PHYSICS

BOOKS - MODERN PUBLICATION

Unit Test - Gravitation

Example

1. Answer the following :- You can shield a charge from electrical forces by putting it inside a hollow conductor. Can you shield a

body from the gravitational influence of nearby matter by putting it inside a hollow sphere or by some other means ?

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2. Answer the following :- An astronaut inside a small space ship orbiting around the earth cannot detect gravity. If the space station orbiting around the earth has a large size, can he hope to detect gravity ?

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3. Answer the following :- If you compare the gravitational force on the earth due to the sun to that due to the moon, you would find that the Sun's pull is greater than the moon's pull. (you can check this yourself using the data available in the succeeding exercises). However, the tidal effect of the moon's pull is greater than the tidal effect of sun. Why ?

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4. Choose the correct alternative :- Acceleration due to gravity $\in creases/decreases$ with increasing altitude.

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5. Choose the correct alternative :- Acceleration due to gravity $\in creases/decreases$ with increasing depth

(assume the earth to be a sphere of uniform density).

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6. Choose the correct alternative :- Acceleration due to gravity is independent of mass of the $earth / mass$ of the body.

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7. Choose the correct alternative :- The formula -GMm$(1/r_2 1/r_1)$ is m or $e/ \leq ss$ accurate than the formula $mq(r_2 - r_1)$ for the difference of potential energy between two points r_2 and r_1, distance away from the centre of the earth.

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8. Suppose there existed a planet that went around the sun twice as fast as the earth.

What would be its orbital size as compared to that of the earth ?

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9. Io, one of the satellites of Jupiter, has an orbital period of 1.769 days and the radius of the orbit is $4.22 \times 10^8 m$. Show that the mass of Jupiter is about one-thousandth that of the sun.

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10. Let us assume that our galaxy consists of 2.5×10^{11} stars each of one solar mass. How long will a star at a distance of 50,000 ly from the galactic centre take to complete one revolution ? Take the diameter of the Milky Way to be 10^5 ly.

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11. Choose the correct alternative:- If the zero of potential energy is at infinity, the total

energy of an orbiting satellite is negative of its

$k \in etic / potential$ energy.

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12. Choose the correct alternative:- The energy required to launch an orbiting satellite out of earth's gravitational influence is $m \text{ or } e / \leq ss$ than the energy required to project a stationary object at the same height (as the satellite) out of earth's influence.

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13. Does the escape speed of a body from the earth depend on:- the mass of the body

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14. Does the escape speed of a body from the earth depend on:- the direction of projection,

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15. Does the escape speed of a body from the earth depend on:- the height of the location from where the body is launched?

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16. A comet orbits the sun in a highly elliptical orbit. Does the comet have a constant:- linear speed,

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17. A comet orbits the sun in a highly elliptical orbit. Does the comet have a constant:- angular speed,

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18. A comet orbits the sun in a highly elliptical orbit. Does the comet have a constant:- angular momentum,

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19. A comet orbits the sun in a highly elliptical orbit. Does the comet have a constant:- kinetic energy,

Watch Video Solution

20. A comet orbits the sun in a highly elliptical orbit. Does the comet have a constant:- potential energy,

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21. A comet orbits the sun in a highly elliptical orbit. Does the comet have a constant:- total energy throughout its orbit? Neglect any mass loss of the comet when it comes very close to the Sun.

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22. Which of the following symptoms is likely to afflict an astronaut in space:- swollen feet,

A. (a) swollen feet

B. (b) swollen face

C. (c) headache

D. (d) orientational problem

Answer:

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23. A rocket is fired from the earth towards the sun. At what distance from the earth's centre is the gravitational force on the rocket zero ? Mass of the sun = $2 \times l0^{30} kg$, mass of the

earth = $6 \times l0^{24} kg$. Neglect the effect of other planets etc. (orbital radius = $1.5 \times 10^{11} m$).

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24. How will you 'weigh the sun', that is estimate its mass? The mean orbital radius of the earth around the sun is $1.5 \times 10^{8} km$.

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25. A saturn year is 29.5 times the earth year. How far is the saturn from the sun if the earth is $1.50 \times 10^8 km$ away from the sun ?

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26. A body weighs 63 N on the surface of the earth. What is the gravitational force on it due to the earth at a height equal to half the radius of the earth ?

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27. Assuming the earth to be a sphere of uniform mass density, how much would a body weigh half way down to the centre of the earth if it weighed 250 N on the surface ?

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28. A rocket is fired vertically with a speed of $5kms^{-1}$ from the earth's surface. How far from the earth does the rocket go before returning to the earth ? Mass of the earth =

$6.0 \times 10^{24} kg$, mean radius of the earth = $6.4 \times 10^{6} m$, G = $6.67 \times 10^{-11} Nm^{2} kg^{-2}$.

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29. The escape speed of a projectile on the earth's surface is $11.2 kms^{-1}$. A body is projected out with thrice this speed. What is the speed of the body far away from the earth? Ignore the presence of the sun and other planets.

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30. A satellite orbits the earth at a height of 400 km above the surface. How much energy must be expended to rocket the satellite out of the earth's gravitational influence? Mass of the satellite = 200 kg, mass of the earth $= 6.0 \times l0^{24} kg$, radius of the earth = $6.4 \times 10^{6} m$, G = $6.67 \times 10^{11} Nm^{2} kg^{2}$.

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31. Two stars each of one solar mass $\left(= 2 \times l0^{30} kg \right)$ are approaching each other for a head on collision. When they are a distance $10^9 km$, their speeds are negligible. What is the speed with which they collide ? The radius of each star is $10^4 km$. Assume the stars to remain undistorted until they collide. (Use the known value of G).

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32. Two heavy spheres each of mass 100 kg and radius 0.10 m are placed 1.0 m apart on a horizontal table. What is the gravitational force and potential at the mid point of the line joining the centres of the spheres ? Is an object placed at that point in equilibrium? If so, is the equilibrium stable or unstable ?

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33. As you have learnt in the text, a geostationary satellite orbits the earth at a height of nearly 36,000 km from the surface of the earth. What is the potential due to earth's gravity at the site of this satellite ? (Take the potential energy at infinity to be zero). Mass of the earth $= 6.0Xx10^{24}kg$, radius = 6400 km.

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34. A star 2.5 times the mass of the sun and collapsed to a size of 12 km rotates with a speed of 1.2 rev. per second. (Extremely compact stars of this kind are known as neutron stars. Certain stellar objects called pulsars belong to this category). Will an object placed on its equator remain stuck to its surface due to gravity ? (mass of the sun $= 2 \times 10^{30} kg$).

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35. A spaceship is stationed on Mars. How much energy must be expended on the spaceship to launch it out of the solar system ? Mass of the space ship = 1000 kg, mass of the sun = $2 \times 10^{30} kg$, mass of mars = $6.4 \times l0^{23} kg$, radius of mars = 3395 km, radius of the orbit of mars = 2.28x10^8 km, $G =$ 6.67xx10^-11 N m^2 kg^-2`.

