PHYSICS

BOOKS - MBD

GRAVITATION

Example

1. What is the difference between g and G?

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2. What is meant by acceleration due to gravity ?

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3. Which one is greater-the gravitational force of the earth on 1 kg iron or the force of gravitation applied by 1 kg on earth ?

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4. What is the value of G in SI?

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5. Who discovered universal law of gravitation?

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6. What will happen to the value of 'g' as we go below the surface of the earth?

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7. What will happen to the value of 'g' as we go above the surface of earth?

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8. Does the value of 'g' vary, as we move on the surface of earth?

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9. Gravitational force is a week force but still it is considered the most important force. Why?

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10. Why does a body becomes weightless at the centre of earth ?

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11. Why does a body becomes weightless at the centre of earth ?

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12. Define gravitational field. Give its SI unit.

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13. Why cannot we move a finger without disturbing all the stars ?

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14. What would happen if gravity suddenly disappears?

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15. Why one can jump higher on the surface of moon than on the earth?

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16. An elephant and an ant are to be projected far away into space. Do we need different velocities for their projection?

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17. How do we choose zero level of gravitational potential energy?

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18. What does values of escape velocity indicate?

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

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20. What is the value of 'g' and 'G' at the centre of earth?

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21. What is communication satellite ?

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22. Does the speed of a sattellite remain constant in a particular orbit.

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23. What is a parking orbit?

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24. What is geostationary satellite? Calculate height of geostationary satellite.

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25. What is the full form of geostationary satellite "APPLE"?

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26. Name India's first astronaut.

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27. Give two uses of polar satellite.

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28. Give two uses of geostationary satellite.

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29. What is weightlessness?

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30. An artificial satellite is revolving around the earth without using any fuel. On the other hand an aeroplane requires fuel to fly. Why?

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31. 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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32. 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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33. 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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34. Choose the correct alternative

A. Acceleration due to gravity increase/decreases with increasing altitude.

B. Acceleratino due to gravity increases/decreases with increasing depth (assume the earth to be a sphere of uniform density).

C. Acceleration due to gravity is independent of the mass of the Earth/mass of the body.

D. The formula - GM $m(1/r_2 - 1/r_1)$ is more/less accurate than the formula mg $(r_2 - r_1)$ for the difference of potential energy between two points r_1 and r_2 distance away from the centre of the Earth.

Answer:

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35. 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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36. 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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37. 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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38. 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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39. Does the escape speed of a body from the earth depend on:- the mass of the body

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40. Does the escape speed of a body from the earth depend on:- the location from where it is projected,

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

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

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

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

A. swollen feet

B. swollen face

C. headache

D. orientational problem

Answer:

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50. 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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51. 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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52. 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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53. 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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54. 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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55. 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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56. 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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57. 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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58. 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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59. 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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60. 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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61. 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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62. 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 = 2.28 x10^8 km, G = 6.67xx10^-11 N m^2 kg^-2`.

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63. 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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64. The earth is an approximate sphere. If the interior containedmatter which is not of the same density everywhere, then on the surface of the earth, the acceleration due to gravity.

A. will be directed towards the centre but not the ame everywhere.

B. will have the same value everywhere but not directed towards the centre.

C. will be same everywhere in magnitude directed towards the centre.

D. cannot be zero t any point.

Answer:

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65. Different points in earth are at slightly different distancesfrom the sun and hence experience different forces due to gravitation. For a rigid body, we know that if various forces act at various points in it, the resultant motion is as if a net force acts on the C.M. (centre of mass) causing rotation around an axis thorugh the C.M. For the

earth-sun system (approximating the earth as a uniform density sphere)

A. the torque is zero

B. thetorque causes the earth to spin

C. the rigid body result is not aapplicable since the earth is not even approximately a rigid body.

D. the torque caauses the earth to move around the sun.

Answer:

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66. Satellites orbiting the earth ahve finitelife and sometimes debris of satellitesfall to the earth. This is because

A. the solar cells and batteries in satellites run out

B. the laws of gravitation predict a trajectory spirlling inwards.

C. of viscous forces causing the speedof satellite and hence height to gradually decrease

D. of collisions with othersatellites.

Answer:

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67. Both earth andmoon are subject to the gravittional force of the sun. As observed from the sun, the orbit of the moon

A. will be ellipticl

B. will not e strictly elliptical because the total gravitational force on it is not central.

C. is not elliptical but will necessarily be a closed curve

D.

Answer: deviatesconsiderably from being elliptical due to influence of planets other than earth.

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68. In our solar system, the inter-planetary region has chunks of matter (much smaller in size compared to planets) called asteroids. They

A. will not move around the sun since they have very small mass as compared to sun

B. will move in an irregular way because of their small masses and will drift away into outer space

C. will move around the sun in closed orbits but not obey Kepler's laws.

D. will move in orbits like planets and obey Kepler's laws.

Answer:

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69. Choose the wrong option.

