



# PHYSICS

## BOOKS - MODERN PUBLICATION

### GRAVITATION

#### Exercise

1. Two point masses of 4 kg and 2 kg kept at a distance of 1m in air attract each other by a force  $F$ . These two masses are now dipped in

kerosene keeping the distance same What is the force of attraction between the masses in kerosene?



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2. The force of attraction between two point masses is proportional to the product of their masses and inversely proportional to the distance between them. (T or F)



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3. Newton's law of gravitation obeys Newton's third law. (T or F)



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



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5. Inverse square law means  $F \propto \frac{1}{r^2}$  (T or F)





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6. The force between two \_\_\_\_\_ masses is proportional to the product of their masses and inversely proportional to the square of the distance between them.



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7. The value of  $G$  is \_\_\_\_\_



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8. The force of gravity exerted by the earth on a stone is  $Gm_1m_2/r^2$  where  $r$  distance of the stone from \_\_\_\_\_ of earth.



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9. The force of gravitation between two point masses is directed along \_\_\_\_\_



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**10.** The value of  $G$  depends on the medium between the masses or the place of experiment. (T or F)



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**11.** The S.I unit of  $G$  = \_\_\_\_\_



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**12.** When a stone is thrown up, earth attract the stone but the earth does not accelerate towards the stone. (T or F)



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**13.** The force which keeps the moon revolving around earth is \_\_\_\_\_.



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**14.** What is Newton's law of gravitation? Define

G.



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**15.** Write characteristics of gravitational force.



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**16.** Find the force of attraction between two spherical bodies of mass 1 kg each and having



centre to centre distance of  $10^4\text{m}$



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17. The gravitational force between two masses is  $F$ . If the distance between the masses is doubled. What will be the new force between them.



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**18.** the gravitational force between sun and jupiter is approximately  $4 \times 10^{23}$  N. If mass of sun =  $1.99 \times 10^{30}$  kg, the mean distance of the jupiter from the sun is  $7.8 \times 10^{11}$  m, find the mass of jupiter.



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**19.** Write down the expression for acceleration experienced by a particle on the surface of the moon due to gravitational force on the moon.

Find the ratio of this acceleration to that experienced by the same particle on the surface of the earth. If the acceleration due to gravity on the earth is  $9.8 \text{ ms}^{-2}$ , what is the acceleration of a particle on the moon's surface ? Mass of moon =  $7.3 \times 10^{22} \text{ kg}$ , Mass of Earth =  $6 \times 10^{24} \text{ kg}$ . Radius of moon =  $1.74 \times 10^6 \text{ m}$ , Radius of earth =  $6.4 \times 10^6 \text{ m}$ .



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20. Find the weight of an object at the height of 6400 km above the Earth surface the weight of the object at the surface of Earth is 20 Newton and radius of the earth is 6400 kilometre



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21. What is the nature of force which keeps a satellite revolving round the earth?



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**22.** What is the nature of force which keeps moon revolving round the earth?



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**23.** What is the nature of force which keeps the earth revolving round the sun?



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**24.** That planet will have large value of  $g$  which has large value of mass and small value of radius (T or F)



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**25.** Suppose a planet starts shrinking. The value of  $g$  starts decreasing. (T or F)



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**26.** The value of  $g$  is a universal constant (T or F)



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**27.** For a body to move in a uniform circular motion a \_\_\_\_\_ force is required which acts towards \_\_\_\_\_ of the circle.



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28. The value of  $g$  at the centre of the earth is

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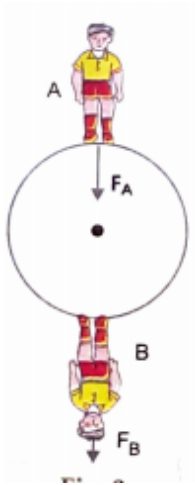


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29. What is wrong in figure. Given  $F_A$  and  $F_B$  are gravitational pull of the earth on persons



A and B respectively.



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30. The unit of  $G$  is \_\_\_\_\_ and  $g$  is \_\_\_\_\_



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**31.** As we move at higher altitude, the value of  $g$  \_\_\_\_\_



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**32.** The value of  $G$  is one-sixth on moon as compared to that on the earth. (T or F)



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**33.**  $1Nm^2kg^{-2} = 1kg^{-1}m^3s^{-2}$  (T or F)



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**34.** A body is thrown upwards. What is the direction  $g$  when the body is moving upwards.



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**35.** A body is thrown upwards. What is the direction  $g$  when the body is at the topmost point of its journey.



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**36.** A body is thrown upwards. What is the direction  $g$  when the body is falling down.



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**37.** The value of  $g$  on the surface of the earth is greater at \_\_\_\_\_ than at \_\_\_\_\_ of the earth.



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**38.** What is centripetal force? With the help of this for how could Newton conclude that

$$F \propto \frac{1}{r^2}?$$



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**39.** What is the difference between  $g$  and  $G$ ?



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**40.** Suppose a planet has its mass twice that of earth and radius 3 times that of the radius of earth. Find the acceleration due to gravity on planet.



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**41.** State the relation between 'g' and 'G'?