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36. A rocket is fired 'vertically' from the surface of mars with a speed of 2 km s^-1. If 20% of its initial energy is lost due to martian atmospheric resistance, how far will the rocket go from the surface of mars before returning to it ? Mass of mars = $6.4 \times 10^{23} kg$, radius of mars = 3395 km, G = $6.67 \times 10^{-11} Nm^2 kg^{-2}$.

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37. Derive Newton's law of gravitation from Kepler's law.

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38. Imagine a planetary system in which the gravitational force varied as $\frac{1}{R}$ instead of $\frac{1}{R^2}$. what relation would correspond to Kepler's third law ($\frac{T^2}{R^3}$ = constant)?

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39. In an imaginary planetary systems the central star has a mass as our sun but it's much brighter so that only a planet twice the distance between the Earth and the Sun can support life. assuming biological evolution (including aging processes, etc.) on that planet similar to ours, what would be the average lifespan of a human on that planet in terms of its natural year? the average lifespan of a human on the earth may be taken as 70 years.

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40. Discuss, whether the weight of a body should be greater in night when the attraction of earth and sun are in the same direction then it is in the mid day, when the attraction of earth and sun are opposite.

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41. A tunnel is dug through the centre of the earth. Show that a body of mass m when

dropped from rest from one end of the tunnel will execute simple harmonic motion.

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42. Suppose that the gravitational force varies inversely as the nth power of distance. In that situation what will be the time period of a planet in a circular orbit of radius R around the sun?

A. $R^{\frac{n+1}{2}}$ ○

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

C. R^n`

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

Answer:

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43. Average density of the earth

A. does not depend on g

B. is a complex function of g

C. is directly proportional to g

D. is inversely proportional to g

Answer:

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44. The change in the value of g at a heighth above the surface of the earth is the same as at a depth d below the surface of earth. When both d and h are much smaller than the radius

of earth, then which one of the following is correct?

A. $d=h/2$

B. $d=2h$

C. $d=3h/2$

D. $d=h$

Answer:

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45. If g is the acceleration due to gravity on the earth's surface, what will be the gain in the potential energy of an object of mass m raised from the surface of the earth to a height equal to twice the radius of the earth?

A. $\frac{1}{4}$mgr

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

C. mgr

D. 2mgr

Answer:

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

A. $GM\frac{m}{12}R^2$

B. $GM\frac{m}{8}R$

C. $GM\frac{m}{3}R^2$

D. $GM\frac{m}{6}R$

Answer:

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47. What will be the kinetic energy needed to project a body of mass m from the surface of the earth (radius R) to infinity?

A. $mg\frac{R}{2}$

B. mg R

C. 2 mg R

D. $mg\frac{R}{4}$

Answer:

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48. Two bodies of masses m and 4 m are placed at a distance r. The gravitational potential at a point on the line joining them, where the gravitational field is zero, is

A. 0

B. $-4G\frac{m}{r}$

C. $-6G\frac{m}{r}$

D. $-9G\frac{m}{r}$

Answer:

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49. A particle of mass 10g is kept on the surface of a uniform sphere of mass 100kg and radius 10cm. Find the work to be done against the gravitational force between them to take the partice far away from the sphere (you may take G = $6.67 \times 10^{-11} N \frac{m^2}{k} g^2$)

A. 13.34x10^-10J

B. 6.67x10^-9-J

C. 3.33x10^-10-J

D. 6.67x10^-10-J

Answer:

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50. The escape velocity of a particle of mass m varies directly as

A. m^0

B. m^2

C. m

D. m^3

Answer:

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51. A planet in a distant solar system is 10 times more massive than the earth and its radius is 10 times smaller. Given that the

escape velocity from the earth is $11kms^{-1}$, the escape velocity from the surface

A. $0.11kms^{-1}$

B. $1.1kms^{-1}$

C. $11kms^{-1}$

D. $110kms^{-1}$

Answer:

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52. The escape velocity for a body projected vertically upwards from the surface of earth is $11kms^{-1}$. If the body is projected at an angle of 45° with the vertical, the escape velocity will be

A. $\frac{11}{\sqrt{2}}kms^{-1}$

B. $11kms^{-1}$

C. $11\sqrt{2}kms^{-1}$

D. $22kms^{-1}$

Answer:

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53. A satellite of mass revolves around the earth of radius R at a height x from its surface. If g is the acceleration due to gravity on the surface of the earth, the orbital speed of the satelite is

A. gx

B. $g\frac{R}{R-x}$

C. $\frac{gR^2}{R+x}$

D. $\left(\frac{gR^2}{R+x}\right)^{\frac{1}{2}}$

Answer:

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

A. the mass of the satellite

B. radius of its orbit

C. both the mass and radius of the orbit

D. neither the mass of the satellite nor the radius of its orbit.

Answer:

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55. The time period of a satellite is 5 hours. If the separate between the earth and the satellite is increased 4 times, what will be the new time period?

A. 10 hour

B. 40 hour

C. 80 hour

D. 20 hour

Answer:

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56. If suddenly the gravitationl force of attraction between earth and a satellite

revolving around it becomes zero, then the satellite will

A. continue to move in its orbit with same velocity.

B. move tangentially to the original orbit with the same velocity

C. become stationary in its orbit.

D. move towards the earth.

Answer:

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57. The period of revolution of a planet A around the sun is 8 times that of B. How many times is the distance of A from the sun greater than that of B from the sun ?

A. 2

B. 3

C. 4

D. 5

Answer:

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58. The distances of two planets from the sun are 10^{13} and 10^{12} m respectively. The ratio of the time periods of these planets is

A. 100

B. $10\sqrt{10}$

C. $\frac{1}{\sqrt{10}}$

D. $\sqrt{10}$

Answer:

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59. A planet moving along an elliptical orbit is closest to the sun at a distance r_1 and farthest away at a distance r_2. If v_1 and v_2 are the linear velocities at these points respectively, then the ratio $\frac{v_1}{v_2}$ is

A. $\frac{r_1}{r_2}$

B. $\frac{r_2}{r_1}$

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

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

Answer:

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60. The largest and the shortest distance of the earth from the sun is r_1 and r_2. What will be its distance from the sun when it is at perpendicular to the major axis of the orbit drawn from the sun?

A. $\frac{r_1 + r_2}{2}$

B. $\frac{r_1 + r_2}{4}$

C. $\frac{r_1 + r_2}{r_1 - r_2}$

D. $\frac{2r_1 r_2}{r_1 + r_2}$

Answer:

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61. A planet is moving in an elliptical orbit. If T, V, E and L stand respectively for its kinetic energy, gravitational potential energy, total energy and magnitude of angular momentum

about the centre of force, which of the following statements is correct?