A. Inertial mass is a measureof difficulty of accelerating a body by an external forcewheeas the gravitational mass is relevant in determining the gravitational force on it by an external mass.

B. That the gravitational massand inertial mass are equal in an experimental result.

C. That the acceleration due to gravity on earth is the same for all bdies is due to the equality of gravitational mass and inertial mass

D. Gravitational mass of a particle like proto can depend on the resence of neghbouring heavy objects but the inertial mass cannot.

Answer:

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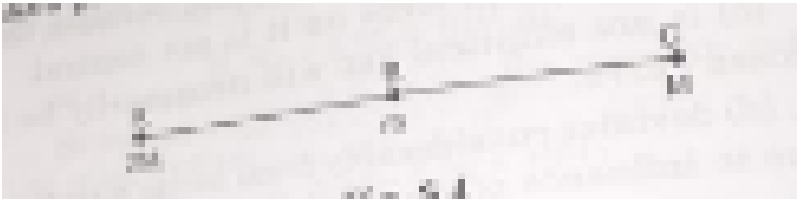
70. Particles of masses 2M, m and M ae are respectively at points A,B and C with $AB = \frac{1}{2}(BC)$. m is much-much smaller than M and at time t = 0, they are all at rest (show in the figuare) AT subsequent times before any collision

takes place.



A. m will remain at rest

B. m will move towards M

C. m will move towards 2M.

D. m will have oscillatory motion.

Answer:

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71. Which of the following options are correct?

A. Acceleration due to gravity decreases with increasing altitude

B. Acceleration due to gravity increases with increasing depth (assume the earth to be a sphere of uniform density).

C. Acceleration due to gravity is independent of the mass of the earth.

D.

Answer:

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72. If the law of gravitation, insted of being inverse-square law, becomes an inverse cube law.

A. planets will not have elliptic orbits.

B. circular orbits of planets is not possible.

C. projectile motion of a stone thrown by hand on the surface of the earth will be approximately parabolic

D. there will be no gravitational force inside a spherical shell of uniform density.

Answer:

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73. If the mass of sun were ten times smaller and gravitatinal constnat G were ten times larger in magnitudes.

A. walking on ground would became more difficult.

B. the acceleration due to gravity on earth will not change

C. raindrops will fall much faster

D. airplanes will have to travel much faster.

Answer:

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74. If the sun and the planets carried huge amounts of opposite charges.

A. all three of Kepler's laws would still be alid.

B. only the thrid law will be valid

C. the second law will not change

D. the first law will still be valid.

Answer:

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75. There have been suggested that the value of the gravitational constant G becomes smaller when

considered over very large time period (in billions of years) in the future. If that happens, for our earth.

A. nothing will change

B. we will become hotter after billions of years.

C. we will be going around but not strictly in closed orbits.

D. after sufficiently long time we will leave the solar system.

Answer:

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76. Supposing Newton's law of gravitational for gravitation fores $\overrightarrow{F}_1$ and $\overrightarrow{F}_2$ between two masses m_1 and m_2 at positions $\overrightarrow{r}_1$ and $\overrightarrow{r}_2$ read $\overrightarrow{F}_1 = -\overrightarrow{F}_2 = -\frac{\overrightarrow{r}_{12}}{r_{12}^3} GM_0^1 \left(\frac{m_1 m_2}{m_0^2}\right)^n$ where M_0 is a constant of dimension of mass. $\overrightarrow{r}_{12} = \overrightarrow{r}_1 - \overrightarrow{r}_2$ and n is a number. In such a case

A. the acceleration due to gravity on earth will be different for different objects.

B. noene of three laws of Kepler will be valid.

C. only the thrid law will become invalid.

D. for n negative, an object lighter than water will sink in water.

Answer:

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77. Which of the following are true?

A. A polar satellite goes around the earth's pole in north-south direction

B. A geostationary satellite goes around the earth in east-west direction

C. A geostationary satellite goes around the earth in west-east direction.

D. A polar satellite goes around the earth in east-west direction.

Answer:

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78. The centre of mass of an extended body on the surface of the earth and its centre of gravity

A. are alwayw at the same point for any size of the body.

B. are always at the same point for same size of the body

C. can never be at the same point

D. is close to each other for objects, say of sizes less than 100 m.

Answer:

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79. Molecules in air in the atmoshpere are attracted by gravitational force of the earth. Explain why all of them do not fall into the earth just like an apple falling from a tree.

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80. Give one example each of central force and non-central force.

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81. Draw areal velocity versus time graph for mars.

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82. What is the direction of areal velocity of the earth around the sun?

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83. How is the graitational force between two point masses affected when they are dipped in waterkeeping the separation between them the same?

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84. Is it possible for a body to have inertia but not weight.?

