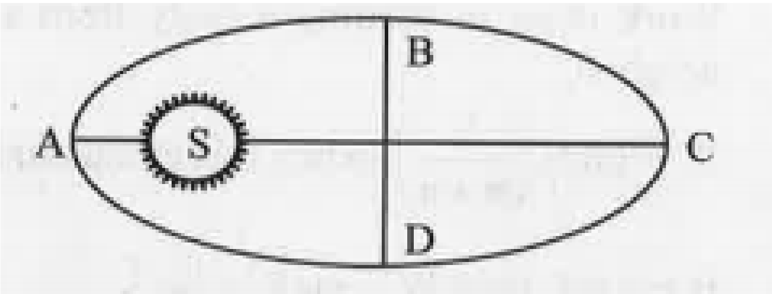
5. The earth rotates about the sun in an elliptical orbit. At which point will its velocity be maximum?



A. At A

B. At B

C. At C

D. At D

Answer:

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6. The earth revolves about the sun in an elliptical orbit with mean radius $93 \times 10^7 m$ in a period of 1 year. Assuming that there are no outside influences, then

A. the earth's kinetic energy remains constant

B. the earth's angular momentum remains constant

C. the earth's potential energy remains constant

D. all the statements above are correct.

Answer:

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7. Kepler's third law i.e. $T^2 \propto R^3$, is a consequence of law of conservation of

A. linear momentum.

B. angular momentum

C. energy.

D. law of quantisation of angular momentum.

Answer:

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8. According to Kepler, the period of revolution of a planet (T) and its mean distance from the sun (r) are related by the equation

A. $T^3 r^3 = cons\tan t.$

B. $T^2 r^{-3} = cons\tan t.$

C. $Tr^3 = cons\tan t.$

D. $T^2 r = cons\tan t.$

Answer:

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9. The earth revolves round the sun in one year. If the distance between them becomes double, the new period of revolution will be

A. $\frac{1}{2}$ year

B. $2\sqrt{2}$ years

C. 4 years

D. 8 years

Answer:

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10. If the distance between the earth and sun becomes $\frac{1}{4^{th}}$, then its period of revolution around the sun will become

A. 1/8 year

B. 8year

C. 16 year

D. 1/3 year

Answer:

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11. Newton's law of gravitation is universal because

A. it is always attractive.

B. it is not affected by the medium

C. acts on all masses at any distances

D. all of these

Answer:

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12. The force of attraction between any two particles in the universe is directly proportional to

A. square of distance between two particles.

B. product of masses of these two particles

C. universal gravitational constant

D. distance between two particles

Answer:

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13. Which of the following represent the Newton's law of universal gravitation correctly?

A. $\overrightarrow{F} = \frac{Gm_1m_2}{r^2}\overrightarrow{r}$

B. $\overrightarrow{F} = \frac{Gm_1m_2}{r^3}\hat{r}$

C. $\overrightarrow{F} = \frac{Gm_1m_2}{r^3}\overrightarrow{r}$

D. $\overrightarrow{F} = \frac{Gm_1m_2}{r}\overrightarrow{r}$

Answer:

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14. The force of attraction between two unit point masses separated by a unit distance is numerically equal to

A. acceleration due to gravity,

B. gravitational potential.

C. universal gravitational constant

D. gravitational intensity.

Answer:

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15. Which of the following statements about the gravitational constant is true?

A. It is a force

B. It has same value in all systems of units.

C. It depends on the value of the masses.

D. It does not depend on the nature of the medium in which the bodies are kept.

Answer:

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16. The dimension of the universal constant of gravitation G is

A. $[M^1L^{-3}T^2]$

B. $[M^{-1}L^3T^{-2}]$

C. $[M^{-1}L^{-3}T^{2}]$

D. $[M^{1}L^{3}T^{2}]$

Answer:

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17. Gravitational constant in the M.K.S. system is of the order of

A. 10^{-11}

B. 10^{-19}

C. 10^{-13}

D. 10^{-24}

Answer:

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18. Which of the following is the S.I. unit of universal gravitational constant?

A. $N\frac{m}{(kg)^2}$

B. $N\frac{m^2}{kg}$

C. $N\frac{m}{kg}$

D. $N\frac{m^2}{(kg)^2}$

Answer:

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19. The C.G.S. unit of universal gravitational constant is

A. $dy \neq c\frac{m^2}{g^2}$

B. $dy \neq \frac{g^2}{c}m2$

C. $dy \neq^2 c\frac{m}{g}$

D. $\frac{g^2}{dy} \neq cm^2$

Answer:

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20. Two bodies of masses m and 2m are kept at distance r apart from each other. Then the value of G varies as

A. r^2

B. r^4

C. r^{-2}

D. r^0

Answer:

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21. The gravitational constant G is equal to $6.67 \times 10^{-11} Nm^2 / kg^2$ in vacuum. Its value in a dense matter of density $10^{10} g / cm^3$ will be

A. $6.67 \times 10^{-1} N \frac{m^2}{k} g^2$

B. $6.67 \times 10^{-11} N \frac{m^2}{k} g^2$

C. $6.67 \times 10^{-21} N \frac{m^2}{k} g^2$

D. $6.67 \times 10^{-10} N \frac{m^2}{k} g^2$

Answer:

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22. The force of gravitation between two bodies of mass 1kg each separated by a distance of 1 m in vaccum is

A. $6.67 \times 10^{-9} N$

B. $6.67 \times 10^{-10} N$

C. $6.67 \times 10^{-11} N$

D. $6.67 \times 10^{-12} N$

Answer:

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23. The value of gravitational constant is determined using

A. spring balance

B. Cavendish balance.

C. Kepler's law.

D. Compton effect.

Answer:

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24. While performing experiment using Cavendish balance, restoring torque at equilibrium equals

A. $\frac{GmML}{r^2}$

B. $\frac{GmML}{r}$

C. $\frac{(GmML)^2}{r}$

D. $\frac{(GmML)^2}{r^2}$

Answer:

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25. The gravitational force exerted by the earth on a body is called

A. weight of the body.

B. acceleration of that body.

C. mass of the body.

D. gravitational constant.

Answer:

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26. If the earth shrinks without change in mass, what will be the effect on the value of acceleration due to gravity g?

A. It will decrease

B. It will increase

C. It will become zero.

D. It will become infinite

Answer:

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

A. $G\frac{M_0}{D_0^2}$

B. $4mG\frac{M_0}{D_0^2}$

C. $4G\frac{M_0}{D_0^2}$

D. $Gm\frac{M_0}{D_0^2}$

Answer:

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28. Toe mass and diameter of a planet have twice the value of the corresponding parameters of earth. Acceleration due to gravity on the surface of the planet is

A. $9.8\frac{m}{s^2}$

B. $4.9\frac{m}{s^2}$

C. $980\frac{m}{s^2}$

D. $19.6\frac{m}{s^2}$

Answer:

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29. The moon's radius is 1/4 that of the earth and its mass is 1 /80 times that of the earth. If g represents the acceleration due to gravity on the surface of the earth, that on the surface of the moon is

A. $\frac{g}{4}$

B. $\frac{g}{5}$

C. $\frac{g}{6}$

D. $\frac{g}{8}$

Answer:

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30. The gravitational acceleration on the surface of the earth of radius R and mean density ρ is

A. $\frac{4}{3}G\pi R^2 p$

B. $\frac{4}{3}G\pi^2 R^2 p$

C. $\frac{2}{3}G\pi Rp$

D. $\frac{4}{3}G\pi Rp$

Answer:

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31. If R is the radius of the earth and g the acceleration due to gravity on the earth's surface, the mean density of the earth is

A. $4\pi\frac{G}{3}gR$

B. $3\pi\frac{R}{4}gG$

C. $3\frac{g}{4}\pi RG$

D. $\pi R\frac{G}{12}g$

Answer:

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32. If the density of the earth is tripled keeping its radius constant, then acceleration due to gravity will be $\left(g = 9.8\frac{m}{s^2}\right)$

A. $29.4\frac{m}{s^2}$

B. $9.8\frac{m}{s^2}$

C. $4.9\frac{m}{s^2}$

D. $2.45\frac{m}{s^2}$

Answer:

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33. The diameters of two planets are in the ratio 4 : 1 and their mean densities in the ratio 1 : 2. The acceleration due to gravity on the planets will be in the ratio

A. $1:2$

B. $2:3$

C. $2:1$

D. $4:1$

Answer:

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34. The density of a newly discovered planet is twice that of earth. The acceleration due to gravity at the surface of the planet is equal to that at the surface of the earth. If the radius of the earth is R, the radius of the planet would be

A. 2R

B. 4R

C. $\frac{1}{4}R$

D. $\frac{1}{2}R$

Answer:

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35. The ratio of acceleration due to gravity at a height 3R above earth's surface to the acceleration due to gravity on the surface of earth is

A. $\frac{1}{9}$

B. $\frac{1}{16}$

C. $\frac{1}{4}$

D. $\frac{1}{64}$

Answer:

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36. The value of gravitational acceleration at a height equal to radius of earth, is

A. 50% of value at earth's surface.

B. 25 % of value at earth's surface.

C. 75% of value at earth's surface.

D. same as value at earth's surface.

Answer:

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37. The value of 'g' at a certain height h above the free surface of Earth is $\frac{x}{16}$ where x is the value 16 of 'g' at the surface of Earth. The height h is

A. R

B. 2R

C. 3R

D. 4R

Answer:

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38. At any point within the interior of earth, the acceleration due to gravity varies with r (distance between the centre of earth and the point) as

A. r

B. r^2

C. $\frac{1}{r}$

D. $\frac{1}{r^2}$

Answer:

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39. If the earth were assumed to have uniform density and spherical symmetry, then the value of g in ms^{-2} halfway towards the centre of earth would be $\left[g = 10m/s^2\right]$

A. 0

B. 1.25

C. 5

D. 10

Answer:

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40. If a body of mass 10 kg is taken to the centre of the earth, its weight will be

A. zero

B. infinity

C. 98 N

D. 980 N

Answer:

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41. The acceleration due to gravity on the surface of earth varies

A. directly with longitude.

B. directly with latitude.

C. inversely with longitude.

D. inversely with latitude.

Answer:

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42. If the earth were to stop rotating, the value of acceleration due to gravity at Mumbai will

A. increase.

B. decrease.

C. become zero.

D. remain unchanged.

Answer:

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43. Considering earth's rotation, the value of g at the earth's surface is

A. maximum at the equator.

B. least at the equator.

C. same at all places.

D. changes with latitude.

Answer:

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44. The acceleration due to gravity at the equatorial plane is

A. greater than the polar value.

B. less than the polar value.

C. can be less or greater than polar value.

D. equal to polar value.

Answer:

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45. If earth's satellite is moved from one stable orbit to a farther stable orbit, then which of the following quantities increase?

A. Potential energy

B. Linear speed

C. Gravitational force

D. Centripetal acceleration

Answer:

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46. Energy required to move a body of mass m from an orbit of radius 2R to 3R is

A. $\frac{GMm}{12}R^2$

B. $\frac{GMm}{3}R^2$

C. $\frac{GMm}{8}R$

D. $\frac{GMm}{16}R$

Answer:

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47. The gravitational potential energy per unit mass at a point gives ___ at that point.

