CHAPTER-10 GRAVITATION

1. The value of 'g' on the surface of the earth is 6.67×10^{-11} Nm^2/kg^2. What will be its value on the surface of the moon? (1)
2. You are applying a force on the pan of a single pan weighing balance and the pointer points to 100 g. What is the force in Newton applied by you? (1)
3. Give any four differences between mass and weight. (2)
4. Calculate the weight of a body of mass 2 kg on the surface of a planet whose mass and radius were both half that of the earth. (2)
5. Calculate the weight of an astronaut of mass 80 kg on the surface of the earth and on the surface of the moon. Also calculate the ratio of the mass of astronaut on the surface of the earth and on the surface of the moon. (given that the acceleration due to gravity on the surface of the moon is one sixth of that on the surface of earth) (2)
6. The weight of an object on the surface of the moon is 1.67 N and its mass on its surface is 1 kg. Calculate its weight and mass on the surface of earth. ('g' on earth=10 m/s^2)
7. A ball thrown vertically upwards rises to a height of 20 m. calculate
   i) The velocity with which the ball is thrown upwards.
   ii) The time taken by the ball to reach the highest point. ($g = 10\ m/s^2$) (2)
8. A stone is released from the top of a tower of 200 m height. At the same time another stone is thrown vertically upward from the ground with a velocity of 10 m/s. Calculate when and where the two stones will meet. ($g = 10\ m/s^2$) (2)
9. A) The weight of a man on the surface of the earth is 392 N. Find his mass. ($g = 9.8\ m/s^2$)
   B) If the man were taken to moon, what would be i) his mass ii) his weight and find iii) the acceleration due to gravity on the moon. (3)
10. A stone dropped from a window reaches the ground in 0.5 s.
    i) Calculate its speed just before touching the ground.
    ii) What is the average speed during 0.5 s?
    iii) Calculate the height of the window from the ground. (3)
11. A ball is thrown vertically upwards with a velocity of 15 m/s. Calculate
    i) The maximum height to which it raises.
    ii) The total time taken to reach the maximum height. (3)
12. The mass of sun is 2×10^{30} kg and that of earth is 6×10^{24} kg. If the average distance between the sun and the earth is 1.5×10^{11} m, calculate the force exerted by the sun on the earth and also by the earth on the sun. (3)
13. What happens to the magnitude of the force of gravitation between two objects, if
    i) the distance between the objects is tripled.
    ii) the mass of both objects doubled.
    iii) the mass of both objects as well as the distance between them is doubled. (3)
14. A) State Newton's universal law of gravitation.
    B) Derive a mathematical expression for the Newton's law of gravitation. (3)
15. Derive an expression for acceleration due to gravity on a planet of mass M and radius R (3)