A. T is conserved

B. E is always negative.

C. V is always conserved.

D. L is conserved but the direction of continuously.

Answer:

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62. Two Spheres of masses m and M are situated in air and the gravitational force between them is F. the space around the masses is now filled with a liquid of specific gravity 3. gravitational force will now be

A. F

B. 3F

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

D. $\frac{F}{9}$

Answer:

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63. The earth (mass=6×10^{24}kg) revolves around the sun with an angular velocity of $2 \times 1^{-7} rads^{-1}$ in a circular orbit of radius 1.5×10^{8} km. the force exerted by the sun on the earth in Newton is

A. 0

B. $18x10^{25}$

C. $36x10^{21}$

D. $27x10^{39}$

Answer:

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64. Two particles of equal mass go around a circle of radius R under the action of their mutual gravitational attraction. The speed 'v' of each particle is :

A. $v = \frac{1}{2R}\sqrt{\left(\frac{1}{Gm}\right)}$

B. $v = \sqrt{\frac{Gm}{2R}}$

C. $v = \frac{1}{2}\sqrt{\frac{Gm}{R}}$

D. $v = \sqrt{\frac{4Gm}{R}}$

Answer:

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65. If the gravitational force between two objects were proportional to $\frac{1}{R}$ (and not as $\frac{1}{R^2}$), where R is separation between them,

then a particle can revolve in a circular orbit under speed u, which is proportional to

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

B. R_0

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

D. R

Answer:

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66. Calculate the average density of the earth terms of g, G and R.

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

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

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

D. $\frac{gR^2}{G}$

Answer:

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67. The acceleration due to gravity g and mean density of the earth p are related by which of the following relations ? (where G is the gravitational constant and R is radius of the earth)

A. $\rho = \left(\frac{4\pi g R^2}{3G}\right)$

B. $\rho = \left(\frac{4\pi g R^3}{3G}\right)$

C. $\rho = \left(\frac{3g}{4\pi G R}\right)$

D. $\rho = \left(\frac{3g}{4\pi G R^3}\right)$

Answer:

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

A. $g' = \frac{g}{9}$

B. $g' = 9g$

C. $g' = 3g$

D. $g' = 27g$

Answer:

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69. The acceleration due to gravity on the planet A is 9 times the accleration due to gravity on planet B. A man jumps to a height of 2 m on the surface of A. What is the height of jump by the same person on the planet B?

A. 6 m

B. 2/3 m

C. 18 m

D. 2/9 m

Answer:

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70. A body weighs 72 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. (A) 72 N

B. 16 N

C. 28 N

D. 32 N

Answer:

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71. The radius of earth is about 6400Km and that of mars is about 3200 km The mass of the earth is about 10 times the mass of mars. An

object weight 200N on earth 's surface, then its weight on the surface of mars will be:

A. 8 N

B. 40 N

C. 20 N

D. 80 N

Answer:

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72. A ball is dropped from a high rise platform at t=0 starting from rest. After 6 s, another ball is thrown downwards from the same platform with a speed v. The two balls meet at t=18 s. What is the value of v? Take g=10ms^{-1}.

A. $40ms^{-1}$

B. $60ms^{-1}$

C. $55ms^{-1}$

D. $75ms^{-1}$

Answer:

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73. A body of mass m is placed on earth surface, which is taken from earth surface to a height of h=3 R. Then, change in gravitational potential energy is

A. $mg\frac{R}{4}$

B. $2mg\frac{R}{3}$

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

D. $3mg\frac{R}{4}$

Answer:

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74. The potential energy between two atoms in a molecule is given by $U(x) = \left(\frac{a}{x^{12}}\right) - \left(\frac{b}{x^{6}}\right)$, where a and b are positive constants and x is the distance between the atoms. find the distance between the atoms so that the molecule is in stable equilibrium

A. $x = \left(\frac{a}{2b}\right)^{\frac{1}{6}}$

B. $x = \left(2\frac{a}{b}\right)^{\frac{1}{6}}$

C. $x = \left(\frac{11a}{5b}\right)^{\frac{1}{6}}$

D. x=0

Answer:

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75. A particle of mass M is situated at the centre of a spherical shell of the same mass

and radius a. The gravitational potential at a point situated at a/2 distance from the centre, will be

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

B. $-2G\frac{M}{a}$

C. $-3G\frac{M}{a}$

D. $-4G\frac{M}{a}$

Answer:

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76. The escape velocity of a particle of mass m varies directly as

A. `sqrt((GM)/R_e)

B. `sqrt((2GM)/R_e)

C. `sqrt((2GMm)/R_e)

D. `sqrt((2GM+R_e)/R_e)

Answer:

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77. The escape velocity for a body projected vertically upwards from the surface of earth is $11kms^{-1}$. If the body is projected at an angle of 45° with the vertical, the escape velocity will be

A. $11kms^{-1}$

B. $11\sqrt{3}kms^{-1}$

C. $\frac{11}{\sqrt{3}}kms^{-1}$

D. $33kms^{-1}$

Answer:

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78. The escape velocity of a body on the surface of the earth is $11.2kms^{-1}$. If the earth's mass increases to twice its present value and radius of the earth becomes half, the escape velocity becomes

A. $5.6kms^{-1}$

B. $11.2kms^{-1}$

C. $22.4kms^{-1}$

D. $44.8kms^{-1}$

Answer:

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79. The escape velocity on the surface of earth is $11.2kms^{-1}$. What would be the escape velocity on the surface of another planet of the same mass but 1/4 times the radius of the earth?

A. $5.6kms^{-1}$

B. $11.2kms^{-1}$

C. $22.4kms^{-1}$

D. $44.8kms^{-1}$

Answer:

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80. With what velocity should an object be projected from the surface of the earth so that its height above the surface becomes equal to the radius of the earth?

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

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

C. $2\sqrt{G\frac{M}{R}}$

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

Answer:

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81. the earth is assumed to be a sphere of radius R. A platform is arranged at a height R from the surface of the earth. the escape

velocity of a body from its platform is kv_e where v_e is its escape velocity from the surface of the earth. find the value of k.

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

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

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

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

Answer:

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82. The radii of circular orbits of two satellites A and B of the earth are 4 R and R respectively. If the speed of satellite A is 3 u, then the speed of satellite B will be

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

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

C. 6v

D. 12v

Answer:

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83. A satellite A of mass m is at a distance r from the centre of the earth. Another satellite B of mass 2 m is at a distance 2r from the earth's surface. Their time periods are in the ratio of

A. $1:2$

B. $1:16$

C. $1:32$

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

Answer:

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

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

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

C. $\frac{Rg}{\omega^2}$

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

Answer:

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85. A satellite is moving in an orbit of radius raround the earth. Find the ratio of its kinetic energy to potential energy

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

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

C. $\sqrt{2}$

D. 2

Answer:

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86. Two knights of the earth S_1 and S_2 are moving in the same orbit. The mass of S_1 is 4 times the mass of S_2 which one of the following statements is correct?