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**42.** The earth's gravitational force causes an acceleration of  $5\text{m//s}^{\wedge}(2)$  in 1 kg mass somewhere in space. How much will the acceleration of a 3 kg mass be at the same place? Give your answer with reason.



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**43.** Prove that if the earth attracts two bodies placed at the same distance from the centre of

earth with equal force, then their masses will be the same.



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**44.** How can you account for the fact that a stone and a feather fall at the same rate in vacuum but at different rates in air?



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**45.** The equations of motion for free fall can be used in case of any free fall. (T or F).



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**46.** The average value of  $g$  on the surface of the Earth is \_\_\_\_\_



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**47.** During free fall, the acceleration of a body near surface of the earth is equal to \_\_\_\_\_ and call \_\_\_\_\_.



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**48.** What is a freely falling body? Write equations of motion for a freely falling body.



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**49.** A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What the speed the ball at the highest point.



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**50.** A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What The acceleration while the ball is moving upwards.



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51. A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What the acceleration while the ball is moving downwards.



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52. A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What the acceleration due to gravity at the top most point.



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**53.** A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What the speed with which the ball reaches back the same point.



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**54.** A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What the time taken by the ball to reach the highest point.



**Watch Video Solution**

**55.** A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What the time taken by the ball to reach the highest point.



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**56.** A ball is thrown up with a speed of  $9.8\text{m.s}^{-1}$  What a maximum height reached?



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57. Two friends decided to calculate height of a high rise building . they match the timing of their watch. one friend goes to the top stair and the other stands on ground.the friend at the top storey drops a stone and notes the time. The friend standing on ground notes the time when the stone reaches the ground. They meet and find that the time taken by stone to reach the ground is 3 second. Find the height of the high-rise building.



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**58.** A piece of stone is thrown vertically upwards. It reaches the maximum height in 3 seconds. If the acceleration of the stone be  $9.8\text{m} / \text{s}^2$  directed towards the ground, calculate the initial velocity of the stone with which it is thrown upwards.



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**59.** A stone is thrown with an initial speed of  $4.9\text{ m/s}$  from a bridge in vertically upward



direction . It falls down in water after 2 sec.

Find height of the bridge.



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**60.** A body is thrown vertically upward with a velocity of  $9.8m / s^{-1}$  Calculate the maximum height attained by the body. ( $g = 9.8m / s^2$ )



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**61.** Weight of a girl is 294 N. Find her mass.



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**62.** Weight of an object is 294 N on the surface of the earth. What is its weight at a height of 200 km from the surface of the earth. Radius of the earth = 6400 km.



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**63.** A body weights 20 kg wt on the surface of the earth . What will be its its weight when it

is at a height equal to the radius of the earth.



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**64.** A body weights 20 kg on the surface of the earth . What will be its its weight when it is at a height equal to double the radius of the earth ?



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**65.** At the centre of the earth, mass of a body is zero. (T or F)



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**66.** The mass and weight both of a body becomes zero at the centre of the earth. (T or F)



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67. Weight is a scalar quantity. (T or F)



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68. Mass is measured by \_\_\_\_\_ balance  
and weight is measured by \_\_\_\_\_  
balance.



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69. The unit of weight is \_\_\_\_\_.



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70. Mass and weights have same units.



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71. The mass of a body on the earth is  $m$ . Its mass on moon is \_\_\_\_\_.



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72. 5kg wt = \_\_\_\_\_ N.



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73. Mass is a \_\_\_\_\_ property of a body.



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74. Where will a person weigh more in Ooty or in Delhi?



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**75.** The weight of an objects is greatest at some region of the earth. What will be the colour of bears found in that region?



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**76.** A body may have zero weight and a finite mass. (T or F).



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77. Differentiate between mass and weight of a body.



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78. Mass of an object is 7 kg. What is its weight?



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**79.** The weight of a body on moon is 60 N.

What is the weight of that body on earth?



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**80.** The weight of a body on earth is 60 N .

What is its weight on moon?



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**81.** State Newton's universal law of gravitation.

Why is it called universal?



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**82.** Write the formula to find the magnitude of gravitational force between the earth and an object on the surface of the earth.



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**83.** Explain Newton's laws of gravitation and hence deduce the definition of universal gravitational constant.



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**84.** What is the difference between weight of an object on pole and on equator?



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**85.** Give the value of universal gravitational constant in S.I. units.



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**86.** Can force of gravitation be repulsive?



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**87.** What is centripetal force?



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**88.** What is the SI unit of weight?



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**89.** What is the mass of a body of 5 kg at the centre of earth?



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**90.** Is weight a vector quantity?



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**91.** What will be the effect on the gravitational force between two particles when the distance between the particles is decreased?



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**92.** What is centripetal acceleration? Give its formula.



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**93.** If a planet X has same radius as that of earth but if its mass is double that of earth then find the acceleration on surface of planet X.



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**94.** How does the value of  $g$  vary as one moves at higher altitudes from the surface of earth.



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



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**96.** What is the acceleration of a pebble thrown vertically upwards when the pebble is moving upwards.