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85. 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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86. 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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87. The gravitational force between a hollow spherical shell (of radius R and uniform density) and a point mass is F. Show the nature of F vs r graph whee r is the distance of

the point form the centre of the hollow spherical shell of uniform density.

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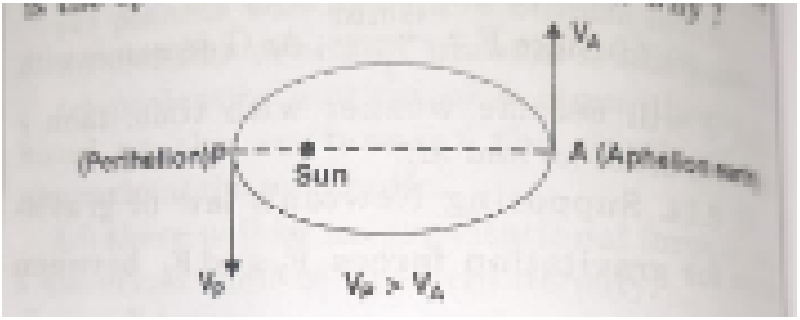
88. Out of aphelion and perihelion, where is the speed of the earth more and why?



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89. What is the angle between the equatorial plane and the orbital plane of Polar satellite?

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90. What is the angle between the equatorial plane and the orbital plane of Geostationary satellite?

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91. The difference in the elngth of a mean solar day and a sidereal day is about

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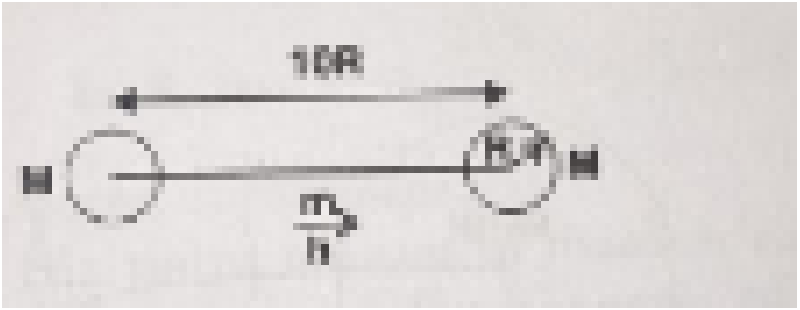
92. Two identical heavy spheres are separated by a distance 10 times their radius. Will an object placed at the mid point of the line joining their centres be in stable equillibrium or unstabel equilibrium ? Give reason for your answer.



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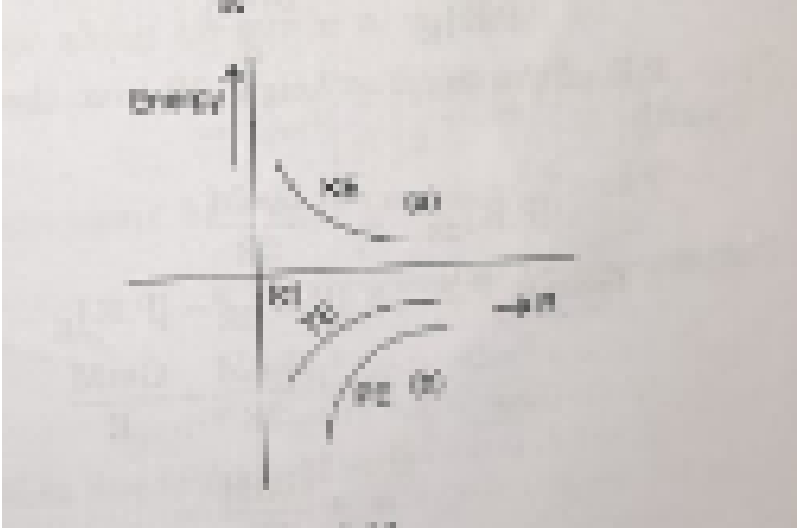
93. Show the nature of the following graph for a satellite orbiting the earth. T.E. vs orbital radius R.



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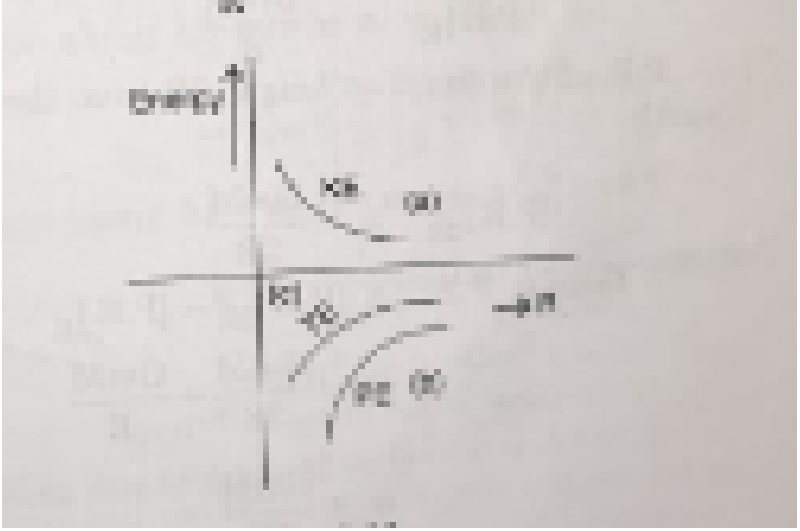
94. Show the nature of the following graph for a satellite orbiting the earth. T.E. vs orbital radius R.