A. gravitational field

B. gravitational potential

C. gravitational potential energy

D. none of these

Answer:

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48. Dimensional formula of gravitational potential is

A. $[M^0 L^1 T^{-2}]$

B. $\left[M^{1}L^{1}T^{-2}\right]$

C. $\left[M^{0}L^{2}T^{-2}\right]$

D. $\left[M^{0}L^{3}T^{-2}\right]$

Answer:

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49. Magnitude of gravitational potential due to a point mass M at a distance $r(>R)$ from the centre of earth is given by,

A. $V = G\frac{M}{r^2}$

B. $V = \frac{G}{r^2}$

C. $V = \frac{G}{r}$

D. $V = G\frac{M}{r}$

Answer:

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50. If g is acceleration due to gravity on the surface of the Earth and R is radius of the

Earth, then the gravitational potential on the surface of the Earth is

A. $-gR$

B. gR

C. $-gR^2$

D. gR^2

Answer:

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51. Gas escapes from the surface of a planet because it acquires an escape velocity The escape velocity will depend on which of the following factors? I. Mass of the planet II. Mass of the particle escaping III.Temperature of the planet IV.Radius of the planet Select the correct answer from the codes given below

A. I and II

B. II and IV

C. I and IV

D. III and IV

Answer:

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52. The escape velocity of a particle of mass m varies as

A. m^2

B. m

C. m^0

D. m^{-1}

Answer:

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53. Two satellites A and B are rotating in same orbit. The ratio of their escape velocities, if radius and mass of A is twice to B, is

A. $1:1$

B. $1:2$

C. $1:3$

D. $1:4$

Answer:

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54. Escape velocity on a planet is Ve. If radius of the planet remains same and mass becomes 4 times, the escape velocity becomes

A. $4v_e$

B. $2v_e$

C. v_e

D. $\frac{1}{2}v_e$

Answer:

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55. The escape velocity from the surface of earth is v_e. The escape velocity from the surface of a planet whose mass and radius are 3 times those of the earth will be

A. v_e

B. $3v_e$

C. $9v_e$

D. $27v_e$

Answer:

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56. The escape velocity of a body on an imaginary planet which is thrice the radius of the earth and double the mass of the earth is (

v_e is the escape velocity of earth

A. $\sqrt{\frac{2}{3}} v_e$

B. $\sqrt{\frac{3}{2}} v_e$

C. $\frac{\sqrt{2}}{3} v_e$

D. $\frac{2}{\sqrt{3}} v_e$

Answer:

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57. Planet A has a mass and radius twice that of Planet B. The escape velocity from Planet A is

A. twice that from B

B. four times that from B

C. equal to that from B

D. half that from B.

Answer:

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58. The escape velocities of the two planets, of densities ρ_1 and ρ_2 and having same radius, are v_1 and v_2 respectively. Then

A. $\frac{v_1}{v_2} = \frac{p_1}{p_2}$

B. $\frac{v_2}{v_1} = \frac{p_2}{p_1}$

C. $\frac{v_1}{v_2} = \left(\frac{p_1}{p_2}\right)^2$

D. $\frac{v_1}{v_2} = \sqrt{\frac{p_1}{p_2}}$

Answer:

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59. The angular velocity of rotation of a star of mass M and diameter R at which the matter will escape from its equator is

A. $\sqrt{\dfrac{2GR}{M}}$

B. $\sqrt{\dfrac{2GM}{R^3}}$

C. $\sqrt{\dfrac{2GM}{R}}$

D. $\sqrt{\dfrac{2GM^2}{R}}$

Answer:

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60. Escape velocity of a body from the surface of a spherical planet of mass M, radius R and density p is

A. $\sqrt{2\pi G p R}$

B. $2R\sqrt{\frac{2G\pi p}{3}}$

C. $\sqrt{4\pi G p R}$

D. $\sqrt{\frac{4}{3}\pi G p R}$

Answer:

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61. The escape velocity of a body from the surface of the earth is V_e and the escape velocity of the body from a satellite orbiting at a height 'h' above the surface of the earth is v_e ' then

A. $v_e = v_e'$

B. $v_e < v_e'$

C. $v_e > v_e'$

D. $v_e \leq v_e'$

Answer:

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62. The ratio of the acceleration due to gravity on two planets P_1 and P_2 is $k_1 . Theratiooftheirrespectiveradiiis$k_2`.

The ratio of their respective escape velocities is

A. $\sqrt{k_1 k_2}$

B. $\sqrt{2k_1 k_2}$

C. $\sqrt{\frac{k_1}{k_2}}$

D. $\sqrt{\dfrac{k_2}{k_1}}$

Answer:

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63. The radius ofa planet is $1/4^{th}$ of earth's radius and its acceleration due to gravity is double to earth's acceleration due to gravity. How many times value of escape velocity at the planet as compared. to its value at the earth?

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. 2

Answer:

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64. The escape velocity of a body from the surface of the earth is equal to

A. 11.2 km/s

B. 11.4 km/s

C. 11.6 km/s

D. 11.0 km/s

Answer:

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65. Given mass of the moon is 1/81 of the mass of the earth and corresponding radius is 1/4 of the radius of earth. If escape velocity on the earth's surface is 11.2 km/s, the value of same on the surface of the moon is

A. 0.14 km/s

B. 0.5 km/s

C. 2.5 km/s

D. 5 km/s

Answer:

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66. A geostationary satellite

A. revolves about the polar axis.

B. has a time period less than that of the near earth satellite.

C. moves faster than a near earth satellite.

D. is stationary in the space.

Answer:

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67. A geostationary satellite has an orbital period of

A. 2 hr

B. 6hr

C. 12 hr

D. 24 hr

Answer:

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68. When a satellite moves around the earth (consider elliptical orbits),

A. its angular momentum remains constant.

B. its angular speed remains constant.

C. its linear speed remains constant.

D. its linear momentum remains constant.

Answer:

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69. Choose the correct statement from the following: The radius of the orbit of a geostationary satellite depends upon

A. mass of the satellite, its time period and the gravitational constant.

B. mass of the satellite, mass of the earth and the gravitational constant.

C. mass of the earth, mass of the satellite, time period of the satellite and the gravitational constant.

D. mass of the earth, time period of the satellite and the gravitational constant.

Answer:

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70. A body detached gently from the outer wall of a satellite orbiting around the earth will

A. fall to the earth.

B. follow an irregular path.

C. continue to move along with the satellite.

D. escape from earth's field.

Answer:

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71. A satellite revolves around the earth in an elliptical orbit. Its speed

A. is the same at all points in the orbit.

B. is greatest when it is closest to the earth.

C. is greatest when it is farthest from the earth.

D. goes on increasing or decreasing continuously depending upon the mass of the satellite.

Answer:

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72. The nature of the path of the satellite depends upon

A. the horizontal velocity.

B. the escape velocity.

C. the critical velocity

D. all of the above.

Answer:

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73. If the horizontal velocity is less than critical velocity, then the satellite will travel in

A. parabolic path.

B. straight path.

C. elliptical path.

D. circular path.

Answer:

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74. The maximum possible velocity of a satellite orbiting round the earth in a stable orbit is

A. $\sqrt{2R_e g}$

B. $\sqrt{R_e g}$

C. $\sqrt{\frac{R_e g}{2}}$

D. infinite

Answer:

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75. The escape velocity of a body from the surface of the earth is equal to

A. 3 times critical velocity of body orbiting close to surface of the earth.

B. $\sqrt{2}$ times critical velocity of a body orbiting very close to surface of the earth.

C. critical velocity of a body orbiting very close to surface of the earth.

D. $\frac{1}{2}$ times critical velocity of a body orbiting very close to surface of the earth.

Answer:

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76. If the gravitational force were proportional to $\frac{1}{r}$, then a particle in a circular orbit under such a force would have its original speed

A. independent of r

B. $\propto \frac{1}{r}$

C. $\propto \frac{1}{r^2}$

D. $\propto r^2$

Answer:

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77. Two satellite of masses m_1 and m_2 ($m_1 > m_2$) are revolving round the earth in circular orbits of radii r_1 and r_2 $(r_1 > r_2)$ respectively. Which of the following statements is true regarding their speeds v_1 and v_2?

A. $v_1 = v_2$

B. $v_1 > v_2$

C. $v_1 < v_2$

D. $\frac{v_1}{r_1} = \frac{v_2}{r_2}$

Answer:

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78. Two satellite fo masses m and 4m orbit the earth in circular orbits of radii 4r and r respectively. The ratio of their orbital speed is

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{1}{\sqrt{5}}$

Answer:

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79. The satellites A and B go round a planet P in circular orbits having radii 9R and R respectively. If the speed of the satellite A is 4v, the speed of the satellite B will be

A. 12 v

B. 6 v

C. $\frac{4}{3}v$

D. $\frac{2}{3}v$

Answer:

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80. An astronaut inside a satellite is in a state of weightlessness because of the effect of

A. inertia.

B. no acceleration.

C. zero gravity.

D. free fall towards the earth.

Answer:

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81. Assertion: An astronaut in an orbiting space station above the Earth experiences weightlessness.

Reason: An object moving around the Earth under the influence of Earth's gravitational force is in state of 'free-fall'.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, but Rerson is True

Answer:

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82. A person sitting in a chair in a satellite feels weightless because

A. the earth does not attract the object in a satellite.

B. the normal force by the chair on the person balances the earth's attraction.

C. the normal force is zero.

D. the person in the satellite is not accelerated.

Answer:

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83. The time period of an earth satellite in circular orbit depends on

A. the mass of the satellite.

B. radius of orbit.

C. both the mass and radius of the orbit.

D. shape of satellite.

Answer:

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

A. the mass of the planet.

B. the radius of the planet.

C. the mass of the satellite.

D. all of these.

Answer:

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85. In the case of a satellite moving along a circular orbit, a larger orbit corresponds to

A. longer period and smaller velocity.

B. larger velocity and longer period.

C. smaller period and smaller velocity.

D. smaller period and larger velocity.

Answer:

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86. Satellite revolving around the earth loses some energy due to collision. What would be the effect on its velocity and distance from the centre of the earth?

A. Velocity increases and distance decreases.

B. Both velocity and distance increases.

C. Both velocity and distance decreases.

D. Velocity decreases and distance increases.

Answer:

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87. B .E. of a satellite is always

A. infinity

B. positive

C. zero

D. negative

Answer:

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88. The binding energy of a body does not depend upon

A. mass of the planet.

B. its distance from the centre of the planet.

C. mass of the body.

D. shape of the body.

Answer:

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89. A satellite is orbiting very close to a planet.

Its periodic time depends only on

A. density of the planet.

B. mass of the planet.

C. radius of the planet.

D. mass of the satellite.

Answer:

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90. If T is the time period of revolution of a satellite, then K.E. is proportional to

A. $T^{-\frac{1}{2}}$

B. T^{2}

C. $T^{-\frac{3}{2}}$

D. $T^{-\frac{2}{3}}$

Answer:

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91. A geostationary satellite orbits around the~ earth in a circular orbit of radius 36000 km. Then, the time period of a satellite orbiting a few hundred kilometres above the earth's surface (R_{Earth} = 6400 km) will approximately be

A. $\frac{1}{2}h$

B. 1h

C. 2h

D. 4h

Answer:

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92. The rotational period of a satellite close to the surface of the earth is 83 minutes. The time period of another earth satellite in an orbit at a distance four times the radius of earth from its surface will be

A. 83 minutes.

B. $83 \times \sqrt{8} \min utes$

C. 664 minutes

D. 249 minutes.

Answer:

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93. If R is the radius of earth and g is acceleration due to gravity on the surface of the earth, then binding energy of the satellite of mass m at the height h above earth's surface is ·

(r is orbital radius of satellite)

A. $\frac{mgR^2}{r}$

B. $-\frac{mgR^2}{r}$

C. $\frac{mgR^2}{2}r$

D. $-\frac{mgR^2}{2}r$

Answer:

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94. How much energy will be required if a mass of 100 kg escapes from the earth?