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**97.** What is the acceleration of a pebble thrown vertically upwards when the pebble is at the maximum height.



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**98.** What is the acceleration of a pebble thrown vertically upwards when the pebble is falling down?



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**99.** What is free fall?



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**100.** Write the equation of motion if an object is thrown in vertically upwards direction.



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**101.** The earth has a mass of  $6 \times 10^{24}$  kg and a radius of  $6.4 \times 10^6$  m. Calculate the amount of

work that must be done to slow down its rotation so that duration of day becomes 30 hrs instead of 24 hours.

$$\text{Moment of inertia of earth} = \frac{2}{5}MR^2.$$



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**102.** If a planet existed whose mass and radius were both half of that of the earth. 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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**103.** Write characteristics of gravitational force.



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**104.** How will you justify that Newton's law of gravitation obey Newton's third law?



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**105.** mass is measured by physical balanced where weight is measured by spring balance.

Explain.



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**106.** Explain why the value of  $g$  differs while moving poles to equator on the surface of the earth. Some would its value change on moving away from the earth.



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**107.** Explain why the value of  $g$  differs while moving poles to equator on the surface of the earth. Some would its value change on moving away from the earth.



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**108.** At what height above the surface of the earth is the gravitational potential energy of a body equal to that on the surface of the moon? Assume that the mass of the earth is 80 times that of the moon and the radius of the

earth is 4 times that of the moon. Given  
,Radius of the earth =6400 km.



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**109.** What is the unit of force? Define it.



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**110.** A stone is dropped from the edge of a  
rood is the following: How long does it take to  
fall 4.9 m?





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**111.** A stone is dropped from the edge of a road: How fast does it move at the end of that fall if height is 4.9 m?



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**112.** A stone is dropped from the edge of a road. How fast does he move at the end of 7.9  $m$ ?



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**113.** A stone is dropped from the edge of a rood is the following: What is its acceleration after 1s and 2s?



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**114.** Derive an expression for acceleration due to gravity on the surface of earth.



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**115.** State Keplers' laws of planetary motion.



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**116.** What is Newton's law of gravitation?

Define G.



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**117.** Derive a mathematical expression for Newton law of gravitation.



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**118.** What is the difference between  $g$  and  $G$ ?



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**119.** What is the difference between mass and weight of an object ? Will the mass and weight of an object on the earth be the same as their values on Mars ? Why ?



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**120.** The mass of the earth is  $6 \times 10^{24}$  kg and that of the moon is  $7.4 \times 10^{22}$  kg. If the distance between the earth and the moon is  $3.84 \times 10^5$  km, calculate the force exerted by the earth on the moon.



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**121.** The gravitational force between two bodies is 4 N. What will be the gravitational

force between the bodies if the distance between them doubles?



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**122.** Calculate the value of acceleration due to gravity on the surface of the planet jupiter. Mass of jupiter. Mass of jupiter is 319 times the mass of the earth. Radius of Jupiter is 11.2 times the radius of earth.



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**123.** Calculate the mass of the earth. Given radius of the earth  $= 6.4 \times 10^6 m$  and  $g = 9.8 m / s^2$



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**124.** A car falls off a ledge and drops to ground in 0.5s. Let  $g = 10 m s^{-2}$  What is its speed on striking the ground?



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**125.** A car falls off a ledge and drops to the ground in 0.5 s. Let  $g = 10\text{ms}^{-2}$  (for simplifying the calculations). What is its average speed during the 0.5 s?



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**126.** A car falls off a ledge and drops to ground in 0.5s. Let  $g = 10\text{ms}^{-2}$  How high is the ledge from the ground?



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**127.** A player throws a ball vertically upward. The ball attains a height of 25 m and then returns back. Find the initial speed of the ball.



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**128.** A boy on a cliff 49 m high drops a stone. One second later, he throws a second stone after the first. They both hit the ground at the same time. With what speed did he second stone?



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**129.** What is the acceleration due to gravity at a height of  $\frac{R}{5}$  from the surface of the earth?

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**130.** A man throws a ball vertically upwards with a velocity of  $20ms^{-1}$ . After what time will the ball come back to his hands?

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**131.** Mass of an object is 10 kg. What is its weight?



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**132.** An object weighs 10 N when measured on the surface of the earth. What would be its weight when measured on the surface of the moon?



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**133.** The mass of a body is 50 kg on the surface of the earth. find its weight on the surface of a planet whose mass is doubled than the mass of the earth and its radius is five times the radius of the earth.



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**134.** Two objects of different masses falling freely near the surface of moon would

A. have same velocities at any instant

B. have different accelerations

C. experience forces of same magnitude

D. undergo a change in their inertia.

**Answer:**



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**135.** The value of acceleration due to gravity

A. is same on equator and poles

B. is least on poles

C. is least on equator

D. increases from pole to equator

**Answer:**



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**136.** The gravitational force between two objects is  $F$ . If masses of both objects are halved without changing distance between them, then the gravitation force would become

A.  $F/4$

B.  $F/2$

C.  $F$

D.  $2F$

**Answer:**



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**137.** In the relation  $F = GMm/d^2$ , the quantity  $G$

- A. depends on the value of  $g$  at the place of observation
- B. is used only when the earth is one of the two masses
- C. is greatest at the surface of the earth
- D. is universal constant of nature.

