



# PHYSICS

## BOOKS - MBD

### GRAVITATION

#### Example

1. State the universal law of gravitation.



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2. 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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3. What is meant by free fall ?



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4. What is meant by acceleration due to gravity ?



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



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6. The weight of an object on the moon is.....  
of its weight on the earth.



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7. Why is it difficult to hold a school bag  
having a strap made of thin and strong string  
?



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**8.** What do you mean by buoyancy ?



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**9.** Why does an object float or sink when placed on the surface of water ?



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**10.** You find your mass to be 42 kg on a weighing machine. Is your mass more or less

than 42 kg ?



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**11.** You have a bag of cotton and an iron bar, each indicating a mass of 100 kg when measured on a weighing machine. In reality, one is heavier than other. Can you say which one is heavier and why ?



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**12.** How does the force of gravitation between two objects change when the distance between them is reduced to half ?



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**13.** 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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**14.** 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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**15.** The earth and the moon are attracted to each other by gravitational force. Does the earth attracts the moon with a force that is greater than or smaller than or the same as



the force with which the moon attracts the earth ? Why ?



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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 meant by acceleration due to gravity ?



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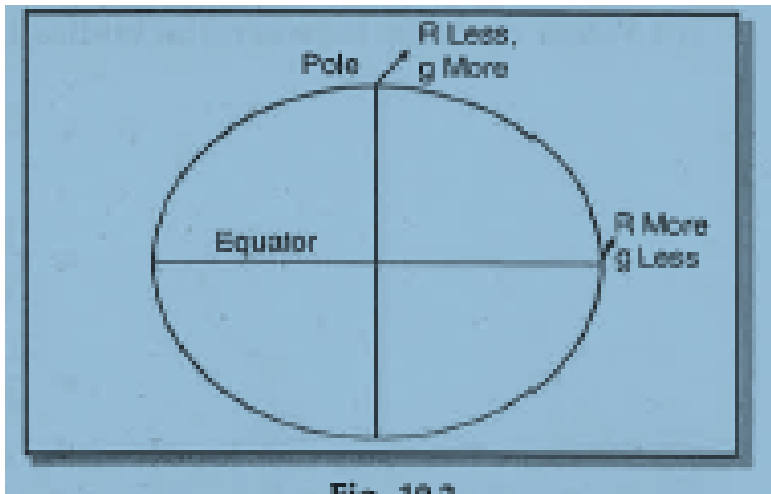
22. What do you call the gravitational force between the earth and an object?



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23. A person 'A' buys few grams of gold at 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 of height 19.6 m. Calculate the final velocity just 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  $1.5 \times 10^{10} m$ .



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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  $25ms^{-1}$ . 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.** In what direction does the buoyant force on an object immersed in a liquid act.



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**36.** Why does a block of plastic immersed under water come to the surface of water ?



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**37.** Why does a block of plastic immersed under water come to the surface of water ?



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**38.** The volume of 50 g of a substance is  $20\text{cm}^3$ . If the density of water is  $1\text{gcm}^{-3}$ , will the substance float or sink ?



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**39.** The volume of 500 g sealed packed in  $350\text{cm}^3$ . Will the packet float or sink in water of the density of water is  $1\text{gcm}^{-3}$ ? What will the mass of the water displaced by his packet?



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**40.** Define Newton's universal law of gravitation and establish mathematical formula for force of attraction between two objects.



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



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**42.** How did Robert proved experimentally that all bodies fall in vacuum with same acceleration?



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**43.** How did Robert Boyle show experimentally that a coin and a piece of paper when dropped simultaneously from same height in vacuum fall with same acceleration ?



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**44.** Prove that acceleration due to gravity is independent of mass.



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**45.** Find the value of 'g'.



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**46.** Describe those factors which are responsible for variation in the value of acceleration due to gravity 'g' ?



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**47.** Establish the relation between 'g' and 'G' .



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**48.** Deduce an expression in terms of mass of the earth ' $M$ ' And universal gravitational constant ' $G$ ' and gravity ' $g$ '.



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**49.** Prove that acceleration due to gravity is independent of mass.



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50. What is Archimedes principle ? How can you verify it experimentally ? Also write applications of Archimedes' principle.



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51. 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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52. Why is  $G$  called universal gravitational constant ?



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



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



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**55.** A tennis ball jumps higher at hills than at planes. Explain.



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**56.** The weight of an object on the surface of earth is 9.8 N. What does this statement mean?