A. the time period of S_1 is 4 times that of S_2

B. the potential energies of the Earth and the satellite are equal in the two cases

C. S_1 and S_2 are moving with the same speed

D. the Kinetic energies of the satellites are equal

Answer:

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87. A roller coaster is designed such that riders experience weightlessness as they go round the top of a hill whose radius of curvature is 20 m. the speed at the top of the hill is between

A. $13ms^{-1}$ and $14ms^{-1}$

B. $14ms^{-1}$ and $15ms^{-1}$

C. $15ms^{-1}$ and $16ms^{-1}$

D. $16ms^{-1}$ and $17ms^{-1}$

Answer:

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88. A man of 50 kg standing in a gravity free space at a height of 10 m above the floor. he throws a stone of 0.5 kg mass downwards with a speed of $2ms^{-1}$. when the stone reaches the floor the distance of the man above the floor will be

A. 9.9m

B. 10m

C. 10.1m

D. 20m

Answer:

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89. Plot the graph of g w.rt. distance from centre of earth

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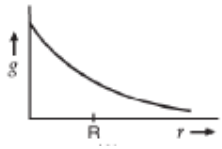
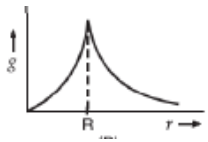
90. The dependence of the acceleration due to gravity g distance r from the centre of the earth, assumed to be a sphere of radius R of uniform density is as shown below: Find the correct graph

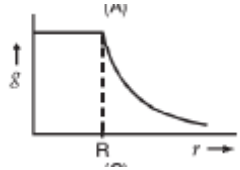
A.



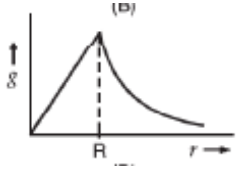
B.



C.



D.



Answer:

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91. A particle is projected vertically upward from the ground. It crosses two paints P and Q, which are separated by h. Time taken to move from the point P and then back to P is t_p and from the point Q and then back to Q is t_q Find the value of g in terms of t_p, t_q and h.

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92. A particle of mass M is situated at the centre of a spherical shell of the same mass

and radius a. The gravitational potential at a point situated at a/2 distance from the centre, will be

A. $\frac{GM}{a}$

B. $\frac{2GM}{a}$

C. $\frac{3GM}{a}$

D. $\frac{4GM}{a}$

Answer:

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93. A particle of mass m is thrown upwards from the surface of the earth, with a velocity u. The mass and the radius of the earth are, respectively, M and R. G is gravitational constant and g is acceleration due to gravity on the surface of the earth. The minimum value of u, so that the particle does not return back to earth is

A. $\sqrt{2G\frac{M}{R^2}}$

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

C. $\sqrt{2g\frac{M}{R}}$

D. $\sqrt{2gR^2}$

Answer:

Watch Video Solution

94. The additional kinetic energy to be provided to a plate of mass m revolving around a planet of mass M to transfer it from a circular orbit of radius R_1 to R_2 ($R_1 > R_2$) is

A. $GMm\left(\frac{1}{R_1^2} - \frac{1}{R_2^2}\right)$

B. `GMm(1/R_1 - 1/R_2)

C. $2GMm\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

D. $\frac{GMm}{2}\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

Answer:

Watch Video Solution

95. All the known planets revolve in

A. straight path

B. circular path

C. elliptical path

D. hyperbolic path

Answer:

Watch Video Solution

96. Show that Kepler's second law follows from the law of conservation of angular momentum.

A. Newton's first law

B. Newton's second law

C. special theory of relativity

D. conservation of angular momentum

Answer:

Watch Video Solution

97. The radius vector, drawn from the sun to a planet sweeps out equal areas in equal times. This is the statement of

A. Kepler's first law

B. Kepler's second law

C. Kepler's third law

D. Newton's third law

Answer:

Watch Video Solution

98. 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 the orbital speed of earth.

D. proportional to distance from the earth.

Answer:

Watch Video Solution

99. For a planet moving around the sun in an elliptical orbit of semi-major and semi-minor axes a and b respectively and period T

A. the torque acting on the planet about the sun is non zero

B. the angular momentum of the planet about the sun is constant.

C. the planet moves with a constant speed around sun.

D. the areal velocity is a $\pi a \frac{b}{T}$

Answer:

Watch Video Solution

100. The force of gravitation may be attractive or repulsive. (T or F)

A. repulsive

B. electrostatic

C. conservative

D. non-conservative

Answer:

 Watch Video Solution

101. Which of the following is an evidence to show that there must be a force acting on earth and directed towards the sun ?

A. Deviation of the falling bodies towards east.

B. Revolution of the earth round the sun

C. Phenomenon of day and night

D. Apparent motion of sun round the earth.

Answer:

Watch Video Solution

102. A man waves his arms, while walking. This is

A. to keep constant velocity

B. to ease the tension

C. to increase the velocity.

D. to balance the effect of earth's gravity.

Answer:

Watch Video Solution

103. Two spheres of same size, one of mass 2 kg and another of mass 4 kg are dropped simultaneously from the top of Qutab minar (height 72 km), When they are 1 m above the ground, the two spheres have the same

A. momentum

B. kinetic energy

C. potential energy

D. acceleration

Answer:

Watch Video Solution

104. A particle is thrown vertically upwards with a velocity of $4ms^{-1}$. The ratio of its accelerations after 1 s and 2s of its motion is

A. 1

B. 2

C. 4.9

D. 9.8

Answer:

Watch Video Solution

105. A body is thrown vertically upwards with a velocity of $19.6ms^{-1}$ The position of the body after 4s will be

A. at the highest point

B. at the starting point

C. at the mid point of the line joining the starting point and the highest point

D. none of these.

Answer:

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106. A parachutist after bailing out falls 50 m without friction When parachute opens, he descends at 2 ms and reaches the ground with a speed of 3 m l At what height did he bailout ?

A. 91m

B. 111m

C. 293m

D. 182m

Answer:

Watch Video Solution

107. Two planets of radii r_1, and r_2, are made from the same material. The ratio of the acceleration of gravity $\frac{g_1}{g_2}$ at the surfaces of the planets

A. $\frac{r_1}{r_2}$

B. $\frac{r_2}{r_1}$

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

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

Answer:

Watch Video Solution

108. If mass of a body is M on the earth surface, then the mass of the same body on the moon surface is

A. $\frac{M}{6}$

B. 0

C. M

D. none of these

Answer:

Watch Video Solution

109. If the radius of earth shrinks by one percent and its mass remaining the same,

then acceleration due to gravity on the earth's surface will

A. decrease

B. increase

C. remain constant

D. decrease or remain constant

Answer:

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110. At what depth below the surface of the earth, is the value of g same as that of a height of 5 km?

A. 10km

B. 7.5km

C. 5km

D. 2.5km

Answer:

Watch Video Solution

111. A body weighed 250 N on the surface assuming the earth to be a sphere of uniform mass density, how much would it weigh half way down to the centre of earth?