**Answer:**



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**138.** Law of gravitation gives the gravitational force between

- A. the earth and a point mass only
- B. the earth and sun only
- C. any two bodies having some mass
- D. two charged bodies only

**Answer:**



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**139.** The value of quantity  $G$  in the law of gravitation.

A. depends on mass of earth only

B. depends on radius of earth only

C. depends on both mass and radius of earth

D. is independent of mass and radius of the earth.

**Answer:**



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**140.** Two particles are placed at some distance. If the mass of each of the two particles is doubled, keeping the distance between them unchanged, the value of gravitational force between them will be

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

B. 4 times

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

D. unchanged

**Answer:**



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**141.** The atmosphere is held to the earth by

A. gravity

B. wind

C. clouds

D. earth's magnetic field

**Answer:**



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**142.** The force of attraction between two units masses separated by a unit distance is called

- A. gravitational potential
- B. acceleration due to gravity
- C. gravitational field
- D. universal gravitational constant

**Answer:**



**143.** The weight of an object at the centre of the earth of radius  $R$  is

A. zero

B. infinite

C.  $R$  times the weights at the surface of the earth

D.  $1/r^2$  times the weight at surface of the earth

**Answer:**



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**144.** An apple falls from a tree because of gravitational between the earth and apple. If  $F_1$  is the magnitude of force exerted by the earth on the apple and  $F_2$  is the magnitude of force exerted by apple on earth, then

A.  $F_1$  is very much greater than  $F_2$

B.  $F_2$  is very much greater than  $F_1$

C.  $F_1$  is only a little greater than  $F_2$

D.  $F_1$  and  $F_2$  are equal.

**Answer:**



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**145.** Neglecting rotation of the earth, if suddenly the attractive power of the earth drops to zero, a man standing on the earth will



A. fly up

B. slide along the surface

C. move out tangentially

D. stand unaffected

**Answer:**



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**146.** For no change in the mass of the earth, if its radius is halved the weight of an object of mass 10 kg will be

A. 40 kg wt

B. 10 kg wt

C. 80 kg wt

D. 20 kg wt

**Answer:**



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**147.** The gravitational effect of which of the following causes tidal waves in sea is

A. earth

B. moon

C. sun

D. none

**Answer:**



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**148.** Suppose the gravitational attraction of earth suddenly disappears, then

A. weight of body becomes zero but mass remains unchanged

B. weight and mass of body both becomes zero

C. weight and mass of body both remains unchanged

D. weight of body remains unchanged but mass becomes zero of weight.

**Answer:**



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**149.** A man carrying a load of weight  $W$  on his hand jumps from a height. During free fall, the weight of load experienced by man is

A. zero

B.  $W$

C.  $2W$

D.  $3W$

**Answer:**



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**150.** What is the weight of a 7 kg-wt body in a planet whose mass is  $\frac{1}{7}$  of that of earth and radius is  $\frac{1}{2}$  of earth?

A. 4 kg wt

B. 8 kg wt

C. 7 kg wt

D. 2 kg wt

**Answer:**



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151. Height at which value of 'g' becomes one-fourth to the on earth is

A.  $R$

B.  $2R$

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

D.  $4R$

**Answer:**



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**152.** If we move from equator to pole, value of 'g' is

A. increases

B. decreases

C. remains same

D. first 'a' and the 'b'

**Answer:**



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

A.  $M$

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

C. zero

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

**Answer:**



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**154.** 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. 20 hours

B. 10 hours

C. 80 hours

D. 40 hours

**Answer:**



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**155.** If suddenly the gravitational force of attraction between earth and a satellite revolving around it becomes zero, what will happen to the satellite?

- A. continue to move in its orbit with same velocity
- B. move tangentially and escape away
- C. become stationary in its orbit

D. move towards the earth

**Answer:**



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**156.** If  $F$  is the force between two bodies of masses  $m_1$  and  $m_2$  at certain separation, then what is the force between  $\sqrt{5}m_1$  and  $\sqrt{3}m_2$  at same separation?

A.  $\sqrt{5}F$

B.  $F / \sqrt{15}$

C.  $\sqrt{15}F$

D. first 'a' and the 'b'

**Answer:**



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**157.** Which of the following statements is not correct about a planet rotating around the sun in an elliptical orbit?

- A. Its kinetic energy is constant
- B. Its angular momentum is constant
- C. It's areal velocity is constant.
- D. Its time period is proportional to  $r^3$

**Answer:**



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**158.** The weight of a rock on the moon is 200.6

N. What is its mass on the earth?

A. 20 kg

B. 118 kg

C. 200 kg

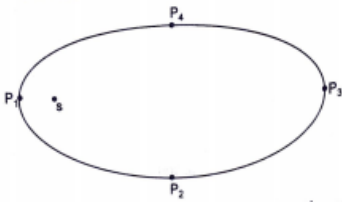
D. 1180 kg

**Answer:**



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**159.** The figure shows a planet in a elliptical orbit around the sun S.



