Upthrust And Archimedes Principle DPP - 1

1. The force experienced by a body when partially or fully immersed in water is called:
- **a)** Apparent weight
- **b)** Upthrust
- **c)** Sown thrust
- **d)** None of these

2. When a body is floating in a liquid:
- **a)** The weight of the body is less than the upthrust due to immersed part of the body
- **b)** The weight of body is more than the upthrust due to the immersed part of the body
- **c)** The weight of body is equal to the upthrust due to the immersed part of the body
- **d)** None of the above

3. With the increase in the density of the fluid, the upthrust experienced by a body immerse in it:
- **a)** Decreases
- **b)** Increases
- **c)** Remains some
- **d)** None of these

4. The apparent weight of a body in fluid is
- **a)** Equal to weigh of fluid displaced
- **b)** Volume of fluid displaced
- **c)** Difference between its weight in air and weight of fluid displaced
- **d)** None of above

5. The phenomenon due to which a solid experiences upward force when immersed in water is called:
- **a)** Floatation
- **b)** Buoyancy
- **c)** Density
- **d)** None of these

6. When an object sinks in liquid, its:
- **a)** Buoyant force is more than the weight of object
- **b)** Buoyant force is less than the weight of object
- **c)** Buoyant force is equal to the weight of the object
- **d)** None of the above

7. The SI unit of density is:
- **a)** g cm^{-3}
- **b)** Kg cm^{-3}
- **c)** Kg m^{-3}
- **d)** g m^{-3}

8. When a body is wholly or partially immersed in a liquid, it experiences a buoyant force which is equal to:
- **a)** Volume of liquid displaced by it
- **b)** Weight of liquid displaced by it
- **c)** Both (a) and (b)
- **d)** None of the above

9. The ratio between the mass of a substance and the mass of an equal volume of water at 4° C is called:
- **a)** Relative density
- **b)** Density
- **c)** Weight
- **d)** Pressure

10. A body has density 9.6 g cm^{-3}. Its density in SI system is:
- **a)** 96 kg m^{-3}
- **b)** 960 kg m^{-3}
- **c)** 9600 kg m^{-3}
- **d)** 96000 kg m^{-3}

Upthrust And Archimedes Principle DPP - 2

1. i) A wooden block floats in water with two third of its volume submerged.

(a) Calculate density of wood

(b) When the same block is placed in oil, three quarter of its volume is immersed in oil. Calculate the density of oil.

ii) (a) What does a hydrometer measure?

(b) What determines the sensitivity of hydrometer?

(c) Draw a labelled diagram for hydrometer for lighter liquids.

2. A metal cube of 5 cm edge and relative density 9 is suspended by a thread so as to be completely immersed in a liquid of relative density 1.2 . Find the tension in the thread.

3. A weather forecasting plastic balloon of volume 15 m^3 contains hydrogen of density 0.09 kg m^{-3}. The volume of equipment carried by the balloon is negligible compared to its own volume. The mass of the empty balloon is 7.15 kg. the balloon is floating in air of density 1.3 kg m^{-3}

(a) Calculate the mass of hydrogen in balloon.

(b) Calculate the mass of hydrogen and the balloon

(c) If the mass of equipment is x kg, write down the total mass of hydrogen, the balloon and the equipment is x kg, write down the total mass of hydrogen, the balloon and the equipment.

(d) Calculate the mass of air displaced by balloon

(e) Using the law of floatation calculate the mass of equipment

4. (a) State the principle of floatation

The mass of a block made of certain material is 1.35 kg and its volume is 1.5 $X10^{-3}$ m^3.

(b) Find the density of block

(c) Will this block float or sink ? Give reasons for your answer

5. (a) State Archimedes' principle.

(b) A block of mass 7 kg and volume 0.07 m^3 floats in a liquid of density 140 kg/m^3 calculate:

I. Volume of block above the surface of liquid

II. Density of block

6. (a) A body whose volume is 100cm^3 weighs 1 kgf in air. Find its weight in water

(b) Why is it easier to swim in sea water than in river water?

7. Why does a ship made of iron not sink in water, while an iron nail sinks in it?

8. A solid of density 5000 kg m^{-3} weighs 0.5 kgf in air . It is completely immersed in a liquid of density 800 kg m^{-3} calculates the apparent weight of the solid in liquid.

9. (a) A body dipped in a liquid experiences an upthrust. State the factors on which the upthrust depends.

(b) While floating, is the weight of body greater than, equal to or less than upthrust?

10. A sinker is first weighed alone under water. It is then tied to a cork and again weighed under water. In which of the two cases weight under water is less and why?

11. A solid weighs 105 kgf in air. When completely immersed in water, it displaces 30,000 cm^3 of water calculate relative density of solid

12. A test tube loaded with lead shots weighs 25 gf and floats up to the mark X in water. When the test tube is made to float in brine solution, it needs 5 gf more of lead shots to float up to level X. Find the relative density of brine solution.