A. 240 N

B. 210 N

C. 195 N

D. 125 N

Answer:

Watch Video Solution

112. If the earth were to cease rotating about its own axis, the increase in the value of g in C.G.S. system at a place of latitude 45° will be

A. 0.34

B. 1.68

C. 2.68

D. 3.36

Answer:

Watch Video Solution

113. The angular velocity of rotation of a star (of mass M and radius R), at which the matter starts to escape from its equator, is

A. $\sqrt{2G\frac{M}{R^3}}$

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

C. $\sqrt{2G\frac{R}{M}}$

D. $\sqrt{2G\frac{M^2}{R}}$

Answer:

Watch Video Solution

114. Knowing that mass of moon is $\frac{M}{81}$ (where M is the mass of earth), find the distance of the point, where gravitational field due to earth and moon cancel each other. Given that the distance between the earth and moon is 60 R, where R is the radius of earth.

A. 2R

B. 4R

C. 6R

D. 8R

Answer:

Watch Video Solution

115. Two masses M_1 and M_2 are initially at rest at infinite distance apart. They approach each other due to gravitational interaction. Find their speed of approach at the instant, when they are distance rapart.

A. $\sqrt{\frac{2G(m_1 - m_2)}{r}}$

B. $\sqrt{\frac{2G(m_1+m_2)}{r}}$

C. $\sqrt{\frac{r}{Gm_1m_2}}$

D. $\sqrt{\frac{Gm_1m_2}{r}}$

Answer:

Watch Video Solution

116. The velocity with which a projectile, must be tired so that it escapes earth's gravitation, does not depend on :

A. mass of the earth

B. mass of the projectile

C. radius of the projectile's orbit

D. gravitational constant.

Answer:

Watch Video Solution

117. The escape velocity of a particle of mass m varies directly as

A. m^2

B. m

C. m^0

D. m^{-1}

Answer:

Watch Video Solution

118. The escape velocity for a body projected vertically upwards from the surface of earth is $11kms^{-1}$. If the body is projected at an angle

of 45° with the vertical, the escape velocity will be

A. $11.2 kms^{-1}$

B. $11.6 kms^{-1}$

C. $12.8 kms^{-1}$

D. $16.2 kms^{-1}$

Answer:

Watch Video Solution

119. The mass of moon is $\frac{1}{81}$ of earth's mass and its radius $\frac{1}{4}$ of that of earth. If the escape velocity from the earth's surface is $11.2 kms^{-1}$, its value for the moon is

A. $0.14 kms^{-1}$

B. $0.76 kms^{-1}$

C. $2.45 kms^{-1}$

D. $5.28 kms^{-1}$

Answer:

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120. The escape Velocity from the earth is $11.2K\frac{m}{s^{-1}}$. The escape Velocity from a planet having twice the radius and the same mean density as the earth, is :

A. $22.4kms^{-1}$

B. $11.2kms^{-1}$

C. $5.8kms^{-1}$

D. $15kms^{-1}$

Answer:

Watch Video Solution

121. There is no atmosphere on the moon, because

A. it is closer to the earth and also it has the inactive inert gases in it.

B. it is too far from the sun and has very low pressure in its outer surface

C. escape velocity of gas molecules is greater than their root mean square velocity.

D. escape velocity of gas molecules is less than their root mean square velocity.

Answer:

 Watch Video Solution

122. A missile is launched with a velocity less than the escape velocity. The sum of its kinetic and potential energies is:

A. zero

B. negetive

C. positive

D. first zero and then negetive

Answer:

 Watch Video Solution

123. 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 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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124. A satellite of the earth is revolving in a circular orbit with a uniform speed v. If the

gravitational force suddenly disappears, the satellite will

A. continue to move with velocity v along the original orbit.

B. move with a velocity v tangentially to the original orbit

C. fall down with increasing velocity

D. ultimately come to rest, somewhere on the original orbit

Answer:

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125. Two satellites of masses m_1 and m_2 ($m_1 > m_2$) are revolving around earth in circular orbits of radii r_1 and r_2 ($r_1 > r_2$) respectively. Which of the following statements is true about their velocities?

A. $v_1 = v_2$

B. $v_1 / r_1 = v_2 / r_2$

C. $v_1 > v_2$

D. $v_1 < v_2$

Answer:

Watch Video Solution

126. If v be the orbital velocity of a satellite in a circular orbit close to the earth's surface and v_e is the escape velocity from the earth, then relation between the two

A. $v_e = v$

B. $v_e = \sqrt{2}v$

C. $v_e = \sqrt{3}v$

D. $v_e = 2v$

Answer:

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127. A satellite is in an orbit around the earth.

If its kinetic energy is doubled, then

A. it will escape out of earth's gravitational field.

B. it will maintain its path

C. it will fall on the earth.

D. it will rotate with a great speed.

Answer:

Watch Video Solution

128. An 80 kg person is parachuting and is experiencing a downward acceleration of $2.8ms^{-2}$. The mass of the parachute is 5 kg. The upward force on the open parachute is

A. 456 N

B. 595 N

C. 675 N

D. 925 N

Answer:

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129. Assertion The stars twinkle, while the planets do not. Reason: The stars are much bigger in size than the planets.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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130. Assertion: A planet is a heavenly body revolving round the sun. Reason: Star is a self-luminous body made of gaseous material.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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131. Assertion: The comets do not obey Kepler's laws of planetary motion Reason: The comets do not have elliptical orbits

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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132. Assertion: The square of the period of revolution of a planet is proportional to the cube of its distance from the sun. Reason: Sun's gravitational field is inversely

proportional to the square of its distance from the planet.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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133. Assertion: If the radius of the earth's orbit around the sun were twice its present value, the number of days in a year would be 1,032 days Reason: According to Kepler's law of periods. $T^2 \propto r^3$

A. A. if both assertion and reason are true and reason is the correct explanation of

the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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134. Assertion: The earth is slowing down and as a result the moon is coming nearer to it. Reason: The angular momentum of the earth moon system is not conserved.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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135. Assertion: The length of the day is slowly increasing Reason: The dominant effect causing a slow down in the rotation of the earth is the gravitational pull of other planets in the solar system.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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136. Assertion: The mass of the earth in terms of g, Rand G is given by M=$g\frac{R^2}{G}$ The acceleration due to gravity on the surface of the earth is given by g=$G\frac{M}{R^2}$

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of

the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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137. The change in the value of g at a height h $h << R$ above the surface of the earth is the same as at a depth d= 2h below the surface of earth Reason: The value of g at a

height is given by $g' = g\left(1 - \left(2\frac{h}{R}\right)\right)$ and the value of g at a depth d is given by $g' = g\left(1 - \left(\frac{d}{R}\right)\right)$

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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138. Assertion: A tennis ball bounces higher on hills than in plains Reason: The acceleration due to gravity on the hill is greater than that on the surface of the earth.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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139. Assertion: Average density of the earth depends on the value of g Reason: It is because, the density is the ratio of the mass of the earth to its volume.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of

the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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140. Assertion: The earth without its atmosphere would be inhospitably cold. Reason: All heat would escape in the absence of atmosphere.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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141. Assertion: The time period of an earth satellite in a circular orbit is independent of the mass of the satellite Reason: The time period of an earth satellite in a circular orbit of radius ris given by $T = 2\pi\sqrt{r^3/(GM)}$

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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142. Assertion: The geostationary satellites are launched, so as to revolve from west to east in an orbit concentric and coplanar with the equitorial plane and with a period of 24 h. Reason: These are pre-requisites for a satellite to appear stationary.

