Chapter 10 – Gravitation

1. State the universal law of gravitation.
2. How does the force of gravitation between 2 objects change when the distance between them is reduced to half?
3. A stone is released from the top of a tower of height 19.6 meters. Calculate its final velocity just before touching the ground. (19.6m/s)
4. Why does the weight of a body vary from poles to equator?
5. Derive an expression for acceleration due to gravity.
6. Differentiate between G and g.
7. Differentiate between mass and weight of a body.
8. Two bodies P and Q having masses m_1 and m_2, when separated by a distance d, exert a force F on each other. What happens when: -
   a. mass of both the objects are doubled.
   b. distance between the two bodies is reduced to half.
9. A toy car falls on the ground in 0.4 seconds. Calculate its speed just before striking the ground (39.2m/s)
10. Mass of a book is 500 g on surface of the earth. What will be its mass at a height equal to radius of the earth?
11. Define density. Write down it's SI unit.
12. State Archimedes principle. Explain the reason that a Cork floats in water, whereas an iron needle sinks.
13. The volume of a bag of mass 1250g is one 150cm³. If this bag is put on water will it float or sink? Justify your answer.
14. The density of copper is 8.9g/cm³ ·Calculate the relative density of copper.(8.9)
15. An object weighs 10 N in air when immersed fully in water it weighs 8N. The weight of the liquid displaced by the object will be: -
   a.   2N   b. 5N   c. 10N   d. 12Ns
16. A body weighs 500gf in air and 300gf when completely immersed in water. Find:
   a. the apparent loss in weight of the body. (200gf)
   b. the up thrust on the body. (200gf)
   c. the volume of the body (200cm³)

1. Calculate the gravitational force between a 10-kg ball and a 20-kg, ball placed at a separation of 5 m.
    $(53.384 \times 10^{-11} N)$

2. The acceleration due to gravity near the earth's surface is 9.8 m/s², and the earth's radius is 6,400 km. From this data, calculate the mass of the earth.
    $(6 \times 10^{24} kg)$

3. Suppose the earth shrinks such that its radius decreases to half the present value. What will be the acceleration due to gravity on the surface of the earth?
    $(4g)$

4. A body weighs 120 N on the earth. Find its approximate weight on the moon.
    (20N)

5. A ball is thrown upwards with a speed of 39.2 m/s. Calculate (a) the maximum height it reaches, and (b) the time taken in reaching the maximum height.
    (78.4m, 4s)

6. A stone thrown upwards attains a maximum height of 20 m. Find the velocity with which it was thrown upwards.
    (20m/s)

7. A ball is thrown up and attains maximum height of 180m. Calculate its initial speed.   (60m/s)

8. A boy weighs 30kg on earth. Find his mass and weight on the surface of the moon.
    (5kg, Mass=30kg)

9. A solid body of mass 150g and volume 250cm³ is put in water. Will the body float or sink?

10. Calculate the mass of a body whose volume is 2 m³ and density 0.52 g/cm³.
    (1040 kg)

11. The mass of a block made of certain material is 13.5 kg and its volume is 15×10^{-3} m³. Will the block float or sink in water? Give reason for your answer.

12. What is the unit of relative density?

13. The relative density of mercury is 13.6. What does this statement mean?

14. The density of turpentine oil is 840 kg/m³. What will be its relative density?
    (0.840)

15 Give reasons
    a) An iron nail floats in mercury but sinks in water.
    b) An eggshell sink in fresh water but floats in a strong solution of salt.

16. Calculate the pressure when a force of 200N acts perpendicular to the surface of area 10m². (20pa)

17. A body weighs 600gf in air and 450gf in water. Find,
    a) The apparent loss in weight of the body.
    b) The up thrust of the body
    c) The volume of the body. (150gf, 150gf, 150cm³)

18. Why is it easier to swim in sea water than in river water?

19. Why do skiers use long flat ski on snow-clad mountains?

20. What are the applications of Archimedes Principle?