A. $3.2 \times 10^9 jo\underline{e}$

B. $6.4 \times 10^9 jo\underline{e}$

C. $1.6 \times 10^9 jo\underline{e}$

D. $8 \times 10^9 jo\underline{e}$

Answer:

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95. Four particles, each of mass M and equidistant from each other, move along a circle of radius R under the action of their mutual gravitational attraction. The speed of each particle is

A. $\sqrt{\frac{GM}{R}}$

B. $\frac{1}{2}\sqrt{\frac{GM}{R}}$

C. $\frac{1}{3}\sqrt{\frac{GM}{R}}$

D. $\frac{1}{4}\sqrt{\frac{GM}{R}}$

Answer:

Watch Video Solution

96. The earth (mass=6×10^{24} kg) revolves around the Sun with angular velocity $2 \times 10^{-7} rad/s$ in a circular orbit of radius 1.5×10^{8} km. The force exerted by the Sun on the earth in Newton is

A. zero

B. 18×10^{25}

C. 36×10^{21}

D. 27×10^{39}

Answer:

Watch Video Solution

97. Assertion. A body weighs X newton on the surface of the earth. Its weight at a height equal to half the radius of the earth will be $\frac{2X}{5}$ Reason: $g' = g\left(\frac{r^2}{(R+h)^2}\right)$

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False but Reason is True.

Answer:

Watch Video Solution

98. Two planets revolve round the sun with frequencies n_1 and n_2 revolutions per year. If their average orbital radii be R_1 and R_2 respectively, then $R1 / R2$ is equal to

A. $\left(\frac{n_1}{n_2}\right)^{\frac{3}{2}}$

B. $\left(\frac{n_2}{n_1}\right)^{\frac{3}{2}}$

C. $\left(\frac{n_1}{n_2}\right)^{\frac{2}{3}}$

D. $\left(\frac{n_2}{n_1}\right)^{\frac{2}{3}}$

Answer:

Watch Video Solution

99. A satellite of mass m moving around the earth of mass m_E in a circular orbit of radius R has angular momentum L. The rate of the area swept by the line joining the centre of the earth and satellite is

A. $\frac{L}{2}m$

B. $\frac{L}{m}$

C. $2\frac{L}{m}$

D. $2\frac{L}{m_E}$

Answer:

Watch Video Solution

100. The period of revolution of planet A around the Sun is 8 times that of B. The distance of A from the Sun is n times greater than the distance of B from the sun. The value of n is

A. 4

B. 8

C. 12

D. 16

Answer:

Watch Video Solution

101. If the mean distance of Mars from the Sun is 1.525 times that of the earth from the sun, in how many years will Mars complete one revolution about the sun?

A. 1.883

B. 2

C. 3.766

D. 4

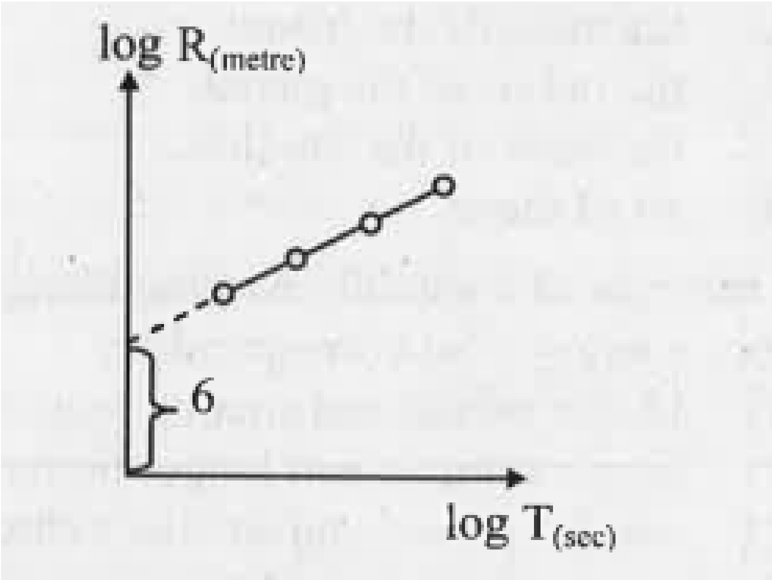
Answer:

Watch Video Solution

102. For many planets revolving around the stationary sun in circular orbits of different radii (R), the time periods (T) were noted. Then log (g) v/s log (T) curve was plotted [

$G = \frac{20}{3} \times 10^{-11}$ in M.K.S. system, $\pi^2 = 10$]

Estimate the mass of the sun.



A. $6 \times 10^{29} kg$

B. $5 \times 10^{20} kg$

C. $8 \times 10^{25} kg$

D. $5 \times 10^{25} kg$

Answer:

Watch Video Solution

103. Assertion: Two solid spheres of radius r and 2 r, made of same material, are kept in. contact. The mutual gravitational force of attraction between them is proportional to $\frac{1}{r^4}$.

Reason: Gravitational attraction between two point mass bodies varies inversely as the square of the distance between them.

A. Assertion is True, Reason is True, Reason is Correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False but Reason is True.

Answer:

Watch Video Solution

104. If the distance between two bodies is doubled, the force of gravitational attraction between them

A. becomes four times.

B. is doubled.

C. is reduced to one-fourth.

D. is reduced to half.

Answer:

Watch Video Solution

105. Two spheres, each of mass 625 kg, are placed with their centres 50 cm apart. The gravitational force between them is

A. 10.42 dyne

B. 15.42 dyne

C. 20.42 dyne

D. 5.42 dyne

Answer:

Watch Video Solution

106. The value of universal gravitational constant G in M.K.S system is $6.67 \times 10^{-11} Nm^2 / kg^2$. Its value in C.G.S system is

A. 6.67×10^{-5}

B. 6.67×10^{-9}

C. 6.67×10^{-8}

D. 6.67×10^{-13}

Answer:

Watch Video Solution

107. The gravitational force on a body of mass 5 kg at the surface of the earth is 50 N. If earth is a perfect sphere, the gravitational force on a satellite of mass 200 kg in a circular orbit of radius same as diameter of the earth is

A. 200N

B. 400 N

C. 500N

D. 800 N

Answer:

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108. If the distance between the sun and the earth is increased by three times, then attraction between two will

A. remain constant.

B. decrease by 63%

C. decrease by 83%.

D. decrease by 89%.

Answer:

Watch Video Solution

109. A body weighs 81 N on the surface of the earth. What is the gravitational force on it due to earth at a height equal to half the radius of the earth from the surface ?

A. 72 N

B. 28 N

C. 36 N

D. 32 N

Answer:

Watch Video Solution

110. Two point masses each equal to I kg attract one another with a force of 10^{-9} kg-wt. The distance between the point masses is ($G = 6.6 \times 10^{-11}$ MKS units)

A. 8 cm

B. 0.8 cm

C. 80 cm

D. 0.08 cm

Answer:

Watch Video Solution

111. Gravitational force between two objects separated by 20 cm is 1.0×10^{-8} N . If total mass of the two objects is 5.0 kg, then the mass of the objects in kg, are

A. 4,1

B. 3,2

C. 2.5, 2.5

D. 3.5, 15

Answer:

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112. Mass of the Earth is 81 times mass of the Moon and distance between Earth and Moon is 60 times the radius of the Earth. If R is the radjus of Earth, then the distance between the Moon and the point on the line joining the Moon and the Earth where gravitational force becomes zero is

A. 30R

B. 15R

C. 6R

D. 5R

Answer:

Watch Video Solution

113. Value of G is to be determined using Cavendish balance. If all quantities measured have same percentage error then which of the following quantities would cause maximum error in measurement of G?

A. Mass of large sphere.

B. Mass of small sphere.

C. Angle of twist.

D. Initial separation between centres of large and small sphere.

Answer:

Watch Video Solution

114. The mass of the moon is $\frac{1}{81}$ of the earth but the gravitational pull is $/6$ of the earth. It is due to the fact that

A. the radius of the moon is $\frac{81}{6}$ of the earth,

B. the radius of the earth is $\frac{9}{\sqrt{6}}$ of the moon

C. moon is the satellite of the earth.

D. moon rotates round the earth.

Answer:

Watch Video Solution

115. The radius of the Earth shrinks by 1 %, its mass remaining the same. The percentage change in the value of g is

A. -2%

B. $+2\%$

C. -3%

D. $+4\%$

Answer:

Watch Video Solution

116. If both the mass and radius of Earth decrease by 1 %, the value of acceleration due to gravity will decrease by nearly

A. 0.01

B. 0.015

C. 0.02

D. 0.025

Answer:

Watch Video Solution

117. Consider a planet in some solar system which has mass double the mass of the Earth and density equal to the average density of the Earth. An object weighing Won the Earth will weigh

A. W

B. 2W

C. $\frac{W}{2}$

D. $2^{\frac{1}{3}}W$

Answer:

Watch Video Solution

118. A body weighs 700 gm-wt on the surface of the earth. How much will it weigh on the surface of a planet whose mass is $\frac{1}{7}$ and radius is half that of the earth?

A. $200g - wt$

B. $400g - wt$

C. $50g - wt$

D. $300g - wt$

Answer:

Watch Video Solution

Watch Video Solution

119. Radius of earth is equal to 6×10^6.

Acceleration due to gravity is equal to $9.8 \frac{m}{s^2}$.

Gravitational constant G is equal to $6.67 \times 10^{-11} Nm^2 kg^{-2}$. Then mass of the earth is

A. $6.0 \times 10^{24} kg$

B. $5.3 \times 10^{24} kg$

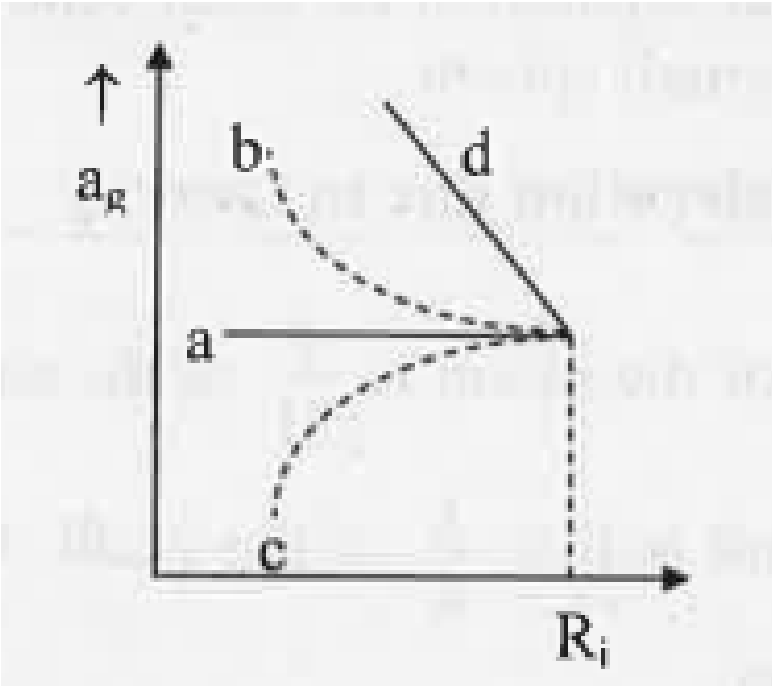
C. $5.9 \times 10^{24} kg$

D. $6.6 \times 10^{24} kg$

Answer:

Watch Video Solution

120. A (non-rotating) star collapses onto itself from an initial radius R_i, its mass remaining unchanged. Which curve in the figure best gives the gravitational acceleration a_g, on the surface of the star as a function of radius of star during collapse?