13. A wooden block is weighed with iron, such that combination just floats in water at room temperature. State your observations when:

(a) Water is heated above room temperature

(b) Water is cool below 4˚C. Give reasons to you answers in (i) and (ii)

14. A rubber ball floats in water with 2/7 of its volume above the surface of water. Calculate the average relative density of rubber ball

15. A cube of ice whose side is 4.0 cm is allowed to melt. The volume of water formed is found to be 58.24 cm^3. Find density of ice.

16. A jeweller claims to make ornaments of pure gold of relative density 19.3. A customer buys from him a bangle of weight 25.25 gf. The customer then weighs the bangle under water and finds its weight 23.075 g with the help of suitable calculations explain whether the bangle is of pure gold or not.

17. When a piece of ice floating in water melts, the level of water inside the glass remains same. Explain.

18. An inflated balloon is placed inside a big glass jar which is connected to an evacuating pump.

19. What will you observe the evacuating pump. Starts working? Give a reason for your answer.

20. A trawler is fully loaded in sea water to maximum capacity. What will happen to this trawler, if moved to river water? Explain your answer.

21. A body of mass 50g is floating in water. What is the apparent weight of body in a water ? Explain your answer

22. A body of mass ‘m’ is floating in a liquid of density ‘p’

(a) What is the apparent weight of body?

(b) What is the loss of weight of body?

23. The area of cross-section of the stem of a hydrometer is 0.32 cm^2, its length is 20 cm and its mass is 22.8 g and volume of bulb is 10 cm^3.

(a) What is the density of liquid in which it floats along with its bulb immersed but not the stem?

(b) What is the density of liquid in which it floats up to the midpoint of the stem?

Upthrust And Archimedes Principle DPP - 3

1. A cylindrical solid of area of cross-section $0.0004 m^2$ and length 0.30 m is completely immersed in water. Calculate

a) weight of solid in S.I. system

b) upthrust acting on solid in S.I. system

c) apparent weight of solid in **(i)** water **(ii)** alcohol.

[Take g =10ms^{-2}; Density of water =1000 kg m^{-3}; Density of alcohol = 780 kg m^{-3}; Density of solid = 1500 kg m^{-3}]

2. A solid of density 2700 kg m^{-3} and volume 0.0015 m^3 is completely immersed in alcohol of density 800 kg m^{-3}. Calculate:

a) Weight of solid in SI system.

b) Upthrust on solid in SI system.

c) Apparent weight of solid in alcohol

d) Will the apparent weight of solid be less or more, if it is immersed completely in brine solution? Give a reason. [g =10ms^{-2}]

3. A stone of density 3000 kg m^{-3} is lying submerged in water of density 1000 kg m^{-3}. If the mass of stone in air is 150 kg, calculate the force required to lift the stone. [g =10 ms^{-2}]

4. A solid of area of cross-section 0.004 m^2 and length 0.60 m is completely immersed in water of density 1000kg m^{-3} Calculate :

a) Wt. of solid in SI system

b) Upthrust acting on the solid in SI system.

c) Apparent weight of solid in water.

d) Apparent weight of solid in brine solution of density 1050 kg m^{-3}.

[Take g = 10 N/kg; Density of solid = 7200 kg m^{-3}]

5. A solid of density 1600 kg m^{-3} is found to weigh 0.040 kgf in air. If $\frac{5}{8}$ volume of solid is completely immersed in brine solution of density 1200 kg m^{-3}, find the apparent weight of solid in brine.

6. A solid of density 7600 kgm^{-3} is found to weight 0.950 kgf in air. If $\frac{4}{5}$ volume of solid is completely immersed in solution of density 900 kg m^{-3}, find the apparent weight of solid in liquid.

7. A glass cylinder of length 12 x 10^{-2} m and area of cross- section 5 x 10^{-4} m^2 has a density of 2500 kg $^{-3}$. It is immersed in liquid of density 1500 kg m^{-3}, such that such that $\frac{3}{8}$ of its length is above liquid. Find the apparent weight of glass cylinder in Newtons.

8. A solid weighs 0.850 kgf in air and 0.575 kgf in water. Find (i) R.D. of solid (ii) Density of solid in SI system.

9. A solid weight 0.08 kgf in air and 0.065 kgf in water. Find Find (i) R.D. of solid (ii) Density of solid in SI system. [Density of water = 1000 kg m^{-3}]

10. A solid of R.D. 2.5 is found to weigh 0.120 kgf in water. Find the wt. of solid in air.

11. A solid of R.D. 4.2 is found to weigh 0.200 kgf in air. Find its apparent weight in water.

12. A cork weighs 3.5 gf in air. When tied to a sinker, the combination is found to weigh 26 gf in water. If the sinker alone weighs 30gf in water, find the R.D. of cork.