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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143. Assertion: The time-period of pendulum on a satellite orbiting the earth is infinity. Reason: Time-period of a pendulum is inversely proportional to $\sqrt{g}$

A. A. if both assertion and reason are true and reason is the correct explanation of the assertion

B. B. if both assertion and reason are true but reason is not correct explanation of the assertion

C. C. if assertion is true, but reason is false

D. D. if both assertion and reason are false

Answer:

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144. A planet of mass m moves around the sun of mass M in elliptical orbit. The maximum and minimum distances of the planet from the sun are r_1 and r_2 respectively. The time period of the planet is proportional to

A. $(r_1 - r_2)^{\frac{3}{2}}$

B. $(r_1 + r_2)^{\frac{3}{2}}$

C. $(r_1)^{\frac{3}{2}}$

D. $(r_1)^{\frac{2}{5}}$

Answer:

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145. The duration of day is highest in :

A. mercury

B. earth

C. venus

D. mars

Answer:

Watch Video Solution

146. A ball is thrown upwards with a velocity of $100ms^{-1}$. It will reach the ground after

A. 40s

B. 10 s

C. 20 s

D. 5s

Answer:

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147. A ball is thrown upwards with a velocity of $19.6ms^{-1}$. The maximum height attained by the ball is

A. 9.8 m

B. 19.6 m

C. 15.8 m

D. 29.2 m

Answer:

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148. What would be the acceleration due to gravity at another planet, whose mass and radius are twice that of the earth?

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

B. g

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

D. 2g

Answer:

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149. If a planet existed whose mass and radius were both half of that of the eawrth. What would be the acceleration due to gravity at

the surface of the planet in terms of that on the surface of the earth?

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150. When the radius of earth is reduced by 1 % without changing the mass, then change in the value of acceleration due to gravity will be:

A. increased 2 %

B. increased 1%

C. decreased 1.5%

D. decreased 1%

Answer:

Watch Video Solution

151. The mass of the planet is $\frac{1}{9}$th of the mass of the earth and its radius is half that of the radius of the earth. If a body weighs 450 N on the earth, what will be its weight on the planet?

A. 100N

B. 150N

C. 200N

D. 400N

Answer:

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152. A body weighs 700 N on earth. What will be its weight on a planet having $\frac{1}{7}$th of earth's mass and half of earth's radius?

A. 100N

B. 300N

C. 200N

D. 400N

Answer:

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153. At what height above the earth surface, the acceleration due to gravity will be half that

on the surface of earth ? Suppose R is the radius of earth.

A. 3,200 km

B. 2,650 km

C. 3,050 km

D. 2,500 km

Answer:

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154. Assume earth to be a sphere of a uniform density, What is the value of gravitational acceleration in a mine 100 km below the earth's surface ? Given, R = 6,400 km.

A. $3.9ms^{-2}$

B. $7.75ms^{-2}$

C. $9.65ms^{-2}$

D. $5.25ms^{-2}$

Answer:

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155. What will be the weight of a body at the centre of the earth?

A. zero

B. infinite

C. same as on the surface of earth

D. None of the above.

Answer:

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156. If we move from equator to pole, the value of acceleration due to gravity:

A. first increases then decreases

B. remains same

C. increases

D. decreases

Answer:

Watch Video Solution

157. At what angular velocity would the earth have to rotate so that bodies at the equator became weightless? The density of the earth is $5600 kgmetre^{-3}$ and the universal gravitational constant is $6.67 \times 10^{-11} Nm^2 kg^{-2}$

A. 1.25×10^{-3}

B. 1.5×10^{-3}

C. 1.56

D. 0.125

Answer:

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158. If the spinning speed of the earth is increased, then weight of the body at the equator:

A. does not change

B. decreases

C. doubles

D. increases

Answer:

Watch Video Solution

159. The speed of earth's rotation about its axis is ω. Its speed is increased to x times to make the effective acceleration due to gravity equal to zero at the equator. Then, x is:

A. 1

B. 8.5

C. 17

D. 34

Answer:

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160. If the gravitational force had varied as $r^{-5/2}$ instead of r^{-2},the potential energy of a particle at a distance 'r' from the centre of the earth would be directly proportional to

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

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

C. r^{-2}

D. r^{-1}

Answer:

Watch Video Solution

161. An artificial satellite is moving in a circular orbit around the earth with aspeed equal to half the magnitude of escape velocity from the

earth. Determine the height of the satellite above the earth's surface.

A. $R/2$

B. $R/4$

C. 2R

D. R

Answer:

Watch Video Solution

162. A bomb explodes on the moon. How long will it take for the sound to reach the earth ?

A. 10s

B. 1000s

C. 2day

D. will never reach

Answer:

Watch Video Solution

163. The distance of a geostationary satellite from the centre of earth (radius R = 6,400 km) is nearest to :

A. 18 R

B. 10 R

C. 7 R

D. 5 R

Answer:

Watch Video Solution

164. A satellite in a circular orbit of radius R has a period of 4 h. Another satellite with orbital radius 3 R around the same planet will have a period (in hour)

A. 4

B. 16

C. $8\sqrt{2}$

D. $12\sqrt{3}$

Answer:

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165. A satellite of mass m is moving in a circular orbit at a distance R above the surface of a planet of mass M and radius R. The amount of work done to shift the satellite to a higher orbit at a distance 2 R above the surface of the planet is:

A. `(MmgR)/(M+m)

B. `(MmgR)/6(M+m)

C. $mg\frac{R}{6}$

D. mgR

Answer:

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166. For a satellite moving in an orbit around the earth, the ratio of kinetic energy to potential energy is:

A. 2

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

C. $\sqrt{2}$

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

Answer:

Watch Video Solution

167. The ratio of energy required to raise a satellite to a height h above the earth's surface to that required to put it into the orbit is:

A. h:2R

B. 2h:R

C. R:h

D. h:R

Answer:

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168. A satellite of mass m is circulating around the earth with constant angular velocity. If the radius of the orbit is R and mass of the earth

is M, the angular momentum about the centre if earth is

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

B. $M\sqrt{GmR}$

C. $m\sqrt{G\frac{M}{R}}$

D. $m\sqrt{GMR}$

Answer:

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169. The time period of a simple pendulum in a satellite is

A. same as on earth

B. infinity

C. unity

D. zero

Answer:

 Watch Video Solution

170. The weightlessness in a satellite is due to the centre of the earth is:

A. zero gravitational acceleration

B. zero acceleration

C. zero mass

D. none of these

Answer:

Watch Video Solution

171. A marble A is dropped vertically. Another identical marble is projected horizontally from the same point at the same instant.