A. a

B. b

C. c

D. d

Answer:

Watch Video Solution

121. Where will it be profitable to purchase 1 kilogram sugar?

A. At poles

B. At equator

C. At 45° latitude

D. At 40° latitude

Answer:

Watch Video Solution

122. A spring balance is graduated on sea level. If a body is weighed with this balance at consecutively increasing heights from earth's surface, the weight indicated by the balance

A. will go on increasing continuously.

B. will go on decreasing continuously

C. will remain same.

D. will first increase and then decrease.

Answer:

Watch Video Solution

123. If a body is taken from the surface of earth to moon, then its weight will

A. first decrease the increase.

B. first increase then decrease.

C. continuously increase.

D. continuously decrease.

Answer:

Watch Video Solution

124. The value of 'g' at a certain height above the surface of the earth is 16% of its va lue on the surface. The height is (R = 6300 km)

A. 12500 km

B. 10500 km

C. 8000 km

D. 1600 km

Answer:

Watch Video Solution

125. Two equal masses, each equal to m are suspended from a balance whose scale pans differ in vertical height by h. The error in weighing in tenns of density of earth ρ is

A. $\pi G \pm h$

B. $\frac{1}{3}\pi G \pm h$

C. $\frac{8}{3}\pi G \pm h$

D. $\frac{4}{3}\pi G \pm h$

Answer:

Watch Video Solution

126. A body weights 63 N on the surface of the earth At a height h above the surface of Earth, its weight is 28 N While at a depth h below the surface Earth, the weight is 31.5 N. The value of h is

A. 0.4 R

B. 0.5 R

C. 0.8 R

D. R

Answer:

Watch Video Solution

127. The value of 'g' at a depth of 80 km will be

$(Radius of earth = 6400 km$ and value of 'g' on the surface of earth is $10\frac{m}{s^2})$

A. $990\frac{cm}{s^2}$

B. $980\frac{cm}{s^2}$

C. $970\frac{cm}{s^2}$

D. $1000\frac{cm}{s^2}$

Answer:

Watch Video Solution

128. Consider earth to be a homogeneous sphere. Scientist A goes deep down in a mine and scientist B goes high up in a balloon. The value of g measured by

A. A goes on decreasing and that by B goes on increasing.

B. B goes on decreasing and that by A goes on increasing.

C. each scientist decreases at the same rate.

D. each scientist decreases at different rates.

Answer:

Watch Video Solution

129. The acceleration due to gravity at a height $\frac{1}{20^{th}}$ of the radius of the earth above the earth surface is 9 ms^{-2}. Its value at a point at an equal distance below the surface of the earth in ms^{-2} is about

A. 8.5

B. 9.3

C. 9.8

D. 11.5

Answer:

Watch Video Solution

130. If change in the value of g at a depth d below the surface of the earth is equal to that on the surface of the earth at latitude of angle

ϕ, then,

A. $\phi = \cos^{-1}\left[\sqrt{\frac{R\omega}{g}d}\right]$

B. $\phi = \cos^{-1}\left[\sqrt{\frac{d}{R^2\omega^2}}\right.$

C. $\phi = \cos^{-1}\left[\left(g\frac{d}{R}\omega\right)\right]$

D. $\phi = \cos^{-1}\left[\frac{\sqrt{gd}}{R\omega}\right]$

Answer:

Watch Video Solution

131. If the earth of radius R, while rotating with angular velocity ro becomes stand still, what will be the effect on the weight of a body of mass rn at a latitude of 45°?

A. Remains unchanged

B. Decreases by $R\omega^2$

C. Increases by $R\omega^2$

D. Increases by $R\frac{\omega^2}{2}$.

Answer:

Watch Video Solution

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132. R is the radius of the earth and ω is its angular velocity and g_P is the value of g at the poles. The effective value of g at the latitude $\phi = 60^\circ$ will be equal to

A. $g_p - \frac{1}{4}R\omega^2$

B. $g_p - \frac{3}{4}R\omega^2$

C. $g_p - R\omega^2$

D. $g_p + \frac{1}{4}R\omega^2$

Answer:

Watch Video Solution

133. What should be the angular speed of earth in radian/second so that a body of 5 kg weights zero at the equator? [Take g = $10m/s^2$ and radius of earth = 6400 km]

A. $\frac{1}{1600}$

B. $\frac{1}{800}$

C. $\frac{1}{400}$

D. $\frac{1}{80}$

Answer:

Watch Video Solution

134. A body falls freely under gravity. Its speed is v when it has lost an amount U of the grav itational energy. Then its mass is

A. $\frac{Ug}{v^2}$

B. $\frac{U^2}{g}$

C. $\frac{2U}{v^2}$

D. $2Ugv^2$

Answer:

Watch Video Solution

135. The maximum vertical distance through which a full dressed astronaut can jump on the earth is 0.5 m. Estimate the maximum vertical distance through which he can jump on the moon, which has a mean density $\frac{2}{3^{rd}}$

that of earth and radius one quarter that of the earth.

A. 1.5 m

B. 3 m

C. 6 m

D. 7.5 m

Answer:

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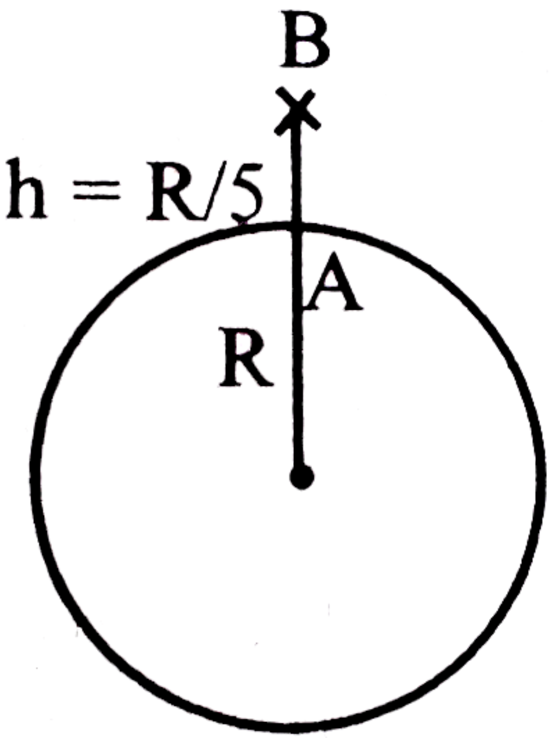
136. A body of mass m rises to a height h = R/5 from the surface of the Earth. If g is acceleration due to gravity on the Earth's surface, then the increase in potential energy is (R = radius of Earth



A. mgh

B. $\frac{4}{5}mgh$

C. $\frac{5}{6}mgh$

D. $\frac{6}{7}mgh$

Answer:

Watch Video Solution

137. M_e is the mass of earth and M_m is the mass of moon $(M_e = 81M_m)$. The potential energy of an object of mass m is a distance R from the Centre of earth and r from the centre

of moon, will be

A. $-GmM_m\left(\frac{R}{81}+r\right)\frac{1}{R^2}$

B. $-GmM_e\left(\frac{81}{r}+\frac{1}{R}\right)$

C. $-GmM_m\left(\frac{81}{R}+\frac{1}{r}\right)$

D. `-GmM_e (81/R -1/r)\`

Answer:

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138. V_e and V_p denote the escape velocities from the earth and another planet having twice the radius and the same mean density as the earth. Then

A. $v_e = v_p$

B. $v_e = \frac{v_p}{2}$

C. $v_e = 2v_p$

D. $v_e = \frac{v_p}{4}$

Answer:

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139. Escape velocity of a satellite of the earth at an altitude equal to radius of the earth is v. What will be the escape velocity at an altitude equal to 7R, where R = radius of the earth?

A. $\frac{v}{4}$

B. $\frac{v}{2}$

C. 2v

D. 4v

Answer:

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140. If the earth suddenly contracts so that its radius reduces by 4% with mass remaining same, then what will happen to the escape velocity from earth's surface now?

A. Increases by 4%

B. Decreases by 4%

C. Increases by 2%

D. Decreases by 2%

Answer:

Watch Video Solution

141. To have an earth satellite synchronous with the rotation of the earth, it must be launched at proper height moving

A. from west to east in an equatorial plane.

B. from north to south in a polar plane.

C. from east to west in an equatorial plane.

D. from south to north in a polar plane.

Answer:

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142. The relay satellite transmits the T.V programme continously from one part of the world to another because its

A. period is greater than the period of rotation of the earth.

B. period is less than the period of rotation of the earth about its axis.

C. period is less than the period of the earth about its axis.

D. period is equal to the period of rotation of the earth about its axis.

Answer:

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143. If a body is released from an artificial satellite then

A. it will fall on the earth.

B. it will not fall on the earth but will be attracted towards the earth.

C. it will escape in the universe.

D. it will continue orbiting along with satellite.

Answer:

Watch Video Solution

144. The orbital speed of Jupiter is

A. greater than the orbital speed of earth.

B. less than the orbital speed of earth.

C. equal to orbital speed of the earth

D. twice the orbital speed of earth.

Answer:

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145. The critical velocity of a satellite of mass I 00 kg is 20 km/hr. The critical velocity of another satellite of mass 200 kg in the same orbit is

A. 20 km/hr

B. 14.14 km/hr

C. 72 km/hr

D. 10 km/hr

Answer:

Watch Video Solution

146. The mean radius of the earth is R, its angular speed on its own axis is ω and the acceleration due to gravity at earth's surface is g. The cube of the radius of the orbit of a geostationary satellite will be

A. $R^2 \frac{g}{\omega}$

B. $R^2 \frac{\omega^2}{g}$

C. $R\frac{g}{\omega^2}$

D. $R^2\frac{g}{\omega^2}$

Answer:

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147. The orbital velocity of a satellite very near to the surface of earth is v. What will be its orbital velocity at an altitude 7 times the radius of the earth?

A. $\frac{v}{\sqrt{2}}$

B. $\frac{v}{2}$

C. $\frac{v}{2}\sqrt{2}$

D. $\frac{v}{4}$

Answer:

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148. 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 larger than that of the first one by approximately.

A. 0.5%

B. 1.0%

C. 1.5%

D. 3.0%

Answer:

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149. Time period of revolution of a nearest satellite around a planet of radius R is T. Period of revolution around another planet, whose radius is 3R but having same density is

A. T

B. 3T

C. 9T

D. $3\sqrt{3}T$

Answer:

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150. A satellite is moving very close to a planet of density $8 \times 10^{3} kgm^{-3}$. If $G = 6.67 \times 10^{-11} Nm^{2} kg^{-2}$, then the time period of the satellite is nearly

A. 420 s

B. 4200 s

C. 1 hour

D. 1 day

Answer:

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151. If two identical satellites are at R and 7R away from earth surface, the wrong statement is (R = Radius of earth)

A. Ratio of their total energy will be 4.

B. Ratio of their kinetic energies will be 4.

C. Ratio of their potential energies will be 4.

D. Ratio of their total energy will be 4 but ratio of potential and kinetic energies will be 2.

Answer:

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152. A satellite of mass m moves around the Earth in a circular orbit with speed v. The potential energy of the satellite is

A. mv^2

B. $-mv^2$

C. $\frac{3}{2}mv^2$

D. $-\frac{3}{2}mv^2$

Answer:

Watch Video Solution

153. If g is the acceleration due to gravity and R is radius of earth, the minimum kinetic energy required to make a satellite to move to infinity from orbit which is close to earth is

A. infinite

B. $\frac{1}{2}mgR$

C. mgR

D. 2 mgR

Answer:

Watch Video Solution

154. A satellite of mass M is orbiting the earth in a circular orbit of radius r. It starts losing energy due to small air resistance at the rate of C J/s. Find the time taken for satellite to .reach the earth.

A. $\frac{GMm}{C}\left(\frac{1}{R}-\frac{1}{r}\right)$

B. $\frac{GMm}{2}C\left(\frac{1}{R}-\frac{1}{r}\right)$

C. $\frac{GMm}{2}CR$

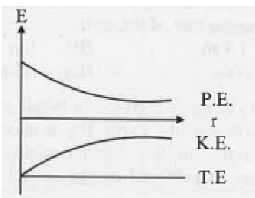
D. $\frac{3GMm}{2}C\left(\frac{1}{R}-\frac{1}{r}\right)$

Answer:

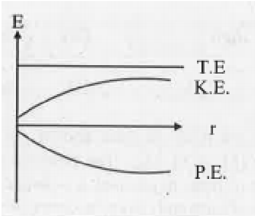
Watch Video Solution

155. The correct graph representing the variation of total energy (T.E.), kinetic energy (K.E.) and potential energy (P.E.) of a satellite with its distance (r) from the centre of the earth is

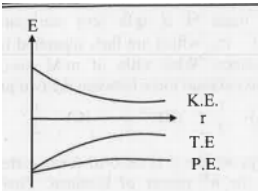
A.