At which position of the planet will its kinetic energy be maximum?

A.  $P_1$

B.  $P_2$

C.  $P_3$

D.  $P_4$

**Answer:**



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**160.** How is the force of attraction dependent on the masses of objects and distance between them?



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**161.** State any one phenomenon related to the universal law of gravitation.



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**162.** Define weight of a body.



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**163.** Derive an expression for acceleration due to gravity on the surface of earth.



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**164.** Why is weight of a body lesser at equator than at poles?



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**165.** After a single sheet of paper is folded in half, there are two layers of paper. The same sheet of paper is repeatedly folded in half. If function  $f$  represents the number of layers of paper that result when the original sheet of paper is folded a total of  $x$  times, then which equation could represent this function?



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**166.** Two types of balances, the beam balance and the spring balance are commonly used for measuring weight in shops. If we are on the moon, we can continue to use .

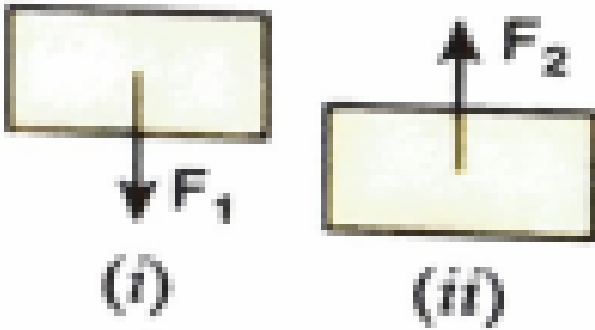


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**167.** If a planet existed whose mass and radius were both half of that of the earth. What would be the acceleration due to gravity at the surface of the planet in terms of that on the surface of the earth?

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168. In the adjoining diagram shown :

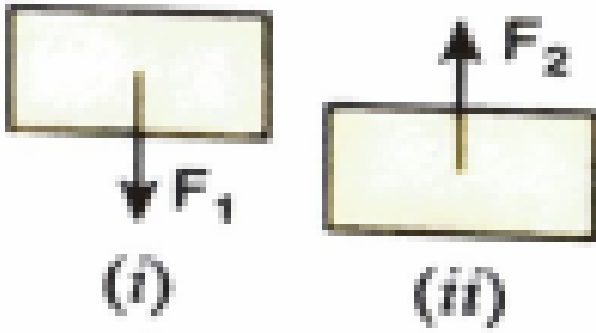


Which

one out of (i) or (ii) represents the weights of the box?

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169. In the adjoining diagram shown :



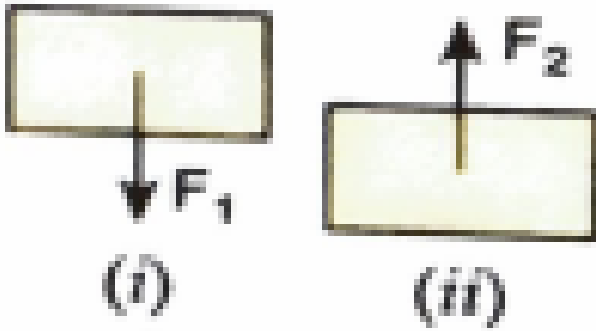
If

$F_1 = 24N$  on the surface of earth, what would its value be on the moon?



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170. In the adjoining diagram shown :



Calculate the mass of an object if the weight of the object is 24 N on earth . ( $g = 10ms^{-2}$ )

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171. Where is the acceleration due to gravity minimum and maximum on the surface of

earth?



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**172.** State universal law of gravitation. Derive an expression for gravitational force between two bodies.



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**173.** The weight of an object



A. increases when taken from pole to equator

B. increases when taken from equator to pole

C. increases when taken from Delhi to top of Mount Everest

D. increases when taken from surface of the earth to the moon

**Answer:**



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**174.** A person weighs  $W$  on the surface of the earth. The weight of the person at the centre of earth will be

A.  $< W$

B.  $> W$

C.  $-W$

D.  $= 0$

**Answer:**



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## Example

1. A particle is thrown up vertically with a velocity of  $50 \text{ m/s}$ . What will be its velocity at the highest point of its journey?



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2. A particle is thrown up vertically with a velocity of  $50 \text{ m/s}$ . How high would the particle

rise?



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3. A particle is thrown up vertically with a velocity of  $50 \text{ m/s}$ . What time would it take to reach the highest point?



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4. A ball is thrown upwards from the top of a tower  $40 \text{ m}$  high with a velocity of  $10 \text{ m/s}$ . Find

the time when it strikes the ground. Take

$$g = 10\text{m} / \text{s}^2.$$



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5. An object is released from a height. Find its speed at  $t = 1\text{s}$



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6. An object is released from a height. Find its speed at  $t = 2\text{s}$



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7. An object is released from a height. Find its speed at  $t = 3\text{s}$



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8. State the universal law of gravitation.



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**9.** Write the formula to find the magnitude of gravitational force between the earth and an object on the surface of the earth.



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**10.** What is meant by free fall ?