13. A sinker is found to weigh 56.7 gf in water, when the sinker is tied to a cork of weight 6 gf, the combination is found to weigh 40.5 gf in water. Calculate R.D. of cork.

14. A solid lighter than water is found to weigh 7.5 gf in air. When tied to a sinker the combination is found to weigh 62.5 gf. If the sinker alone weighs 72.5 gf in water, find R.D. of solid.

15. An iron cube of side 5cm and of R.D. 7.6 is suspended by a thread in brine solution of relative density 1.20. Find the tension in thread.

16. An aluminium cube of side 5cm and R.D. 2.7 is suspended by a thread in alcohol of relative density 0.80. Find the tension in thread.

17. A cube of lead of side 8 cm and R.D. 10.6 is suspended from the hook of a spring balance. Find the reading of spring balance. The cube is now completely immersed in sugar solution of R.D. 1.4 Calculate the new reading of spring balance.

Upthrust And Archimedes Principle DPP - 4

1. A block of wood of length 50 cm and area of cross-section 10 cm2, floats in water with $\frac{3}{5}$ of its length above water. Calculate:
   - **a)** density of wood
   - **b)** wt. of wood
   - **c)** extra force required to completely submerge it in water.
2. A hollow cylinder of copper of length 25 cm and area of cross-section 15cm2, floats in water with $\frac{3}{5}$ of its length inside water. Calculate :
   - **a)** apparent density of hollow copper cylinder
   - **b)** Wt. of cylinder
   - **c)** Extra force required to completely submerge it in water.
3. A cork cut in the form of cylinder floats in alcohol of density 0.8g cm^{-3}, such that $\frac{3}{7}$ of its length is outside alcohol. If the total length of cylinder is 35 cm and area of cross-section 25 cm^2, calculate:
   - **a)** density of cork
   - **b)** wt. of cork
   - **c)** extra force required to submerge it in alcohol.
4. A block of wood floats in brine solution of density 1.20 g cm-^{3}, such that $\frac{3}{8}$ th of its volume is above brine. Calculate the density of wood.
5. A cylinder made of copper and aluminium floats in mercury of density 13.6 g cm^{-3}, such that 0.26^{th} part of it is below mercury. Find the density of solid.
6. An iceberg floats in sea water of density 1.17 g cm^{-3}, such that $\frac{2}{9}$ of its volume is above sea water. Find the density of iceberg.
7. A block of wood floats in water with $\frac{3}{10}$ of its length above water. If the block is made to float in salt solution of R.D. 1.05, find what fraction of its length is above salt solution.
8. A wooden block floats in alcohol with $\frac{3}{8}$ of its length above alcohol. If it is made to float in water, what fraction of its length is above water? Density of alcohol is 0.80 g cm^{-3}.
9. A hollow metal cylinder of length 10cm floats in alcohol of density 0.80 g cm-^{3}, with 1 cm of its length above it. What length of cylinder will be above copper sulphate solution of density 1.25gcm^{-3}?
10. A block of wood of density 0.70g cm^{-3}, floats in a mixture of water and alcohol and density 0.98 g cm-3. What fraction of wood will be above the surface of mixture?
11. What fraction of an iceberg of density 910kg m^{-3} will be above the surface of sea water of density 1170 kg m^{-3}?

12. What fraction of metal of density 3400 kg m^{-3} will be above the surface of mercury of density 13600 kg m^{-3}? While floating in mercury?

13. A balloon of volume 100m^3 is filled with hot air of density 0.40 kg m^{-3}. If the fabric of balloon weight 16 kgf and equipment P is attached to it, such that balloon is in the state of equilibrium, calculate

- **I.** wt. of only hot air
- **II.** wt. of hot air and balloon
- **III.** wt. of hot air, balloon and equipment
- **IV.** wt. of cold air displaced
- **V.** weight of equipment of P, when density of cold air is 1.3 kg m^{-3}.

14. A balloon of volume 1000 m^3 is filled with a mixture of hydrogen and helium of density 0.32 kg m^{-3}. If the fabric of balloon weighs 40 kgf and the density of cold air is 1.32 kg m^{-3}, find the tension in the rope, which is holding the balloon to ground.

15. A balloon of volume 800 cm^3 is filled with hydrogen gas of density 9 X 10^5 g cm^{-3}. If the empty balloon weighs 0.3 gf and density of air is 1.3 X 10^{-3} g cm^{-3}, calculate the lifting power of balloon.

16. A balloon of volume 120 m^3 is filled with hot air, of density 0.38 kg m^{-3}. If the fabric of balloon weighs 12 kg, such that an additional equipment of wt. X is attached to it, calculate the magnitude of X. Density of cold air is 1.30 kg m^{-3}.