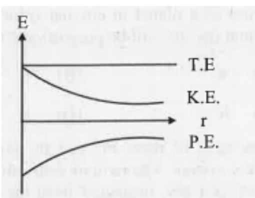
B.



C.



D.



Answer:

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156. Suppose the universal gravitational constant starts to decrease, then

A. length of the day does not change.

B. length of the year will increase.

C. the earth will follow a spiral path of decreasing radius.

D. kinetic energy of the earth will decrease.

Answer:

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157. At a given place where acceleration due to gravity is 'g' m/s^2, a sphere of lead of density 'd' kg/m^3 is gently released in a column of liquid of density $\rho kg/m^3$. If dgtρ, the sphere will

A. fall vertically with an acceleration 'g' m/s^2`.

B. fall vertically with no acceleration.

C. fall vertically with an acceleration $g\left(\frac{d-p}{d}\right)$.

D. fall vertically with an acceleration $g\left(\frac{p}{d}\right)$.

Answer:

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158. In order to find time, the astronaut orbiting in an earth satellite should use

A. a pendulum clock.

B. watch having main spring to keep it going

C. either a pendulum clock or a watch

D. neither a pendulum clock nor a watch.

Answer:

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159. A planet with the diameter and mass, both one third of those of the earth has surface temperature around 1000 K. Is it possible to find oxygen molecules around the atmosphere of the planet? (Given: Boltzmann constant = $1.38 \times 10^{-23} \frac{J}{K}$, Mass of oxygen molecule = $5.3 \times 10^{-26} kg$)

A. It is possible.

B. It is not possible.

C. It is possible only if temperature is less than 800 K.

D. It is possible only if gravitational acceleration of planet is thrice that of the earth.

Answer:

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160. A satellite is moving around the earth with speed v in a circular orbit of radius r. If the orbit radius is decreased by 1 %, its speed will

A. increase by 1%.

B. increase by 0.5%

C. decrease by 1%.

D. decrease by 0.5%.

Answer:

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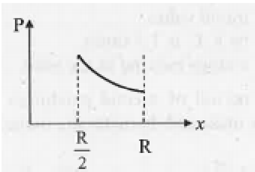
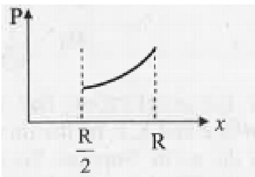
161. A tunnel' is dug along a chord of the earth at a perpendicular distance $\frac{R}{2}$ from the centre of 2 earth. The wall of the tunnel may be assumed to be frictionless. A particle is released from one end of the tunnel. The pressing force by the particle on wall is depicted by the graph

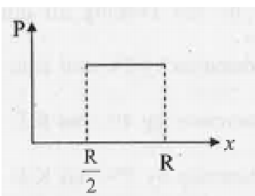
A.



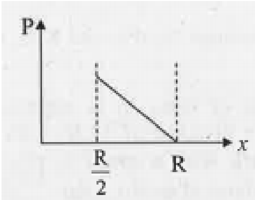
B.



C.



D.



Answer:

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

A. $\frac{R}{3}$

B. $\frac{R}{2}$

C. $\frac{R}{4}$

D. $\frac{R}{5}$

Answer:

Watch Video Solution

163. Two masses m_1 and m_2 (m_1 lt m_2) are released from rest from a finite distance. They start under their mutual gravitational attraction. Then the wrong statement is,

A. acceleration of m_1 is more than that of m_2.

B. acceleration of m_2 is more than that of m_1.

C. centre of mass remains al rest.

D. total energy of the system remains constant.

Answer:

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164. A satellite orbiting close to earth surface will escape, if

A. its speed is increased by 41.4%.

B. its speed in the orbit is $(\sqrt{1.5})$ times of its initial value.

C. its K.E. is 1.5 times,

D. it stops moving in the orbit.

Answer:

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165. Time period of second pendulum on a planet, whose mass and diameter are twice that of earth, is

A. $2\sqrt{2}s$

B. 2 s

C. $\sqrt{2}$

D. $\frac{1}{\sqrt{2}}s$

Answer:

Watch Video Solution

166. Let g be the acceleration due to gravity at earth's surface and K.E be the rotational kinetic energy of the earth. Suppose the earth's radius decreases by 2% keeping all other quantities same, then

A. g decreases by 2% and K.E. decreases by 4%.

B. g decreases by 4% and K.E. increases by 2%.

C. g increases by 4% and KE increases by 4%.

D. g decreases by 4% and K E. increases by 4%.

Answer:

Watch Video Solution

167. An asteroid of mass m is approaching earth, initially at a distance of 10 R_e with speed V_i. It hits the earth with a speed $v_{f\,(R_e \text{ and } M_e}$ are radius and mass of earth), then

A. $v_r^2 = v_i^2 + \left(\frac{2GM}{M_e}R\right)\left(1 - \frac{1}{10}\right)$

B. $v_r^2 = v_i^2 + \left(\frac{2GM_e}{R_e}\right)\left(1 + \frac{1}{10}\right)$

C. $v_r^2 = v_i^2 + \left(\frac{2GM_e}{R_e}\right)\left(1 - \frac{1}{10}\right)$

D. $v_r^2 = v_i^2 + \left(\frac{2GM}{R_e}\right)\left(1 - \frac{1}{10}\right)$

Answer:

Watch Video Solution

168. A mass M is split into two parts, m and (M-m), which are then separated by a certain distance. What ratio of m/M maximizes the gravitational force between the two parts

A. $\frac{1}{3}$

B. $\frac{1}{2}$

C. $\frac{1}{4}$

D. $\frac{1}{5}$

Answer:

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169. Suppose the gravitational force varies inversely as the n^{th} power of distance. Then the time period of a planet in circular orbit of radius R around the sun will be proportional to

A. $R^{\frac{n+1}{2}}$

B. $R^{\frac{n-1}{2}}$

C. R^{n}

D. $R^{\frac{n-2}{2}}$

Answer:

Watch Video Solution

170. Two stars of mass m_1 and m_2 are parts of a binary system. The radii of their orbits are r_1 and r_2 respectively. Measured from the C.M. of the system. The magnitude of gravitational force m_1 exerts on m_2 is

A. $\frac{m_1 m_2 G}{(r_1 + r_2)^2}$

B. $\frac{m_1 G}{(r_1 + r_2)^2}$

C. $\frac{m_2 G}{(r_1 + r_2)^2}$

D. $\frac{m_1 + m_2}{(r_1 + r_2)^2}$

Answer:

Watch Video Solution

171. A system of binary stars of masses m_A and m_B respectively. If T_A and T_B are the times periods of masses m_A and m_B respectively then,

A. $\frac{T_A}{T_B} = \left(\frac{r_A}{r_B}\right)^{\frac{3}{2}}$

B. $T_A > T_B(\text{ if } r_A > r_B)$

C. $T_A > T_B(\text{ if } m_A > m_B)$

D. $T_A = T_B$

Answer:

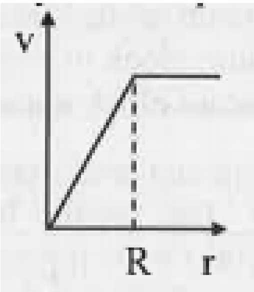
Watch Video Solution

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

$$\begin{matrix} \rho & \text{for} & r \leq R \\ 0 & \text{for} & r > R \end{matrix}$$

Where ρ_0 is a constant. A test mass can undergo circular motion under the influence of the gravitational field or particles. Its speed v as a functional of distance r (0ltrlt∞) from the centre of the system is represented by

A.



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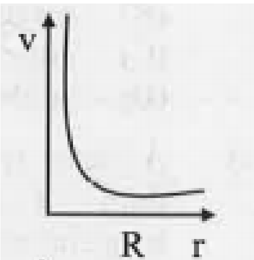

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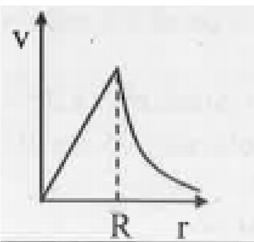

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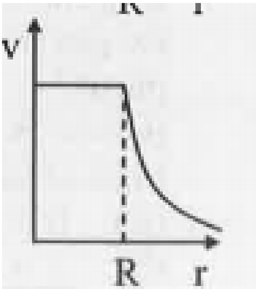

Answer:

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173. For a particle projected m a transverse direction from a height h above earth's surface, find the minimwn initial velocity so that it grazes the surface of earth such that path of this particle would be an ellipse with centre of earth as the farther focus, point of projection as the apogee and a diametrically opposite point on earth as perigee

A. $\sqrt{2GM_e\left(\frac{R}{r}(R+r)\right)}$

B. $\sqrt{2GM_e\left(\frac{R}{R}(R+r)\right)}$

C. $\sqrt{2GM_e\left(\frac{r}{R}(R+r)\right)}$

D. $\sqrt{2GM_e\left(\frac{R}{r^2}\right)}$

Answer:

Watch Video Solution

174. The moon revolves around the earth in a circular orbit of radius - 3.84×10^{5} km with velocity 1 km/s. The additional velocity required to escape from influencing earth satellite is

A. 2.414 km/s

B. 1.414 km/s

C. 0.414 km/s

D. 1.000 km/s

Answer:

Watch Video Solution

175. The ratio of the kinetic energy required to be given to the satellite to escape earth's gravitational field, to the kinetic energy required to be given so that the satellite moves in a circular orbit just above earth's atmosphere is

A. $1 : 1$

B. $2 : 1$

C. $1 : 2$

D. $3 : 2$

Answer:

Watch Video Solution

176. What should be the velocity of earth due to rotation about its own axis so that the weight at equator becomes 3/5 of initial value? Radius of earth on equator is 6400 km

A. $7.4 \times 10^{-4} ra\frac{d}{s}$

B. $6.7 \times 10^{-4} ra\frac{d}{s}$

C. $7.9 \times 10^{-4} ra\frac{d}{s}$

D. $8.7 \times 10^{-4} ra\frac{d}{s}$

Answer:

Watch Video Solution

177. A light planet is revolving round a massive star with a period of revolution T. If the gravitational force of attraction varies as

$r^{-5/2}$, then T^2 is proportional to (r is the distance between the planet and star)

A. $\frac{R^7}{2}$

B. $R^{-\frac{7}{2}}$

C. $\frac{R^5}{2}$

D. $\frac{R^2}{5}$

Answer:

Watch Video Solution

178. Assertion: The artifical satellite does not have any fuel but even then it remains orbiting around the earth.

Reason: The necessary centripetal force required to move the satellite in an ·orbit around the earth is provided by the gravitational force of attraction between the satellite and the earth.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False

D. Assertion is False but Reason is True.

Answer:

Watch Video Solution

179. Assertion: When an object is weighed with a physical balance, then its mass will be same both at the pole and at the equator.

Reason: When body is weighed with a spring balance, then its weight will be maximum at pole

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False but Reason is True.