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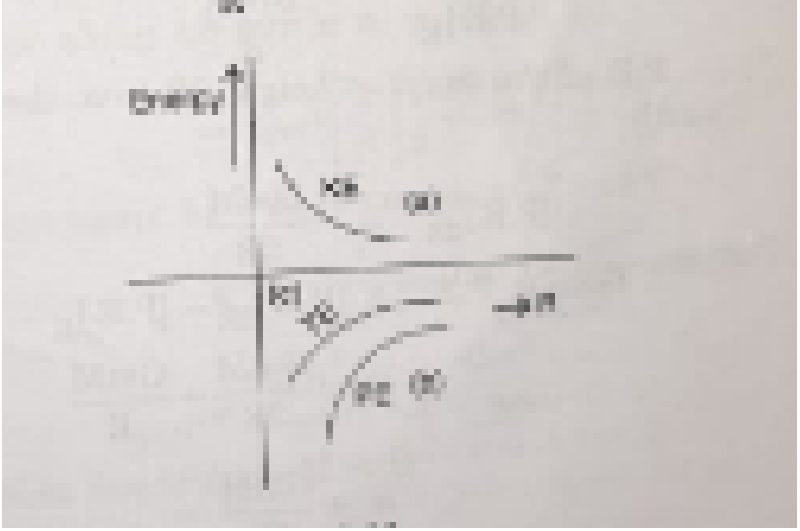
95. Show the nature of the following graph for a satellite orbiting the earth. T.E. vs orbital radius R.



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96. An object of mass m is raised from the surface of the earth to a heigt equal to the radius of the earth , that is, taken from a distance R to 2R from the centre of the earth. What is the gain in its potential energy?

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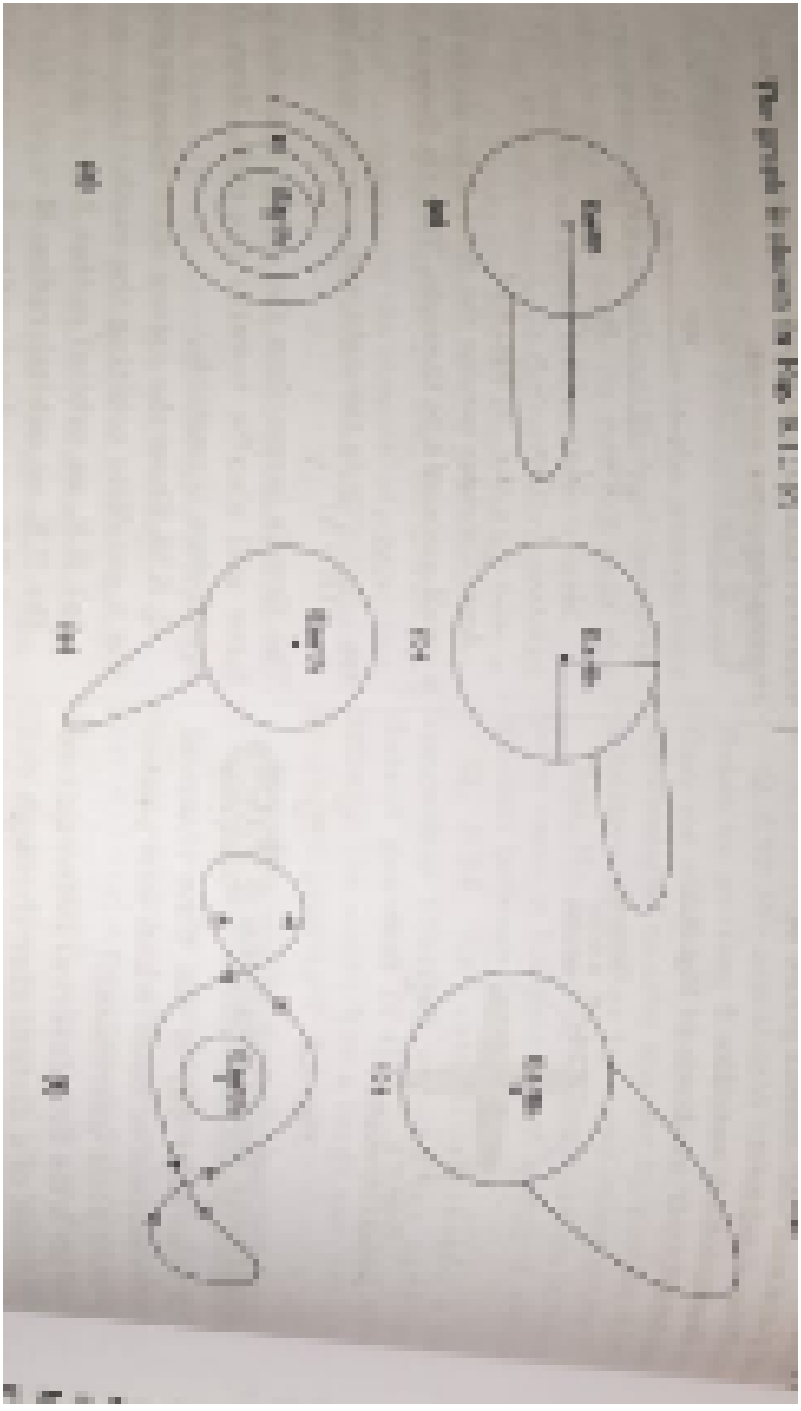
97. Shows are several curves.