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**57.** What type of motion a freely falling body execute under gravity ?



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**58.** Give points of difference between Acceleration due to gravity ( $g$ ) and Universal gravitational constant ( $G$ ).



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**59.** You buy weight of sugar at a place situated on equatorial 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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**60.** Why cannot we move a finger without disturbing all the stars ?



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**61.** Distinguish between Gravitation and Gravity.



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**62.** Explain why a small piece of stone is not attracted towards another big piece of stone on the earth's surface ?



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**63.** The earth attracts an apple. Does the apple also attract with earth ? If it does, why does the earth not move towards the apple ?



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**64.** If the force of gravity somehow vanishes today, why would we be sent being in space ?



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**65.** What is meant by density and relative density ?



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**66.** What do you mean by buoyancy? In which direction does the buoyant force on an object immersed in a liquid act ?



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**67.** State Archimedes' principle.



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**68.** Name two forces which act on a body immersed in a liquid. Give the directions in which they act.



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**69.** How is submarine able to move on water surface as well as go under water ?



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**70.** Give reason when Big buildings and dams have wide foundations for safety.



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**71.** A steel needle sinks in water but a steel ship floats. Explain how ?



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**72.** Give reasons for the following :A sharp blade is more effective in cutting an object than a blunt blade.



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**73.** Give reasons for the following :A cork piece floats but an iron piece sinks in water.



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**74.** Explain the following : Swimmers are provided with an inflated rubber jacket.



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**75.** Explain the following : It is easier of swim in sea water than in river water.



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**76.** Why is the pressure on ground more when a man is walking than when he is standing ?



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**77.** Why a bucket of water is lighter when in water than when it is taken out of water?



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**78.** If a fresh egg is put into a beaker filled with water, it sinks. On dissolving a lot of salt in the water, the egg begins to rise and floats. Why ?



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**79.** Two spheres of 1kg mass each are separated by 3 m. Calculate the gravitational force between them. Given

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



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**80.** 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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**81.** Find the change in weight percentage of a body when it is taken from equator to poles. Polar radius is 6357 km and equatorial radius is 6378 km.



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**82.** At what height above the earth surface, the acceleration due to gravity will be half that on the surface of earth ? Suppose  $R$  is the radius of earth.



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**83.** A ball is dropped from top of 40m high tower. What will be its velocity after covering a

distance of 20m ? What will be its velocity on striking the earth ?



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**84.** If weight of an object is 49 N then what will be its mass ?



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**85.** A block of wood is kept on the table top. The mass of wooden block is 5 kg and its

dimensions are  $40\text{cm} \times 20\text{cm} \times 10\text{cm}$ . Find the pressure exerted by the wooden block on the table top if it is made to lie on the table top with its sides of dimensions :  $20\text{cm} \times 10\text{cm}$ .



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**86.** A block of wood is kept on the table top. The mass of wooden block is 5 kg and its dimensions are  $40\text{cm} \times 20\text{cm} \times 10\text{cm}$ . Find the pressure exerted by the wooden block on

the table top if it is made to lie on the table top with its sides of dimensions :  $40\text{cm} \times 20\text{cm}$  .



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**87.** What is  $g$  on the moon as compared to that on earth?



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**88.** What is unit of  $G$ ?



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**89.** What is the mass of the earth?



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



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91. What is SI unit of weight of a body?



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92. The earth's gravitational force an acceleration of  $5ms^{-2}$  on a 1kg mass somewhere in the space. How much will be the accleration of a 3kg mass at that place ?



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



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



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**95.** The value of 'G' on the surface of earth is  $6.67 \times 10^{-11} Nm^2 / kg^2$ . What is its value on the surface of moon ?



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



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**97.** 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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**98.** Can the mass of a body be zero.



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**99.** You find your mass to be 42 kg on a weighing machine. Is your mass more or less than 42 kg ?



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**100.** How does the value of 'g' vary from equator to poles ?



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**101.** What will be the weight of an object on the earth whose mass is 10 kg ?



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**102.** Write the S.I. unit of G.



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**103.** When does an object float when placed on the surface of water ?



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**104.** While swimming why do we feel light ?



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**105.** Why does a truck or a motor-bus has much wider tyres ?



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**106.** An army tank weighing more than a hundred tonne move conveniently on an earthen road. How ?



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**107.** What is the unit of relative density ? Why ?



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**108.** The weight of an object on the moon is..... of its weight on the earth.



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