Answer:

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180. A satellite is placed in a circular orbit about Earth with radius equal to half the radius of the moon's orbit. Period of rotation of the satellite is n times that of the lunar month (lunar month is the period of revolution of the moon). The value of n is

A. $2^{-\frac{3}{2}}$

B. $2^{\frac{3}{2}}$

C. $\frac{2^{1}}{2}$

D. $2^{-\frac{1}{2}}$

Answer:

Watch Video Solution

181. A diametrical tunnel is dug across the Earth. A ball is dropped into the tunnel from one side. The velocity of the ball, when it reaches the centre of the Earth is (Given: gravitational potential at the centre of Earth $= -\frac{3}{2}\frac{GM}{R}$)

A. $\sqrt{R}$

B. $\sqrt{gR}$

C. $\sqrt{2.5gR}$

D. $\sqrt{7.1gR}$

Answer:

Watch Video Solution

182. If the angular momentum of a planet of mass m, moving around the Sun in circular orbit is L, about the center of the Sun, its areal velocity is

A. $\frac{L}{m}$

B. $4\frac{L}{m}$

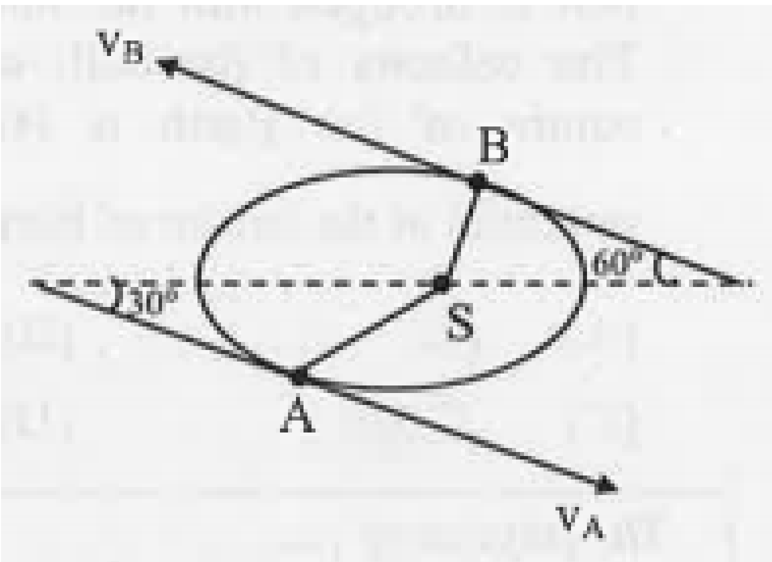
C. $\frac{L}{2m}$

D. $2\frac{L}{m}$

Answer:

Watch Video Solution

183. A planet is revolving around the sun as shown in the figure. The radius vectors joining the sun and the planet al points A and B are $90 \times 10^6 km$ and 60×10^6 km respectively. The ratio of velocities of the planet at A and B when its velocities make 30° and 60^2 with major axis of the orbit is



A. $\frac{3}{2}\sqrt{3}$

B. $\frac{2}{\sqrt{3}}$

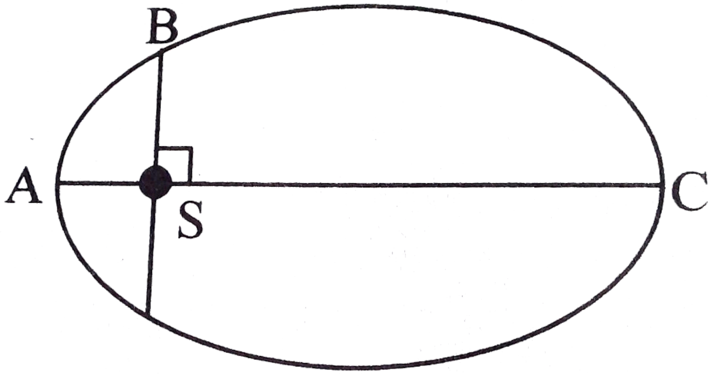
C. $\frac{1}{\sqrt{3}}$

D. $\frac{\sqrt{3}}{2}$

Answer:

Watch Video Solution

184. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A,$K_B$and K_C, respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure . Then



A. $K_A < K_B < K_C$

B. $K_A > K_B > K_C$

C. $K_B < K_A < K_C$

D. $K_B > K_A > K_C$

Answer:

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185. Assume that the earth moves around the sun in a circular orbit of radius R and there exists a planet which also moves around the sun in circular orbit with an angular speed twice as large as that of the earth. The radius of the orbit of the planet is

A. $(2)^{-\frac{2}{3}}R$

B. $(2)^{\frac{2}{3}}R$

C. $(2)^{-\frac{1}{3}}R$

D. $\frac{R}{\sqrt{2}}$

Answer:

Watch Video Solution

186. Two small satellites move in circular orbits arounds the earth respectively, at distances r and $(r + \triangle r)$ from the centre of the earth.

If their time periods are T and T and

$T + \triangle T(\triangle r \text{ltlt} r, \triangle T \text{ltlt} T)$, then

A. $\triangle T = \frac{3}{2} T \triangle \frac{r}{r}$

B. $\triangle T = -\frac{3}{2} T \triangle \frac{r}{r}$

C. $\triangle T = \frac{2}{3} T \triangle \frac{r}{r}$

D. $\triangle T = T \triangle \frac{r}{r}$

Answer:

Watch Video Solution

187. A planet of mass m moves around the Sun along an elliptical path with a period of revolution T. During the motion, the planet's maximum and minimum distance from Sun is R and $\frac{R}{3}$ respectively. If $T^2 = \alpha R^3$, Then the magnitude of constant α will be

A. $10\frac{\pi}{9}GM$

B. $20\frac{\pi^2}{27}GM$

C. $32\frac{\pi^2}{27}GM$

D. $\frac{\pi^2}{18}GM$

Answer:

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188. Two astronauts are floating in gravitational free space after having lost contact with their spaceship. The two will

A. keep floating at the same distance between them.

B. move towards each other.

C. move away from each other.

D. will become stationary.

Answer:

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189. Two particles of mass m_1 and m_2, approach each other due to their mutual gravitational attraction only. Then

A. acceleration of both the particles are equal.

B. acceleration of the particle of mass m, is proportional to m_1.

C. acceleration of the particle of mass m, is proportional to m_2.

D. acceleration of the particle of mass m, is inversely proportional to m_1.

Answer:

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

A. $4G\frac{M_P}{D_P^2}$

B. $GM_P\frac{m}{D_P^2}$

C. $G\frac{M_P}{D_P^2}$

D. $4GM_P\frac{m}{D_P^2}$

Answer:

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191. 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

Answer:

Watch Video Solution

192. Four particles, each of mass M and equidistant from each other, move along a circle of radius R under the action of their mutual gravitational attraction. The speed of each particle is

A. $\sqrt{G\frac{M}{R}}$

B. $\sqrt{(2\sqrt{2})G\frac{M}{R}}$

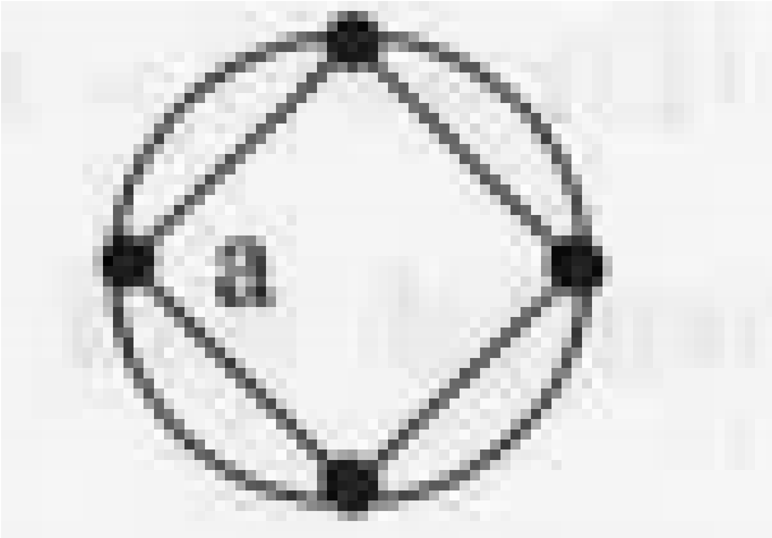
C. $\sqrt{G\frac{M}{R}(1+2\sqrt{2})}$

D. $\frac{1}{2}\sqrt{G\frac{M}{R}(1+2\sqrt{2})}$

Answer:

Watch Video Solution

193. Four identical particles of mass M are located at the corners of a square of side a. What should be their speed if each of them revolves under the influence of other's gravitational field in a circular orbit circumscribing the square?



A. $1.35\sqrt{G\frac{M}{a}}$

B. $1.16\sqrt{G\frac{M}{a}}$

C. $1.21\sqrt{G\frac{M}{a}}$

D. $1.41\sqrt{G\frac{M}{a}}$

Answer:

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194. If density of the earth is doubled keeping radius constant, the new acceleration due to gravity is (g = $9.8m/s^2$)

A. $9.8\frac{m}{s^2}$

B. $19.6\frac{m}{s^2}$

C. $4.9\frac{m}{s^2}$

D. $39.2\frac{m}{s^2}$

Answer:

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195. A body weighs 700 gm-wt on the surface of the earth. How much will it weigh on the surface of a planet whose mass is $\frac{1}{7}$ and radius is half that of the earth?

A. 200g

B. 400g

C. 350g

D. 50g

Answer:

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196. A body is raised to a height 'nR' from the surface of the earth of radius R. The ratio of acceleration due to gravity on the surface to that at a given height is

A. $(n+1)^{-3}$

B. $(n+1)^{-2}$

C. $(n+1)^{2}$

D. $(n + 1)$

Answer:

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197. The value of gravitational acceleration 'g' at a height 'h' above the earth's surface is $\frac{g}{4}$ then (R=radius of earth)

A. $h = R$

B. $h = \frac{R}{2}$

C. $h = \frac{R}{3}$

D. $h = \frac{R}{4}$

Answer:

Watch Video Solution

198. 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. 24N

D. 48 N

Answer:

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199. The height at which the weight of a body becomes $\frac{1}{16}$, its weight on the surface of earth 16 (radius R), is

A. 5R

B. 15R

C. 3R

D. 4R

Answer:

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200. The depth d at which the value of acceleration due to gravity becomes $\frac{1}{n}$ times the value at the earth's surface is [R=radius of earth]

A. $d = R\left(\frac{n}{n} - 1\right)$

B. $d = R\left(n - \frac{1}{2}n\right)$

C. $d = R\left(n - \frac{1}{n}\right)$

D. $d = R^2\left(n - \frac{1}{n}\right)$

Answer:

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201. The value of acceleration due to gravity at a depth of 1600 km is equal to

A. $4.9ms^{-2}$

B. $9.8ms^{-2}$

C. $7.35ms^{-2}$

D. $19.6ms^{-2}$

Answer:

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202. A body weighs 200 N on the surface of the earth. How much will is weigh half way down to the centre of the earth?

A. 250 N

B. 100 N

C. 150 N

D. 200 N

Answer:

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203. Let $'g_h'$ and $'g_d'$ be the acceleration due to gravity at height 'h' the above the earth's surface and at depth 'd' below the earth's surface respectively. If $g_h = g_d$ then the relation between 'h' and 'd' is

A. $d = h$

B. $d = \frac{h}{2}$

C. $d = \frac{h}{4}$

D. $d = 2h$

Answer:

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204. Let 'g_h' and 'g_d' be the acceleration due to gravity at height 'h' above the earth's surface and at depth 'd' below the earth's surface respectively. If $g_h = g_d$ then the relation between 'h' and 'd' is

A. $d = \frac{1}{2}km$

B. $d = 1km$

C. $d = \frac{3}{2}km$

D. $d = 2km$

Answer:

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205. The value of the acceleration due to gravity g a point 5.0 km above the earth's surface and 5.0 km below the earth's surface are respectively

A. $9.78\frac{m}{s^2}, 9.79\frac{m}{s^2}$

B. $9.78\frac{m}{s^2}, 0$

C. $9.79\frac{m}{s^2}, 0$

D. $9.78\frac{m}{s^2}, 9.78\frac{m}{s^2}$

Answer:

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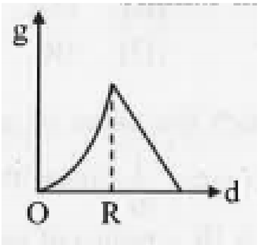
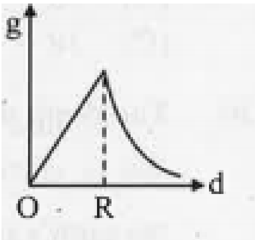
206. The variation of acceleration due to gravity g with distance d from centre of the earth is best represented by (R=Earth's radius)

A.