Explain with reason, which ones amongest them can be possible trajectories traced by a projectile (neglect air friction).

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98. An object of mass m is raised from the surface of the earth to a heigt equal to the radius of the earth , that is, taken from a distance R to 2R from the centre of the earth. What is the gain in its potential energy?

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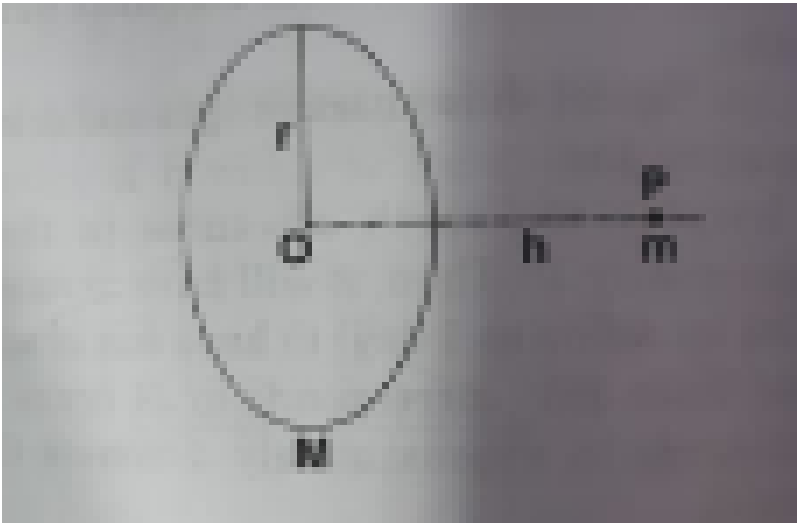
99. A mass m is placed at P a distance h along the normal through the centre O of a this circular ring of mass M and radius r (shown in the figure)



If the mass is removed further away such that OP becomes 2h, by what factor the force of gravitation will decrease, If h = r?

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100. A star like the sun has several bodies moving around it at different distances. Consider that all of them are moving in circular orbits. Let r be the distance of the body frm the centre of the star and let its linear velocity be v, angular velocity ω, kinetic energy K, gravitational potential energy U, total energy E and angular momentum p. As the radius r of the orbit increases, determine which of the above quantities increase and which one decrease.

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101. Six point masses of mass m each are at the vertices of a regular hexagon of side l. Calculate the force on any of the masses.

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102. A satellite is to be placed in equatorial geostationary orbit around earth for communication. calculate height of such a satellite. [$M = 6 \times 10^{24} kg, R = 6400 km, T = 24 h, G = 6.67 \times 10^{-11}$ SI units]

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103. A satellite is to be placed in equatorial geostationary orbit around earth for communication. Find out the minimum number of satellites that are needed to cover entire earth so that aat least one satellite is visible from any point on the equator. [

$M = 6 \times 10^{24} kg, R = 6400 km, T = 24 h, G = 6.67 \times 10^{-11}$ SI units]

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104. Earth's orbit is an ellipse with eccentricity 0.0167. Thus, earth's distance from the sun and speed as it moves around the sun varies form day to day. This mean s that the length of the solar day is not constant through the year. Assume that earth's spin axis is normal to its orbital plane and find out the length of the shortest and the longesst day. A day should be taken from noon to noon. Does this explain variation of length of the day during the year?

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105. A satellite is in an elliptic orbit around the earth with aphelion of 6R and perihelion of 2R where R = 6400 km is the radius of the earth. Find eccentricity of the orbit.

$[G = 6.67 \times 10^{-11}$ SI units and M $= 6 \times 10^{24} kg]$

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106. 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:

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107. Two planets have same density but different raddi. The acceleration due to gravity would be

A. same on both the planets

B. greater on the smaller planet

C. greater on the larger planet

D. depe3ndent of the distance of plant from the sun.

Answer:

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108. If the radius of the earth were increased by a factor of 2 keeping the mass constant, by what factors would its density have to be changed to keep g same?