**Watch Video Solution**

**11.** What do you mean by acceleration due to gravity?



**Watch Video Solution**

**12.** What is the difference between the mass of an object and its weight ?



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**13.** Why is the weight of an object on the moon of  $\frac{1}{6}$  its weight on the earth?



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**14.** Gravitational force acts on all objects in proportion to their masses. Why then, a heavy object does not fall faster than a light object ?



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15. What is magnitude of gravitational force between the earth and a 1 kg object on its surface ? Take mass of earth to be  $6 \times 10^{24} \text{ kg}$  and radius of the earth is  $6.4 \times 10^6 \text{ m}$ .  $G = 6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$ .



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16. If the moon attracts the earth, why does the earth not move towards the moon ?



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17. What happens to the force between two objects, if the mass of one object is doubled ?



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18. What happens to the force between two objects, if the distance between the objects is doubled and tripled ?



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**19.** What happens to the force between two objects, if the masses of both objects are doubled ?



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**20.** What is the importance of universal law of gravitation?



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**21.** What is the acceleration of free fall ?



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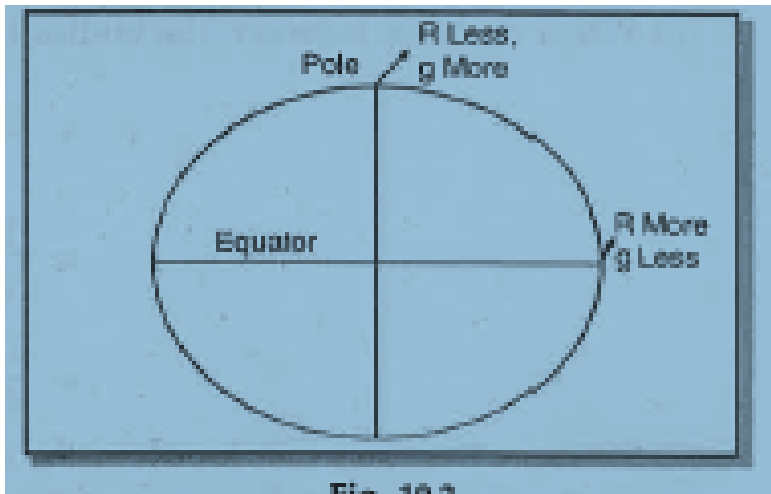
**22.** What do you call the gravitational force between the earth and an object?



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**23.** A person 'A' buys a few grams of gold at the poles as per the instruction of one of his friends. He hands over the same when he meets him at the equator. Will the friend agree with

the weight of gold bought? If not, Why?



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24. Why will a sheet of paper fall slower than one that is crumpled into a ball?



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**25.** Gravitational force on the surface of moon is  $1/6$  as strong as gravitational force on the earth. What is the weight in newton of a 10 kg object on moon and on the earth ?



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**26.** A ball is thrown vertically upwards with a velocity of  $49\text{m.s}^{-1}$ . Calculate :The maximum height to which it rises



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**27.** A ball is thrown vertically upwards with a velocity of  $49\text{ms}^{-1}$ . Calculate :The total time it takes to return to the surface of earth.

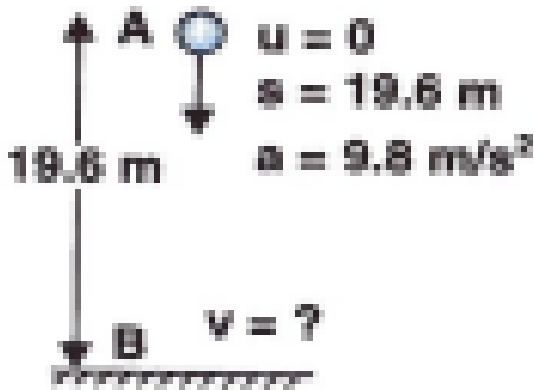


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**28.** A stone is released from the top of a tower a height 19.6 m. Calculate its final velocity



before touching the ground.



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29. A stone is thrown vertically upward with an initial velocity of  $40 \text{ m s}^{-1}$ . Taking  $g = 10 \text{ m s}^{-2}$ , find the maximum height reached by the

stone. What is the net displacement and the total distance covered by the stone ?



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**30.** Calculate the force of gravitation between the earth and the sun, given the mass of earth =  $6 \times 10^{24} \text{ kg}$  and of the sun =  $2 \times 10^{30} \text{ kg}$ .

Average distance between the two is  $1.5 \times 10^{10} \text{ m}$ .



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**31.** A stone is allowed to fall from the top of the tower 100 m high and at the same time another stone is projected vertically upwards from the ground with a velocity of  $25\text{m.s}^{-1}$ . Calculate when and where the two stones will meet ?



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**32.** A ball thrown up vertically returns to the thrower after 6 s. Find Velocity with which it was thrown up.



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**33.** A ball thrown up vertically returns to the thrower after 6 s. Find the maximum height it reached .



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**34.** A ball thrown up vertically returns to the thrower after 6 s. Find its position after 4 s.



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**35.** What is the source of centripetal force that a planet requires to revolve around the sun ?  
On what factors does that force depend?  
suppose this force suddenly becomes zero then in which direction will the planet begin to move if no other celestial body affect it?