B.



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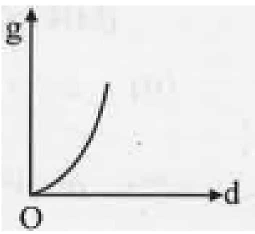

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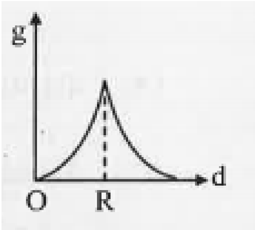

Answer:

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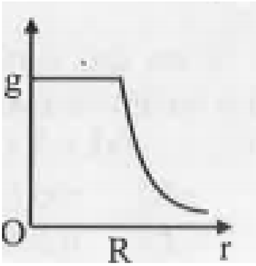
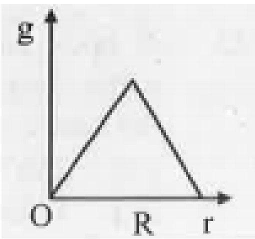
207. Starting from the centre of the earth having radius R, the variation of g(acceleration due to gravity) is shown by

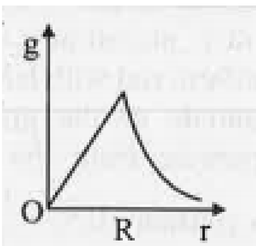
A.



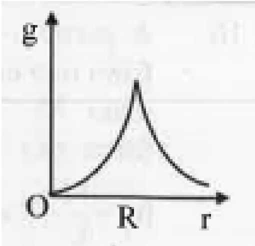
B.



C.



D.



Answer:

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208. If the earth rotates faster than its present speed, the weight of an object will

A. increase at the equator but remain unchanged at the poles.

B. decrease at the equator but remain unchanged at the poles.

C. remain unchanged at the equator but decrease at the poles.

D. remain unchanged at the equator but increase at the poles.

Answer:

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209. Which of the following statements is not correct for the decrease in the value of acceleration due to gravity?

A. As we go down from the surface of the earth towards its centre.

B. As we go up from the surface of the earth.

C. As we go from equator to the poles on the surface on the earth.

D. As the rotational velocity of the earth is increased.

Answer:

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210. Calculate angular velocity of earth so that acceleration due to gravity at 60° latitude becomes zero. (Radius of earth = 6400 km, gravitational acceleration at poles = $10m/s^2$, $\cos 60^\circ = 0.5$)

A. $7.8 \times 10^{-2} ra\frac{d}{s}$

B. $0.5 \times 10^{-3} ra\frac{d}{s}$

C. $1 \times 10^{-3} ra\frac{d}{s}$

D. $2.5 \times 10^{-3} ra\frac{d}{s}$

Answer:

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211. The change in potential energy when a body of mass m is raised to a height nR from the earth's surface is [R = Radius of earth]

A. $mgR\left(\frac{n}{n}-1\right)$

B. nmgR

C. $mgR\left(\frac{n^2}{n^2}-1\right)$

D. $mgR\left(\frac{n}{n}+1\right)$

Answer:

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212. 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. $m\frac{R}{M+m}$

D. $m\frac{R}{M}$

Answer:

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213. A body of mass 'm' is raised to a height '10 R' from the surface of earth, where 'R' is the radius of earth. The increase in potential energy is (G = universal constant of gravitation, M = mass of earth and g = acceleration due to gravity)

A. $GM\frac{m}{11}R$

B. $GM\frac{m}{10}r$

C. $mg\frac{R}{11}G$

D. $10GM\frac{m}{11}R$

Answer:

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214. A body of mass 'm' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be

A. mg2R

B. $\frac{2}{3}mgR$

C. 3mg2R

D. $\frac{1}{3}mgR$

Answer:

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215. The work done to raise a mass m from the surface of the earth to a height h, which is equal to the radius of the earth, is :

A. $\frac{1}{2}mgR$

B. $\frac{2}{3}mgR$

C. mgR

D. $2mgR$

Answer:

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216. Assuming that the gravitational potential energy of an object at infinity is zero, the change in potential energy (final-initial) of an object of mass m, when taken to a height h from the surface of earth (of radius R), is given

by,

A. $\frac{GMm}{R+h}$

B. $-\frac{GMm}{R+h}$

C. $\frac{GMmh}{R(R+h)}$

D. mgh

Answer:

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217. Infinite number of bodies, each of mass 2 kg are situated an x-axis at distance 1 m, 2 m, 4 m, 8 m, ... respectively, from the origin. The resulting gravitational potential due to this system at the origin will be

A. $-G$

B. $-\frac{8}{3}G$

C. $-\frac{4}{3}G$

D. $-4G$

Answer:

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218. The escape velocity from the surface of earth is v_e . The escape velocity from the surface of a planet whose mass and radius are 3 times those of the earth will be

A. $9v_e$

B. v_e

C. $3v_e$

D. $12v_e$

Answer:

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219. The ratio of escape ve locity at earth (v_e) to the escape ve locity at a planet (v_p) whose radius and mean density are twice as that of earth is

A. $1:4$

B. $1:\sqrt{2}$

C. $1:2$

D. $1:2\sqrt{2}$

Answer:

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220. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass= 5.98×10^{24} kg) have to be compressed to be a black hole?

A. $10^{-9}m$

B. $10^{-6}m$

C. $10^{-2}m$

D. 100 m

Answer:

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221. A space station is at a height equal to the radius of the Earth. If V_E is the escape velocity on the surface of the Earth, the same on the space station is ___ times V_E,

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{1}{\sqrt{3}}$

Answer:

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222. A period of geostationary satellite is

A. 24h

B. 12 h

C. 30h

D. 48h

Answer:

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223. Two satellites A and B go round a planet in circular orbits having radii 4R and R, respectively. If the speed of satellite A is 3v, then speed of satellite B is

A. $3\frac{v}{2}$

B. $4\frac{v}{2}$

C. 6v

D. 12v

Answer:

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224. 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.

Then

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 varies periodically with time

D. the linear momentum of S remains constant in magnitude.

Answer:

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225. A remote - sensing satellite of earth revolves in a circular orbit at a height of 0.25×10^6 m above the surface of earth. If earth's radius is 6.38×10^6 m and g

$= 9.8 ms^{-2}$, then the orbital speed of the satellite is

A. $6.67 kms^{-1}$

B. $7.76 kms^{-1}$

C. $8.56 kms^{-1}$

D. $9.13 kms^{-1}$

Answer:

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226. The time period of a geostationary satellite is 24 h, at a height $6R_E(R_E$ is radius of earth) from surface of earth. The time period of another satellite whose height is $2.5R_E$ from surface will

A. $\frac{12}{\sqrt{2}}h$

B. $6\sqrt{2}h$

C. $12\sqrt{2}h$

D. $\frac{24}{2.5}h$

Answer:

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227. If a satellite has to orbit the earth in a circular path every 6 hrs, what distance from the surface of the earth should the satellite be placed? (Radius of earth=6400 km) (Assume $\left(G\frac{M}{4\pi^2}\right) = 8 \times 10^{12} N\frac{m^2}{k}g$, where G and M are gravitational constant and mass of the earth and $10^{\frac{1}{3}} = 2.1$)

A. 15100 km

B. 8720 km

C. 20600 km

D. 5560km

Answer:

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228. A satellite is moving with a constant speed 'v' in a circular orbit about the earth. An object of mass 'm' is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of its ejection, the kinetic energy of the object is

A. $\frac{1}{2}mv^2$

B. mv^2

C. $\frac{3}{2}mv^2$

D. $2mv^2$

Answer:

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229. A satellite is orbiting close to the earth and has a kinetic energy K. The minimum extra kinetic energy required by it to just overcome the gravitation pull of the earth is

A. $\sqrt{3}K$

B. K

C. $2\sqrt{2}K$

D. 2 K

Answer:

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230. 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. $\sqrt{\frac{2gRn}{n}+1}$

Answer:

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231. A satellite has kinetic energy K, potential energy V and total energy E. Which of the following statements is true?

A. $K = -\frac{V}{2}$

B. $K = \frac{V}{2}$

C. $E = \frac{K}{2}$

D. $E = -\frac{K}{2}$

Answer:

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232. What is the minimum energy required to launch a satellite of mass m from the surface of a planet of mass M and radius R in a circular orbit at an altitude of 2R?

A. $\frac{5GmM}{6}R$

B. $\frac{5GmM}{3}R$

C. $\frac{GmM}{2}R$

D. $\frac{GmM}{3}R$

Answer:

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233. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. the total energy of the satellite in terms of go, the value of acceleration due to gravity at the earth's surface, is

A. $(2mg_0R^2$/R+h`

B. $(mg_0R^2$/2(R+h)`

C. $(mg_0R^2$/2(R+h)`

D. $(2mg_0R^2$/R+h`

Answer:

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234. The ratio of binding energy of a satellite at rest on earth's surface to the binding energy of a satellite of same mass revolving around the earth at a height 'h' above the earth's surface is (R = radius of the earth).

A. $2\frac{R+h}{R}$

B. $\frac{R+h}{2}R$

C. $\frac{R+h}{R}$

D. $\frac{R}{R}+h$

Answer:

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235. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is not correct

A. Raindrops will fall faster.

B. Walking on the ground would become more difficult.

C. Time period of a simple pendulum on the Earth would decrease.

D. 'g 'on the Earth will not change.

Answer:

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236. An extremely small and dense neutron star of mass M and radius R is rotating with angular velocity ω. If an object is placed at its equator, then 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. $M > \frac{R^2\omega^3}{G}$

Answer:

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237. A satellite is revolving in a circular orbit at a height 'h' from the earth's surface (radius of earth R, h <

A. $\sqrt{g}R$

B. $\sqrt{g\frac{R}{2}}$

C. $\sqrt{g}R(\sqrt{2}-1)$

D. $\sqrt{2}gR$

Answer:

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238. A satellite is revolving in a circular orbit at a height 'h' above the surface of the earth of radius 'R'. The speed of the satellite in its orbit is one-fourth the escape velocity from the surface of the earth. The relation between 'h' and 'R' is

A. $h = 2R$

B. $h = 3R$

C. $h = 5R$

D. $h = 7R$

Answer:

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239. A body mass 'm' is dropped from height $\frac{R}{2}$, from earth's surface, where 'R' is the radius of earth. Its speed when it will hit the earth's surface is (v_e= escape velocity from earth's surface)

A. $\sqrt{3}v_e$

B. $\frac{v_e}{\sqrt{3}}$

C. $\frac{v_e}{\sqrt{2}}$

D. $\sqrt{2}v_e$

Answer:

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240. The mass density of a spherical galaxy varies as $\frac{K}{r}$ over a large distance 'r' from its centre. In that region, a small star is in a circular orbit of radius R. Then the period of revolution, T depends on R as:

A. $T \propto R$

B. $T^2 \propto R^3$

C. $T^2 \propto R$

D. $T^2 \propto \frac{1}{R^3}$

Answer:

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241. Consider a spherical planet which is rotating about its axis such that the speed of a point on its equator is 'v' and the effective acceleration due to gravity on the equator is $\frac{1}{3}$ of its value at the poles. What is the escape velocity for the particle at the pole of this planet?

A. 3v

B. 2v

C. $\sqrt{3}v$

D. $\sqrt{2}v$

Answer:

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242. Kepler's third law states that square of period of revolution (T) of a planet around the sun, is proportional to third power of . average distance r between sun and planet i.e $T^2 = Kr^3$ here K is constant.