A. 4

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

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

D. $\frac{1}{8}$

Answer:

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109. Two spheres of equal radius r are touching each other. The force of attra tion between them is proportional to

A. r^6

B. r^4

C. r^2

D. r^{-2}

Answer:

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110. If earth revolvesround the sun in one year. If the distance between them become double, the new period of

revolution will be

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

B. $2\sqrt{2}$ years

C. 4 years

D. 8 years

Answer:

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111. Which of the following statements is correct in respect of a geostrationary satellite?

A. It moves in a plane containing the Greenwich meridian.

B. It moves in a plane perpendicular to the celestial equatorial plane

C. Its height above the earth's surface is about the same as the radius of the earth

D. Its height above the earth's surface is about six times the radius of the earth.

Answer:

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112. Radius of the earth is 6400 km. Theradius of the orbit of a stationary satellite is about

A. 36000 km

B. 29600 km

C. 42400 km

D. Infinity

Answer:

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113. How many times is escape velocity (v_e) or orbital velocity (v_0) for a satellite revolving near earth?

A. $\sqrt{2}$ times

B. 2 times

C. 3 times

D. 4 times

Answer:

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114. 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 the three parameters (a), (b) and (c)

Answer:

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115. A satellite is orbiting round the earth at a height h above the surface of the earth. If the distance h is increased, the time period of satellite will

A. decrease

B. increase

C. emain unaffected

D. become zero

Answer:

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116. A spaceship entering the earth's atmosphere is likely to catch fire. This is due to

A. the surface tension of air

B. the viscosity of air

C. the high temperature of upper atmoshpere

D. the greater portion of oxygen in the atmoshpere at higher height.

Answer:

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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:

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118. If a satellite is orbiting the earth very close to its surface, then the orbital velocity mainly depends upon

A. the mass of the satellite only

B. the radius of the earth only

C. the orbital radius only

D. the mass of the earth only.

Answer:

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119. If g_e and g_p denote the acceleration due to gravity on the surface of earth and another planet whose mass and

radius are twice that of earth, then the ratio $\frac{g_p}{g_e}$ is

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

B. $\sqrt{2}$

C. 1

D. 2

Answer:

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120. Escape velocity on a planet is v_e, if the radius of the planet remains same and mass becomes four 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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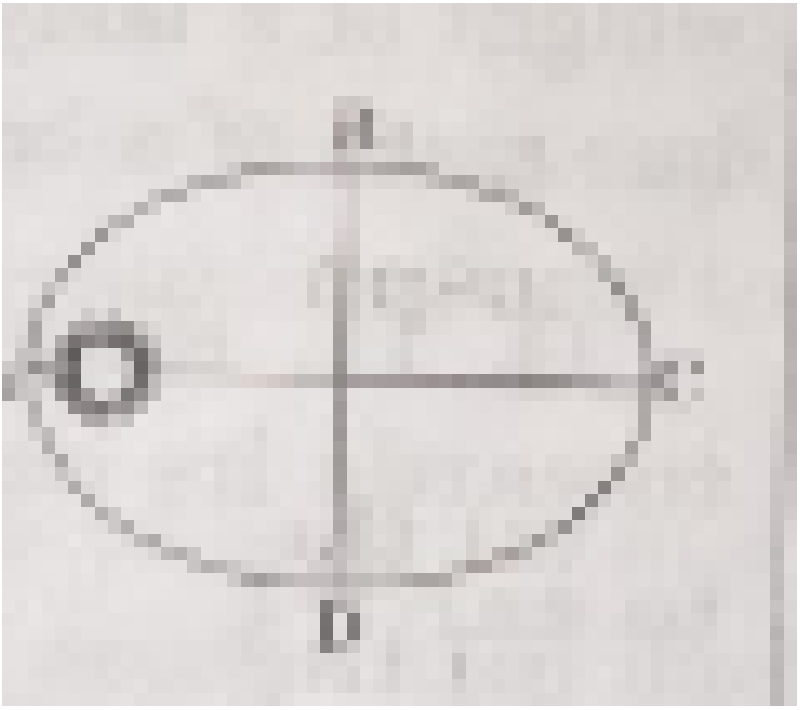
121. The earth rotates about the sun as shown int he figure is an elliptical orbit. At which point the velocity will

be maximum



A. At A

B. At B

C. At C

D. At D

Answer:

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122. If the earth suddenly shrinks to half of its present radius, the acceleration due to gravity will be

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

B. 4g

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

D. 2g

Answer:

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123. 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. Zero

C. M

D. None of these

Answer:

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124. The acceleration on the surface of earth varies

A. directly with longitude

B. directly with latitiude

C. inversely with longitude

D. inversely with latitude

Answer:

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125. The gravitation potential energy of a body (in earth's field) is minimm

A. on the surface of the earth

B. at infinity

C. below the earth's surface

D. between the earth's surface and infinity.

Answer:

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126. Gravitational mass is proportional to gravitational.