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**36.** On the earth, a stone is thrown from a height in a direction parallel to the earth's

surfaces while another stone is simultaneously dropped from the same height. Which stone would reach the ground first and why ?



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**37.** Suppose gravity of earth suddenly becomes zero, then in which direction will the moon begin to move if no other celestial body affects it?



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**38.** Identical packets are dropped from two aeroplanes, one above the equator and the other above the north pole, both at height  $h$ . Assuming all conditions are identical, will those packets take the same time to reach the surface of earth. Justify your answer.



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**39.** The weight of any person on the moon is about  $\frac{1}{6}$  times that on the earth. He can lift a mass of 15 kg on the earth. What will be the

maximum mass, which can be lifted by the same force applied by the person on the moon?



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**40.** Calculate the average density of the earth terms of  $g$ ,  $G$  and  $R$ .



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**41.** The earth is acted upon by the gravitational attraction of the sun. Why does not the earth fall into the sun?



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**42.** How does the weight of an object vary with respect to mass and radius of the earth. In a hypothetical case, if the diameter of the earth becomes half of its present value and its mass becomes four times of its present value, then

how would the weight of any object on the surface of the earth be affected?



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**43.** How does the force of attraction between the two bodies depend upon their masses and distance between them ? A student thought that two bricks tied together would fall faster than a single one under the action of gravity. Do you agree with his hypothesis or not ? comment.



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**44.** Two objects of masses  $m_1$  and  $m_2$  having the same size are dropped simultaneously from heights  $h_1$  and  $h_2$  respectively. Find out the ratio of time they would take in reaching the ground. Will this ratio remain the same if one of the objects is hollow and the other one is solid.



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**45.** Two objects of masses  $m_1$  and  $m_2$  having the same size are dropped simultaneously from heights  $h_1$  and  $h_2$  respectively. Find out the ratio of time they would take in reaching the ground. Will this ratio remain the same if both of them are hollow, size remaining the same in each case. give reason.



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**46.** What is the ratio of the force of gravitation between two masses  $m_1$  and  $m_2$  kept at a distance  $R$  on the earth and on the moon.



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**47.** What is the ratio of the force of gravitation between two masses  $m_1$  and  $m_2$  kept at a distance on the moon?



**Watch Video Solution**

**48.** State any one phenomenon related to the universal law of gravitation.



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**49.** State two factors on which the gravitational force between two objects depends.



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**50.** The gravitational force between two objects is  $F$ . How will the force change when the distance between them is reduced to  $\frac{1}{4}$  th?



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**51.** Define mass of an object?



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52. The earth is acted upon by the gravitational attraction of the sun. Why does not the earth fall into the sun?



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53. Two objects of mass  $M_1$  and  $M_2$  are dropped in vacuum from a height above the surface of earth ( $M_1 > M_2$ ). which one will reach the ground first and why?



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54. Write the units of 'g' and 'G'.



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55. Mass of an object is 10 kg. What is the weight on the earth ( $g = 9.8ms^{-2}$ )?



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56. An object of mass 2 kg falls with a acceleration of  $9.8ms^{-2}$  towards the gorund.

With acceleration will an object of mass 4 kg fall?



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57. Prove that if the earth attracts two bodies placed at the same distance from the centre of earth with equal force, then their masses will be the same.





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**58.** A man weighs 600 N on earth. What is his mass. ( $g = 10ms^{-2}$ ). On moon his weight would be 100N. What is his acceleration due to gravity on the moon?



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**59.** A stone fell from the top of a tower 5 seconds to reach the ground level. Calculate the velocity with which it reaches the ground.



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**60.** A stone fell from the top of a tower 5 seconds to reach the ground level. Calculate the height of the tower. ( $g = 9.8 \text{ m s}^{-2}$ )



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**61.** Gravitational force acts on all objects in proportion to their masses. Why then, a heavy object does not fall faster than a light object ?



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**62.** What is meant by free fall ?



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**63.** Write the equation of motion if an object is thrown in vertically upwards direction.



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**64.** A car falls off a ledge and drops to ground in 0.5s. Let  $g = 10ms^{-2}$  What is its speed on striking the ground?



**Watch Video Solution**

**65.** A car falls off a ledge and drops to ground in 0.5s. Let  $g = 10ms^{-2}$  How high is the ledge from the ground?



**Watch Video Solution**

**66.** A car falls off a ledge and drops to ground in 0.5s. Let  $g = 10\text{m.s}^{-2}$  What is its average speed during 0.5s?



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**67.** If a planet existed whose mass and radius were both half of that of the earth. 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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**68.** If mass of Earth is  $6 \times 10^{24}$  kg, radius of Earth is  $6.4 \times 10^6$  m and the gravitational constant is  $6.7 \times 10^{-11}$  Nm<sup>2</sup>kg<sup>-2</sup>. Calculate the value of g.



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**69.** How is the force of attraction dependent on the masses of objects and distance between them?





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**70.** Where is the value of 'g' zero on earth?