A. A will reach the ground earber than B

B. B will reach the ground earlier than A

C. Both A and B will reach the ground at the same instant

D. None of the above.

Answer:

Watch Video Solution

172. If the radius of earth shrinks by one percent and its mass remaining the same, then acceleration due to gravity on the earth's surface will

A. would decrease

B. would remain unchanged.

C. would increase

D. cannot be predicted

Answer:

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173. A double star system consists of two stars A and B which have time periods T_A and T_B radii R_A and R_B and masses M_A and M_B. Choose the correct option:

A. If $T_A > T_B$, then $R_A > R_B$

B. If $T_A > T_B$, then $M_A > M_B$

C. $(T_A/T_B)^2 = (R_A/R_B)^3$

D. $T_A = T_B$

Answer:

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174. Imagine a light planet revolving around a very massive star in circular orbit of radius R with a period of revolution T. If the gravitational force of attraction between the planet and the star is proportional to $R^{-\frac{5}{2}}, then$T^2` is proportional to

A. R^3

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

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

D. $R^{\frac{15}{4}}$

Answer:

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

A. 64.5

B. 12

C. 182.5

D. 730

Answer:

Watch Video Solution

176. If g is the acceleration due to gravity on the earth's surface, what will be the gain in the potential energy of an object of mass m raised

from the surface of the earth to a height equal to twice the radius of the earth?

A. $mg\frac{R}{2}$

B. $2mgR$

C. mgR

D. $mg\frac{R}{4}$

Answer:

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177. The magnitudes of gravitational field at distances r_1, and r_2 from the centre of a uniform sphere of radius R and mass M are F_1 and F_2 respectively. Then,

A. $F_1/F_2 = r_1/r_2$ if $r_1 < R$ and $r_2 < R$

B. $F_1/F_2 = r_2^2/r_1^2$ if $r_1 > R$ and $r_2 > R$

C. $F_1/F_2 = r_1/r_2$ if $r_1 > R$ and $r_2 > R$

D. $F_1/F_2 = r_1^2/r_2^2$ if $r_1 < R$ and $r_2 < R$

Answer:

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Watch video solution

178. A missile is launched with a velocity less than the escape velocity. The sum of its kinetic and potential energies is:

A. Positive

B. Negative

C. Zero

D. Maybe positive or negative depending upon its initial velocity

Answer:

Watch Video Solution

179. There is no atmosphere on the moon, because

A. it is closer to the earth.

B. it revolves round the earth.

C. it gets light from the sun.

D. the escape velocity of gas molecules is lesser than their rms velocity here

Answer:

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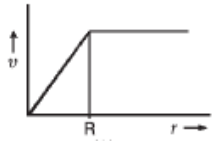
180. A spherically symmetric gravitational system of particles has a mass density $\rho = \begin{cases} \rho_0 & r \leq R \\ 0 & r > R \end{cases}$ where ρ_0 is a constant. A test mass can undergo circular motion under the influence of the gravitational field of

particles. Its speed as a function of distances r

(`0

A.



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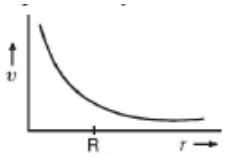

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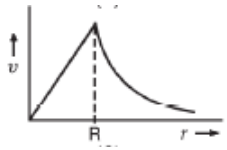
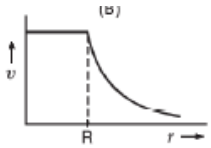


D.



Answer:

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181. The radii of circular orbits of two satellites A and B of the earth are 4 R and R respectively. If the speed of satellite A is 3 u, then the speed of satellite B will be

A. 12v

B. 6v

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

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

Answer:

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182. 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 magnitude.

Answer:

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183. A geostationary satellite is orbiting the earth at a height 6 R above the surface of earth, where R is the radius of the earth. The time period of another satellite orbiting at the

height 2.5 R from the surface of the earth will be approximately :

A. $6\sqrt{2}$ hours

B. $6\sqrt{3}$ hours

C. 6 hours

D. 10 hours

Answer:

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184. A geostationary satellite orbits around the earth in a circular orbit of radius 36000km. Then, the time period of a spy satellite orbiting a few hundred kilometers above the earth's surface will approximately be (Given: Radius ofEarth =6400 km)

A. $\left(\frac{1}{2}\right)h$

B. 1h

C. 2h

D. 4h

Answer:

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185. A satellite is moving with a constant speed v in circular orbit around 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 ejection, the kinetic energy of the object is

A. $\left(\frac{1}{2}\right)mv^2$

B. mv^2

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

D. $2mv^2$

Answer:

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186. Which of the following quantities remain constant during their motion in elliptical orbits as seen from the sun ?

A. speed

B. angular speed

C. kinetic energy

D. angular momentum

Answer:

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187. Kepler's second law regarding constancy of aerial velocity of a planet is a consequence of the law of conservation of

A. energy

B. angular momentum

C. linear momentum

D. none of these.

Answer:

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188. The force keeping the planets in elliptical orbit is

A. electrostatic force

B. nuclear force

C. gravitational force

D. magnetic force.

Answer:

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189. Gravitational attraction separated by 1 m will be

A. 6.67×10^{-9} N

B. 6.67×10^{11} N

C. 6.67×10^{-13} N

D. none of the above

Answer:

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190. the gravity is measured in

A. N

B. kg

C. Nkg^{-1}

D. $Nkg^{-2}m^{-2}$

Answer:

Watch Video Solution

191. The mass of the moon is about 1.2% of the mass of the earth. Compared to the gravitational force the earth exerts on the

moon, the gravitational force the moon exerts on the earth

A. is the same

B. is greater

C. is smaller

D. varies with its phase.

Answer:

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192. Two bodies of masses m_1 and m_2 fall from height h_1 and h_2 respectively. The ratio of their velocities, when they hit the ground is

A. h_1 / h_2

B. $\sqrt{h_1 / h_2}$

C. h_1^2 / h_2^2

D. $m_1 h_1 / m_2 h_2$

Answer:

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193. The total vertical distance covered by a freely falling body in a given time is directly proportional to

A. product of time and acceleration due to gravity

B. square of acceleration due to gravity

C. square of time.

D. time

Answer:

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194. A ball takes t second to fall from a height h_1, and 2 t seconds to fall from a height h_2. Then h_1 / h_2, is

A. 0.25

B. 0.5

C. 2

D. 4

Answer:

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195. g_1 and g_2 denote acceleration due to gravity on the surface of the earth and on a planet, whose mass and radius are twice that of the earth. Then,

A. $g_1 = g_2$

B. $g_1 = 2g_2$

C. $2g_1 = g_2$

D. $g_1 = 2g_2^2$

Answer:

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196. Force of gravitational attraction is least

A. at the equator

B. at the poles

C. at a point in between equator and any pole.

D. None of the above.

Answer:

Watch Video Solution

197. The weight of the body at earth's surface is W. At a depth half way to the centre of the earth, it will be (assuming uniform density in earth).