A. field

B. forces

C. intensity

D. all of these

Answer:

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127. Fill in the blanks:

_____ gave geocentric theory.

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128. Fill in the blanks:

__ is the force of attraciton betwen two material objects.

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129. Fill in the blanks:

Earth revolves around the sun in _____ orbit.

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130. Fill in the blanks:

_____ is the force of attraction between earth and any other body.

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131. Fill in the blanks:

The value of g on the surface of earth depends on the _____ and _____ of earth.

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132. What is the difference between gravity and gravitation?

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133. What is the difference between g and G?

Watch Video Solution

134. What is dimension of G?

Watch Video Solution

135. At what place on earth, the centirpetal force is maximum?

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136. What is the full form of geostationary satellite "APPLE"?

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137. According to Kepler's second law the earth travels fastest when it is closest to the sun. Is this consistent with the law of gravitation? Explain.

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138. Is the sun's gravitational pull on the earth the same in all seasons of the year ? Explain.

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139. Prove that acceleration due to gravity is independent of mass.

Watch Video Solution

140. Why is G called universal gravitational constant ?

Watch Video Solution

141. What is essential property of matter- mass or weight ?

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142. Earth is continuously pulling moon towards its centre.

Why does not moon fall on to earth?

Watch Video Solution

143. What is apogee and perigee?

Watch Video Solution

144. The astronatus on landing on moon's surface found difficulty in moving about. Explain.

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145. Why does a body becomes weightless at the centre of earth ?

Watch Video Solution

146. What is gravitational potential? What are its units and dimensions?

Watch Video Solution

147. Why gravitational force between two bodies is usually unnoticeable?

Watch Video Solution

148. Mass of a body is 20 kg at the surface of earth. AT what depth does its mass reduce to 5 kg?

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149. Distinguish between Gravitation and Gravity.

Watch Video Solution

150. Explain that gravitation has universal character.

Watch Video Solution

151. Give some evidences in support of Newton's law of gravitation?

Watch Video Solution

152. Imagine a spacecraft going from earth to the moon. HOw does its weight vary as it goes from the earth to the moon? Will there be any change in the mass?

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153. Why one can jump higher on the surface of moon than on the earth?

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154. How does earth retain its atmosphere?

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155. If g_e and g_p denote the acceleration due to gravity on the surface of earth and another planet whose mass and radius are twice that of earth, then the ratio $\frac{g_p}{g_e}$ is

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156. If earth suddenly stops rotating about its axis, what would the effect on g? Would this effect be same at all places?

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157. Is the value of 'g' at a given place same for different bodies or it is variable ?

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158. Molecules in air in the atmoshpere are attracted by gravitational force of the earth. Explain why all of them do not fall into the earth just like an apple falling from a tree.

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159. Give one example each of central force and non-central force.

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160. Does inertial mass of a body depend upon the speed of body?

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161. Are inertial mass and gravitational mass of a body different?

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

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163. Name one factor on which the period of revolution of a planet around the sun depends?

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164. Is the density of earth uniform throughout?

Watch Video Solution

165. What is escape velocity for the sun?

Watch Video Solution

166. Can gravitational potential be positive?

Watch Video Solution

167. What is the value of G in SI?

Watch Video Solution

168. Write Kepler's law in context with the motion of planets.

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169. ARea covered per unit time is called _____.

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170. Acceleration due to gravity is __ at the surface of earth.

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171. Acceleration due to gravity is _____ at the centre of earth.

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172. Maximum effect of weight of a body due to rotation of earth is at _____.

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173. Total energy of a bound system is always_____.

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174. The orbit of a geostationary satellite is called __ orbit.

Watch Video Solution

175. Earth rotates about its axis in _____ direction.

Watch Video Solution

176. The satellite that revolves in polar orbit around the earth is called a_____ satellite.

Watch Video Solution

177. Polar satellite may be called as _____ or _____ satellite.

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178. What is the importance of universal law of gravitation?

Watch Video Solution

179. Find the expression for mass of earth.

Watch Video Solution

180. Which one is greater-the gravitational force of the earth on 1 kg iron or the force of gravitation applied by 1 kg on earth ?

Watch Video Solution

181. Explain why an apple should fall down to meet the earth instaed of earth moving upwards to meet the apple, when the gravitational pull is the same in both cases.

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182. Newton's law of gravitation states that everybody exerts a gravitational force on every other body. If this is true, why for example two boys sitting in the examination hall do not move towards each other due to this force?

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183. Lighter the body, smaller will be the acceleratio with which it falls towards the earth. Is this statement true? Explain.

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184. What is an artificial satellite?

