PHYSICS

BOOKS - JBD PUBLICATION

GRAVITATION

Example

1. A body is taken from the centre of the earth to the top of the mountain ,how does its weight change?

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2. Although in winter earth is closer to sun in northern hemisphere even then less heating effect of sun is felt on earth. why?

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3. What is the signifiance of negative sign in the vector form of Newton's law of gravitation?

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4. What is gravity?

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5. What is meant by acceleration due to gravity ?

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6. What is the value and dimesional formula of g?

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

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

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9. What is the value of 'g' at a height near the surface of earth?

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10. At what height value of g is zero ?

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11. If the value of acceleration due to gravity at a height of 100 km from the surface of earth is g ',then at what depth ,value of acceleration due to gravity wioll again be g'?

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

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

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14. Define escape velocty. Obtain an expression for the escape velocity of a body from the surface of earth.

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

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16. What is the direction of gravitational force betwen two particles?

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

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

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19. What is g on the moon as compared to that on earth?

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20. Two satellites A and B go round a planet in circular orbits R and 2R respectively.If the speed of satellite A is 4 v ,then what will be the speed of satellite B?

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21. Earth is continuously pulling moon towards its centre. Why does not moon fall on to earth?

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22. 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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23. Can we shield a body from gravitational effects?

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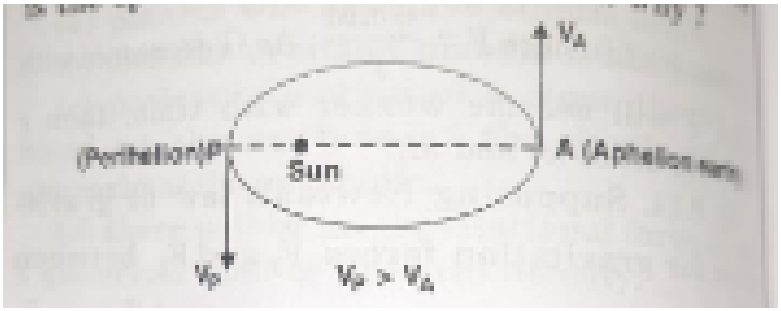
24. Out of aphelion and perihelion, where is the speed of the earth more and why?



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

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

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27. A rocket is fired with a speed of $2\sqrt{gR}$ near the surface of earth and is direceted upwards .What is the speed of the rocket in the interstellar space?

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28. Is the value of 'g' same everywhere on the surface of earth?

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29. Define escape velocty. Obtain an expression for the escape velocity of a body from the surface of earth.

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30. Why do stars appear displaced away from the sun?

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31. Why the efffect of moon is ore than that of sun on tide formation?

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32. 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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33. Why is it more advatageous to lauunch a rocket in the equatorial plane?

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34. If an earth's satellite is put in an orbit at some height h,where the resistance due the atmosphere cannot be neglected,how will the motion of the satellite be affected?

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35. A body has a sense of weightlessness in a satellite revolving round the earth.Why?

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

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37. Express the constant $k\left(= 10^{-13} s^2 m^{-3} \right)$ in days and kilometres.

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38. What is the difference between gravity and gravitation?

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39. Weighing the earth:You are given the following data : $g = 9.81ms^{-2}, R_E = 6.37 \times 10^6 m,$ the distance to the mooon $R = 3.84 \times 10^8 m$ and

the time period of moon's revoluti8n is 27.3 days.Obtain the mass of the earth M_E in two different ways.

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40. Mention some special features of Newton's law of gravitation.

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

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

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

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

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

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

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

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

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50. Which of the following symptoms is likely to afflict an astronaut in space:- orientational problem.

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51. 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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52. 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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53. 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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54. 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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55. 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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56. 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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57. 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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58. 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 ?

59. Define gravitaional field and gravitiaonal intensity.

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60. Among the known types of forces in nature,gravitational force is the weakest.Why then does it play a diminant role for motin of bodies on the terrestrial,astronomical and cosmological scale?

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61. Mention some special features of Newton's law of gravitation.

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62. Why are space rockets usually launched from west to east?

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63. 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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64. A person sitting in an artficial satellite feels weightlessness but a person sitting on moon(which is a satellite of earth) feels some weight.Explain.

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65. Why is G called universal gravitational constant ?

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

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67. A body is taken from the centre of the earth to the top of the mountain ,how does its weight change?

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68. Explain why moon has no atmosphere.

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69. It is said that you move the sky when you move figer,how?

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

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71. 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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72. Mention some special features of Newton's law of gravitation.

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73. State the necessary conditions for a satellite to appear stationary.

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74. What is an artificial satellite?

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

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76. State Keplers' laws of planetary motion.

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

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78. Explain the principle of launching of an artificil saellite.

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