A. W

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

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

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

Answer:

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198. The change in the value of g at a heighth above the surface of the earth is the same as at a depth d below the surface of earth. When both d and h are much smaller than the radius of earth, then which one of the following is correct?

A. x=h

B. $x = h^2$

C. x=2h

D. $x = h/2$

Answer:

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199. If the earth stops rotating, the value of g at the equator will

A. increase

B. decrease

C. remain same

D. None of the above.

Answer:

Watch Video Solution

200. What is the unit of intensity of gravitational field?

A. Centre of the earth

B. Equator

C. Poles

D. Same everywhere

Answer:

Watch Video Solution

201. A body of mass m rises to a height $h = \frac{R}{5}$ from the surface of earth, where R is radius of earth. If g is acceleration due to

gravity at earth's surface, the increase in potential energy is

A. mgh

B. $\frac{4}{3}mgh$

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

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

Answer:

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202. A body falls freely under gravity. If its speed is v, when it has lost an amount U of gravitational potential energy, then its mass is

A. $2\frac{U}{v^4}$

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

C. $\frac{U}{v^6}$

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

Answer:

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

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

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

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

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

Answer:

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204. The unit of gravitational potential is

A. J

B. kg

C. J kg

D. Jkg^{-1}

Answer:

Watch Video Solution

205. Let V and E denote the gravitational potential and gravitational field at a point. It is possible to have

A. V=0 and E=0

B. V=0 and $E \neq 0$

C. $V \neq 0$ and E=0

D. all of above

Answer:

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206. The magnitude of gravitational potential of the earth-moon system is U with zero potential energy at infinite separation. The kinetic energy of the moon w.rt. the earth is T.

A. $U < T$

B. $U > T$

C. U = T

D. none of the above.

Answer:

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207. The gravitational potential energy of a body of a body at a distance r from the centre of earth is U. What will be its weight at that distance?

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

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

C. Ur^2

D. Ur

Answer:

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208. The escape velocity of a body

A. increases with increase in the mass of the body.

B. decreases with increase in the mass of the body

C. is independent of the mass of the body

D. is independent of the mass of the earth

Answer:

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209. Escape velocity of a body of mass 1 kg from the earth's gravitational field is $11.0kms^{-1}$(approx). Escape velocity of 10 kg weight under same condition is

A. $11.0kms^{-1}$

B. $1.10kms^{-1}$

C. $110kms^{-1}$

D. zero

Answer:

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210. The escape velocity from the earth's surface is $11.0kms^{-1}$. A certain planet has a radius twice that of the earth but its mass is

the same as that of the earth. The value of the escape velocity from this planet would be

A. $11.0 kms^{-1}$

B. $22 kms^{-1}$

C. $5.5 kms^{-1}$

D. $7.78 kms^{-1}$

Answer:

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211. The ratin of the radii of the two planets is k and the ratio of the acceleration due to gravity on them is s. What would be the ratio of escape velocities from these planets?

A. ks

B. $\sqrt{ks}$

C. $\sqrt{\frac{k}{s}}$

D. $\sqrt{\frac{s}{k}}$

Answer:

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212. The atmosphere is held to the earth by

A. winds

B. clouds

C. gravity

D. the rotation of earth

Answer:

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213. Which of the following statement is wrong about the satellite of earth

A. It is freely falling

B. It is not accelerated.

C. It has constant speed

D. It is weightless

Answer:

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214. A small satellite is revolving near earth's orbital velocity will be nearly

A. $8kms^{-1}$

B. $11.2kms^{-1}$

C. $4kms^{-1}$

D. $6kms^{-1}$

Answer:

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215. Orbital velocity of a satellite revolving round the earth is independent of the

A. mass of the earth

B. mass of the satellite.

C. radius of the earth

D. radius of the orbit

Answer:

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216. Two particles of equal mass go around a circle of radius R under the action of their mutual gravitational attraction. The speed 'v' of each particle is :

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

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

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

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

Answer:

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Watch video solution

217. The ratio of velocity of a satellite rotating around earth in a circular orbit close to the surface of the earth to escape velocity from earth is

A. $1:1$

B. $1:2$

C. $1:\sqrt{2}$

D. $\sqrt{2}:1$

Answer:

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218. If v_e and v_o represents the escape velocity and orbital velocity of a satellite corresponding to a circular orbit of radius R ($\cong$ radius of earth), then

A. $v_e = v_0$

B. $v_e = \sqrt{2}v_0$

C. v_e and v_0 not related

D. $v_e = \frac{v_0}{\sqrt{2}}$

Answer:

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219. The time period of a satellite in a circular orbit of radius R is T. The period of another satellite in a circular orbit of radius 4 R is

A. 4T

B. 8T

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

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

Answer:

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220. For a satellite, if the time of revolution is T, then kinetic energy is proportional to

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

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

C. $\frac{1}{T^3}$

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

Answer:

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221. which of the following statement is not correct ?

A. Its height is fixed.

B. Time period of rotation is same as that of the earth.

C. Its orbital plane is inclined at a small angle to the axis of rotation of earth.

D. Direction of rotation is same as that of earth.

Answer:

222. What is the height of a geostationary satellite above the surface of the earth?

A. 3600 km

B. 30,000 km

C. 42,000 km

D. 36,000 km

Answer:

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223. For an earth satellite to be synchronous with the rotation of the earth, it should be projected to move

A. from east to west in the equitorial plane

B. from west to east in the equitorial plane

C. from north to south in polar plane

D. from south to north in polar plane

Answer:

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224. Persons sitting in artificial satellite of the earth have

A. zero mass

B. zero weight

C. certain definite weight

D. infinite weight.

Answer:

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225. A satellite is revolving round the earth and the universal gravitational constant G is stated to decrease uniformly with time. Which of the following quantity still remains constant for the satellite ?

A. radius

B. weight

C. angular momentum

D. tangential speed

Answer:

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226. A satellite is orbiting the earth close to its surface. A particle is to be projected from the satellite to just escape from the earth. The escape velocity from the earth is v_e. Its speed v w.rt. the satellite

A. $v < v_e$

B. $v > v_e$

C. $v = v_e$

D. will depend on direction of projection.

Answer:

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227. A body is suspended from a spring balance kept in a satellite. The reading of the balance is W, when the satellite goes in an orbit of radius R and is W', when it goes in an orbit of radius 2R.

A. $W = W'$

B. $W < W'$

C. $W > W'$

D. none of the above

Answer:

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228. Consider a planet moving in an elliptical orbit around the sun. The work done on the planet by the gravitational force of the sun

A. is zero in any small part of the orbit.

B. is zero in some parts of the orbit.

C. is zero in one complete revolution

D. is zero in no part of the orbit

Answer:

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229. Weightlessness experienced, while orbiting the earth in a spaceship, is the result of

A. inertia

B. zero gravity.

C. acceleration

D. centre of gravity

Answer:

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