If the masses of sun and planet are M and m respectively then as per Newton's law of gravitation force of attraction between them is $F = \frac{GMm}{r^2}$, here G is gravitational constant. The relation between G and K is decribed as

A. $GK = 4\pi^2$

B. $GMK = 4\pi^2$

C. $K = G$

D. $K = \frac{1}{G}$

Answer:

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243. A planet of mass 'm' moves in an elliptical orbit around an unknown star of mass 'M' such that its maximum and minimum distances from the star are equal to r_1 and r_2 respectively. The angular momentum of the planet relative to the centre of the star is

A. $m\sqrt{\frac{2GMr_1r_2}{r_1+r_2}}$

B. 0

C. $m\sqrt{\left(2GM\frac{r_1+r_2}{r_1}r_2\right)}$

D. $m\sqrt{\left(\left(2GM\frac{r_1}{r_1}+r_2\right)\right)r_2}$

Answer:

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244. The ratio of accelerations due to gravity $g_1 : g_2$ on the surfaces of two planets is $5 : 2$ and the ratio of their respective average densities $\rho_1 : \rho_2$ is $2 : 1$. what is the ratio of respective escape velocities $v_1 : v_2$ from the surface of the planets?

A. $5 : 2$

B. $\sqrt{5} : \sqrt{2}$

C. $5 : 2\sqrt{2}$

D. $25 : 4$

Answer:

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245. A body is thrown from the surface of the earth with velocity 'u' mis. The maximum height in m above the surface of the earth upto which it will reach is (R = radius of earth, g = acceleration due to gravity)

A. $\dfrac{u^2 R}{2gR - u^2}$

B. $\dfrac{2u^2 R}{gR - u^2}$

C. $\frac{u^2R^2}{2gR^2 - u^2}$

D. $\frac{u^2R}{gR - u^2}$

Answer:

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246. A particle of mass M is situated at the centre of a spherical shell of same mass and radius a. the magnitude of the gravitational potential at a point situated at $\frac{a}{2}$ distance from the centre, 2 will be

A. $4G\frac{M}{a}$

B. $G\frac{M}{a}$

C. $2G\frac{M}{a}$

D. $3G\frac{M}{a}$

Answer:

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247. A light planet is revolving round a massive star with a period of revolution T. If the gravitational force of attraction varies as

$r^{-5/2}$, then T^2 is proportional to (r is the distance between the planet and star)

A. $\frac{r^3}{2}$

B. $\frac{r^5}{2}$

C. $\frac{r^7}{2}$

D. $\frac{r^1}{2}$

Answer:

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248. At what height from the surface of earth the gravitation potential and the value of g are $-5.4 \times 10^7 J \quad kg^{-2}$ and 6.0 ms^{-2} respectively? Take the radius of earth as 6400 km

A. 1400 km

B. 2000 km

C. 2600 km

D. 1600 km

Answer:

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249. A satellite of mass 'm' is revolving in circular orbit of radius 'r' round the earth. Its angular momentum w.r.t the centre of its orbit is (M=mass of earth, G=universal gravitational constant)

A. $GMmr\frac{)^1}{2}$

B. $GMm^2r\frac{)^1}{2}$

C. $GMm^2r^2\frac{)^1}{2}$

D. $GM^2m^2r\frac{)^1}{2}$

Answer:

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250. The radii of a planet and its satellite are 2r and r and their densities are ρ and 2ρ respectively. Their centres are separated by a distance d. The minimum speed with which a body should be projected from the mid point of the line joining their centres so that the body escapes to infinity is (G-universal gravitational constant)

A. $4\left[\sqrt{\frac{10G\pi r^3 p}{3}d}\right]$

B. $\sqrt{\frac{40G\pi r^3 p}{3}d}\Big]$

C. $2\left[\sqrt{\frac{10G\pi r^3 p}{d}}\right]$

D. $\frac{1}{4}\left[\sqrt{\frac{10G\pi r^3 p}{3}d}\right]$

Answer:

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251. The radius of the Earth is about 6400 km and that of Mars is about 3200 km. The mass of the Earth is about 20 times the mass of Mars. An object weighs 500 Non the surface of Earth. Its weight on the surface of Mars would be

A. 100 N

B. 200 N

C. 150 N

D. 20 N

Answer:

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252. Given radius of Earth 'R' and length of a day 'T' the height of a geostationary satellite is [G- Gravitational Constant, M-Mass of earth]

A. $\left(\frac{4\pi^2 GM}{T^2}\right)^{\frac{1}{3}}$

B. $\left(\frac{4\pi GM}{R^2}\right)^{\frac{1}{3}} - R$

C. $\left(\frac{GMT^2}{4\pi^2}\right)^{\frac{1}{3}} - R$

D. $\left(\frac{GMT^2}{4}\pi^2\right)^{\frac{1}{3}} + R$

Answer:

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253. The mass of planet Jupiter is $1.9 \times 10^{27} kg$ and that of the Sun is $1.9 \times 10^{30} kg$. The mean distance of Jupiter from the Sun is 7.8×10^{11} m. Calculate te gravitational force which Sun exerts on Jupiter. Assuming that Jupiter moves in circular orbit around the Sun, also calculate the speed of Jupiter

$G = 6.67 \times 10^{-11} Nm^2 kg^{-2}$.

A. $4.1 \times 10^{23} N$

B. $4.1 \times 10^{34} N$

C. $2.2 \times 10^{23} N$

D. $2.2 \times 10^{34} N$

Answer:

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254. A mass M is broken into two parts of masses m_1 and m_2. How are m_1 and m_2 related if we want the gravitational attraction between the two parts to be maximum?

A. $m_1 = m_2$

B. $m_1 = M$

C. $m_2 = M$

D. None of these

Answer:

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255. Suppose the gravitational force varies inversely as the n^{th} power of distance. Then the time period of a planet in circular orbit of radius R around the sun will be proportional to

A. $r^{\frac{n-1}{2}}$

B. $r^{\frac{n+1}{2}}$

C. r^{n-1}

D. r^{n}

Answer:

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

A. $\frac{R}{8}$

B. $\frac{R}{2}$

C. $\frac{R}{4}$

D. $\frac{R}{5}$

Answer:

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257. What should be the velocity of earth due to rotation about its own axis so that the weight at equator becomes $\frac{2}{5}$ of initial value? Radius of earth on equator is 6400 km and is $10\frac{m}{s^2}$.

A. $7.4 \times 10^{-4} \frac{rad}{s}$

B. $6.7 \times 10^{-4} \frac{rad}{s}$

C. $9.7 \times 10^{-4} \frac{rad}{s}$

D. $8.7 \times 10^{-4} \frac{rad}{s}$

Answer:

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258. For a satellite that orbits as close to the earth's surface as possible, which of the following statements is INCORRECT?

A. Its speed is maximum.

B. Time period of its rotation is minimum.

C. The total energy of the 'earth plus satellite' system is minimum.

D. The total energy of the 'earth plus satellite' system is maximum.

Answer:

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259. Let ω be the angular velocity of earth's rotation about the axis. Assume the acceleration due to gravity on the earth's surface has the same value at the equator and poles. An object weighed at the equator gives the same reading as a reading taken at a depth d below earth's surface at the pole (d ltlt R). The value of dis

A. $\frac{\omega^2 R^2}{g}$

B. $\frac{\omega^2 R^2}{2} g$

C. $\frac{2\omega^2 R^2}{g}$

D. $\left(\frac{\sqrt{Rg}}{g}\right.$

Answer:

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260. Two planets have density in the ratio 2 : 3 and radii in the ratio 1 : 2. The ratio of acceleration due to gravity at their surface is

A. $1:3$

B. $3:1$

C. $1:9$

D. $9:4$

Answer:

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261. Two planets move around the Sun. The periodic times and the mean radii of the orbits are T_1, T_2 and r_1, r_2 respectively. The ratio T_1 / T_2 is equal to

A. $\dfrac{\left(\frac{r_1}{r_2}\right)^1}{2}$

B. $\left(\dfrac{r_1}{r_2}\right)$

C. $\left(\dfrac{r_1}{r_2}\right)^2$

D. $\dfrac{\left(\frac{r_1}{r_2}\right)^3}{2}$

Answer:

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262. If the value of the gravitational acceleration at the height h be 1% of its value at the surface of the earth, then h is equal to

(given $R_e = 6400 km$)

A. 6400 km

B. 57600 km

C. 2560 km

D. 64000 km

Answer:

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263. Two satellites are orbiting around the Earth in circular orbits of the same radius. The mass of satellite A is five times greater than the mass of satellite B. Their periods of revolution are in the ratio

A. $1:1$

B. $1:10$

C. $3:1$

D. $1:5$

Answer:

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264. A particle of mass m is subjected to an attractive central force of magnitude $\frac{k}{r^2}$ being a constant. At the instant when the particle is at its extreme position in its closed orbit at a distance 'a' from the centre of force, its speed is $\frac{k}{2ma}$. If the distance of other extreme is b, find $\frac{a}{b}$.

A. -1

B. 2

C. 3

D. 4

Answer:

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265. The percentage change in the acceleration of the Earth towards the Sun from a total eclipse of the Sun to the point where the Moon is on a side of Earth directly opposite to Sun is,

A. $\left(\frac{M_s}{M_m}\right)\left(\frac{r_2}{r_1}\right) \times 100$

B. $\left(\frac{M_s}{M_m}\right)\left(\frac{r_2}{r_1}\right)^2 \times 100$

C. $2\left(\frac{r_1}{r_2}\right)^2\left(\frac{M_m}{M_s}\right) \times 100$

D. $\left(\frac{r_1}{r_2}\right)^2\left(\frac{M_m}{M_s}\right) \times 100$

Answer:

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266. The escape velocity for a body projected vertically upwards is 11.2 km/s. If the body is projected in a direction making an angle 45° with vertical, the escape velocity will be,

A. $\frac{11.2}{\sqrt{2}}k\frac{m}{s}$

B. $11.2 \times \sqrt{2}k\frac{m}{s}$

C. $11.2 \times 2k\frac{m}{s}$

D. $11.2k\frac{m}{s}$

Answer:

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267. The orbital velocity of a body at height h above the surface of Earth is 36% of that near the surface of the Earth of radius R. If the escape velocity at the surface of Earth is $11.2 kms^{-1}$, then its value at the height h will be

A. $11.2 kms^{-1}$

B. $\sqrt{\frac{h}{R}} \times 11.2 kms^{-1}$

C. $\frac{9}{25} \times 11.2 kms^{-1}$

D. $\sqrt{\frac{R}{h}} \times 11.2 kms^{-1}$

Answer:

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268. Assuming the earth as a sphere of uniform density. the acceleration due to gravity half way towards the centre of the earth will be

A. 0.75 g

B. 0.50 g

C. 0.25 g

D. 0.125 g

Answer:

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269. Mars has about $\left(\frac{1}{10}\right)^{th}$ as much mass as the Earth and half as a diameter of earth. The acceleration of falling body on Mars is nearly

A. $9.8ms^{-2}$

B. $19.6ms^{-2}$

C. $3.92 m s^{-2}$

D. $4.9 m s^{-2}$

Answer:

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270. A comet is moving around the earth in.highly elliptical orbit. Identify the incorrect statement

A. K.E and P.E. both change over the orbit.

B. Its T.E. changes over the orbit.

C. Its linear momentum changes in magnitude as well as in direction over the orbit.

D. Its angular momentum remains constant over the orbit.

Answer:

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271. Two particles are projected from the surface of the earth with velocities $\sqrt{\frac{5}{7}gR}$ and $\sqrt{\frac{2}{5}gR}$ where, R is the radius of the earth what should be the ratio of maximum heights attained?

A. $\frac{2}{5}$

B. $\frac{5}{3}$

C. $\frac{3}{5}$

D. $\frac{5}{2}$

Answer:

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272. Two identical solid copper spheres of radius R placed in contact with each other. The gravitational attraction between them is proportional to

A. R^2

B. R^{-2}

C. R^4

D. R^{-4}

Answer:

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273. The time period of a satellite in a circular orbit of radius R is T. The radius of the orbit in which time period is 8 T is

A. 2 R

B. 3 R

C. 4 R

D. 5 R

Answer:

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