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**71.** After a single sheet of paper is folded in half, there are two layers of paper. The same sheet of paper is repeatedly folded in half. If function  $f$  represents the number of layers of paper that result when the original sheet of

paper is folded a total of  $x$  times, then which equation could represents this function?



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**72.** Where is the acceleration due to gravity minimum and maximum on the surface of earth?



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**73.** Calculate the weight of an astronaut whose mass is 80 kg on the surface of earth and on the surface of moon. Given that the acceleration due to gravity at moon is one-sixth of that of earth.



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**74.** State two factors on which the gravitational force between two objects depends.





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75. Why is  $G$  called universal gravitational constant ?



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76. What happens to the gravitational force between two objects if masses of both objects are doubled and distance between them is also doubled?



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77. What is the value of 'G' on moon?



[Watch Video Solution](#)

78. What is the value of 'G' on moon?



[Watch Video Solution](#)

79. If the acceleration due to gravity on  $3.8ms^{-2}$ , then what would be the weight

object on mars which has a mass of 10 kg on moon.



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**80.** If the acceleration due to gravity on Mars is  $3.8\text{ms}^{-1}$  and object having mass 10kg on earth. What would be its weight on earth?



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**81.** Inverse square law means  $F \propto \frac{1}{r^2}$  (T or F)

A.  $\propto r$

B.  $\propto r^2$

C.  $\propto r^{-2}$

D.  $\propto \frac{1}{r^{3/2}}$

**Answer:**



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**82.** Two masses  $m$  and  $M$  are kept at a distance  $r$ . The ratio of the force exerted on  $m$  due to  $M$  and that of  $M$  due to  $m$  is equal to

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

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

C.  $m \frac{r}{M}$

D. 1 : 1

**Answer:**



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**83.** Newton's law of gravitation is valid in

A. laboratory



B. only on the earth

C. only in our solar system

D. everywhere

**Answer:**



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**84.** When a body is moving upwards, the force of gravity is acting.

A. upwards

B. downwards

C. horizontal direction

D. between horizontal and upwards  
direction.

**Answer:**



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**85.** As we move above the surface of the earth,  
the value of  $g$

A. increases

B. decreases

C. remains same

D. information incomplete

**Answer:**



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**86.** The value of  $g$  at the centre of the earth is

A. zero

B.  $9.8m / s^2$

C. Slightly greater than  $9.8m / s^2$

D.  $< 9.8m / s^2$

**Answer:**



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**87.** As we move from equator to poles, the value of  $G$

A. increases

B. decreases

C. remains same

D. information incomplete

**Answer:**



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**88.1 kg wt-**

A. 5 N

B. 9.8 N

C. 19.6 N

D. None

**Answer:**



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**89.** The weight of body can be expressed in

A. kg

B. N

C. J

D. Ns

**Answer:**



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**90.** The value of  $G$  depends on the medium between the masses or the place of experiment. (T or F)

A. masses of the bodies

B. distance between the bodies

C. some other masses kept nearby

D. none

**Answer:**



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**91.** If  $m_e$  is the mass of a body on the surface of the earth and  $m_m$  is the mass of the same body on the moon, then

A.  $m_e = 6m_m$



B.  $m_e < m_m$

C.  $m_e > m_m$

D.  $m_e = m_m$

**Answer:**



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**92.** If  $G_e$  is the value of universal gravitainal constant at the earth and  $G_m$  is the value of universal gravitationl constant on the moon then

A.  $G_e = 6G_m$

B.  $G_e < G_m$

C.  $G_e > G_m$

D.  $G_e = G_m$

**Answer:**



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**93.** An iron block was weighed at equator and its value was found to be 1 N. When the same

iron block is weighed at poles, its value is found to be  $x$  N. Then

A.  $1=x$

B.  $1 > x$

C.  $x > 1$

D. can't say

**Answer:**



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94. Gravitational force is a

A. weakest force

B. strongest force

C. short-range force

D. non-central force

**Answer:**



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95. The acceleration due to gravity depends on

A. mass of the planet

B. radius of the planet

C. mass and radius of the planet

D. none

**Answer:**



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96. The value of acceleration due to gravity at the Mount Everest is

A.  $g$

B.  $> g$

C.  $< g$

D. zero

**Answer:**



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97. The S.I unit of mass is

A. gram

B. pound

C. newton

D. kilogram

**Answer:**



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98. According to Kepler's law the relationship between  $T$  (time period of revolution of a planet) and  $r$  (the semi-major axis of ellipse) is`

A.  $T^2 \propto r^2$

B.  $T^2 \propto r^{-3}$

C.  $T \propto r^{3/2}$

D.  $T^2 \propto r$

**Answer:**



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**99.** Suppose the radius of the earth is reduced to half of its present value and its mass remaining the same then what will be effect on the value of weight of an object of mass 30 N.



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**100.** Two bodies of mass  $M$  and  $m$  are kept on the surface of the earth. Compare the acceleration due to gravity on the two bodies.





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**101.** Why do not we take into consideration the force of gravitation on a falling body due to other objects like a building, a tree, etc?



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**102.** You buy weight of sugar at a place situated on equitorial line and then take it to Antarctica. Will that sugar weigh same there ? If not whether it would be more or less.



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