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185. Write two uses of artifical satellites.

Watch Video Solution

186. Are inertial mass and gravitational mass of a body different?

Watch Video Solution

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

Watch Video Solution

188. Discuss Cavendish torision balance to determine G.

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189. Define acceleration due to gravity. What is the value?

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

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191. Show that for same change in acceleration due to gravity, the depth to which a body is to be taken is twice the height?

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192. Show that velocity of escape is proportional to the square root of the product of acceleration due to gravity and the diameter of earth.

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193. Find the expression for escape velocity of earth.

Watch Video Solution

194. Define gravitaional field and gravitiaonal intensity.

Watch Video Solution

195. Derive an expression for energy of an orbiting satellite.

Watch Video Solution

196. Define orbital velocity. How is it related with escape velocity?

Watch Video Solution

197. A satellite of mass 'm' is revolving in a circular orbit of radius 'r' around the earth of mass M. What is the total energy of the satellite?

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198. What is geostationary satellite? Calculate height of geostationary satellite.

Watch Video Solution

199. Explain why moon has no atmosphere.

Watch Video Solution

200. What is heliocentric theory?

Watch Video Solution

201. An object of mass m is raised from the surface of the earth to a heigt equal to the radius of the earth , that is, taken from a distance R to 2R from the centre of the earth. What is the gain in its potential energy?

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202. State Keplers' laws of planetary motion.

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203. State the universal law of gravitation.

Watch Video Solution

204. Derive Newton's law of gravitation in vector form. What conclusion do you draw from this law?

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205. Find the expression for mass of earth.

Watch Video Solution

206. Derive expression to find the density of earth.

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207. How does value of acceleration due to gravity vary with altitude

Watch Video Solution

208. How does value of acceleration due to gravity vary with depth

Watch Video Solution

209. How does value of acceleration due to gravity vary with shape of earth

Watch Video Solution

210. How does value of acceleration due to gravity vary with rotation of earth?

Watch Video Solution

211. What is meant by orbital velocity ? Determine its value. Derive its time period.

Watch Video Solution

212. What is geostationary satellite? Calculate height of geostationary satellite.

Watch Video Solution

213. Are inertial mass and gravitational mass of a body different?

Watch Video Solution

214. Define gravitational potential energy. Find the expression for gravitational potential energy at any point.

Watch Video Solution

215. Define gravitational potential energy. Find the expression for gravitational potential energy at any point.

Watch Video Solution

216. Deduce an expression for potential at a point due to gravitational field.

Watch Video Solution

217. Define gravitational potential energy. Find the expression for gravitational potential energy at any point.

Watch Video Solution

218. Discuss about "beyond the solar system".

Watch Video Solution

219. Who gave theory of relativity?

Watch Video Solution

220. What is the force between two spheres weighing 40 kg each and placed 5 m apart?

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221. The radius of moon is $1.7 \times 10^6 m$ and its mass is $7.35 \times 10^{22} kg$. What is the acceleration due to gravity on the surface of moon ? Given $G = 6.67 \times 10^{-11} Nm^2 / kg^2$.

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222. If earth suddenly stops rotating about its axis, what would the effect on g? Would this effect be same at all places?

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223. At what height acceleration due to gravity is three-fourths of that at the surface of earth?

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224. There is a crater of depth $\frac{R}{100}$ on the surface of the moon (radius R). A projectile is fired vertically upwards from the crater with velocity, which is equal to theescape

velocity v from the surface of the moon. Find the maximum height attained attained by the projectile.

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225. 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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226. A satellite is launched into a circular orbit 1600 km above the surface of the earth. Find the period of revolution, the radius of the earth R = 6400 km and the acceleration due to gravity is $9.8m/\sec^2$.

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227. 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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228. If the earth be one-half its present distance from the sun, how many days will be in one year?

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Exercise

1. What is the difference between gravity and gravitation?

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2. How g and G are related?

Watch Video Solution

3. Is the density of earth uniform throughout?

Watch Video Solution

4. When a pendulum is taken to a mountain, it becomes slow, but a wrist watch controlled by a spring remains unaffected. Explain.

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5. Imagine a spacecraft going from earth to the moon. HOw does its weight vary as it goes from the earth to the moon? Will there be any change in the mass?

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

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7. Does the value of 'g' vary, as we move on the surface of earth?

Watch Video Solution

8. Establish the relation between 'g' and 'G' .

Watch Video Solution

9. Write four important properties of inertial mass.

Watch Video Solution

10. What happens to the weight of a body when it is taken to a mountain peak?

Watch Video Solution

11. State the universal law of gravitation.

Watch Video Solution

12. Prove that the force of gravitation obeys Newton's thrid law of motion.

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13. Show that intensity of gravitational field is equal to acceleration due to gravity in the field of earth.

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14. Define gravitational potential energy. Find the expression for gravitational potential energy at any point.

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