SHORT QUESTIONS

6.1 Explain what do you understand by the term viscosity?

Ans. **Viscosity:** The frictional effect between different layers of a flowing fluid is described in terms of viscosity of the fluid. Viscosity measures, how much force is required to slide one layer of the liquid over another layer. It is denoted by η. The SI unit of viscosity is Ns/m^2.

6.2 What is meant by drag force? What are the factors upon which drag force acting upon a small sphere of radius r, moving down through a liquid, depend?

Ans. **Drag Force:** An object moving through a fluid experiences a retarding force called drag force. This force increases as the speed of object through the fluid increases. In case of a spherical object moving through a fluid, the expression of drag forces is:

$$F = 6\pi\eta r v$$

This shows that drag force depends on the following factor:

(i) Radius r of the spherical body.

(ii) Speed v of the body.

(iii) Coefficient of viscosity η.

6.3 Why fog droplets appear to be suspended in air?

Ans. As we know that the expression for the terminal velocity is

$$v_t = \frac{mg}{6\pi\eta r}$$

where $\frac{g}{6\pi\eta r}$ is constant so

$$v_t \propto m$$

This shows that terminal velocity is directly proportional to mass.

As the mass of the fog droplet is very small therefore the terminal velocity is very small. So the droplet appears to be suspended in air.

6.4 Explain the difference between laminar flow and turbulent flow.

Ans. **Laminar Flow:** The fluid, flow is said to laminar if every particle of the fluid that passes a point moves along the same path as followed by particles which passed that point earlier.

Turbulent Flow: The irregular or unsteady flow of the fluid is called turbulent flow. In turbulent flow, there is a great disorder and constantly changing flow path.

6.5 State Bernoulli's relation for a liquid in motion and describe some of its applications.

Ans. **Bernoulli's Theorem:** This theorem states that "the sum of pressure, kinetic energy per unit volume and potential energy per unit volume in a steady flow of an incompressible and non-viscous fluid remains constant at any point of its path".

Mathematically it is expressed as

$$P + \frac{1}{2}\rho v^2 + \rho g h = \text{Constant}$$

where ρ is the density of the liquid and g is the acceleration due to gravity.

Applications of Bernoulli's Theorem: Following are the applications of Bernoulli's theorem:

(i) Operation of paint sprayer or perfume sprayer.

(ii) Swing of a cricket ball.

(iii) Working of a carburetor of a car.

(iv) Working of a filter pump.

6.6 A person is standing near a fast moving train. Is there any danger that he will fall towards it?

Ans. We know that according to Bernoulli's principle "the pressure will be low where the speed of the fluid is high and vice versa therefore when a person is standing near a fast moving train the speed of air between person and train is very high and pressure will be low while the speed of air behind the person is low so pressure is high, thus a force will act from high pressure to low pressure therefore the person will be in danger.

6.7 Identify the correct answer. What do you infer from Bernoulli's theorem?

(i) Where the speed of the fluid is high the pressure will be low.

(ii) Where the speed of the fluid is high the pressure is also high.

(iii) This theorem is valid only for turbulent flow of the liquid.

Ans. (i) is correct where the speed of the fluid is high, the pressure will be low.

6.8 Two row boats moving parallel in the same direction are pulled towards each other. Explain.

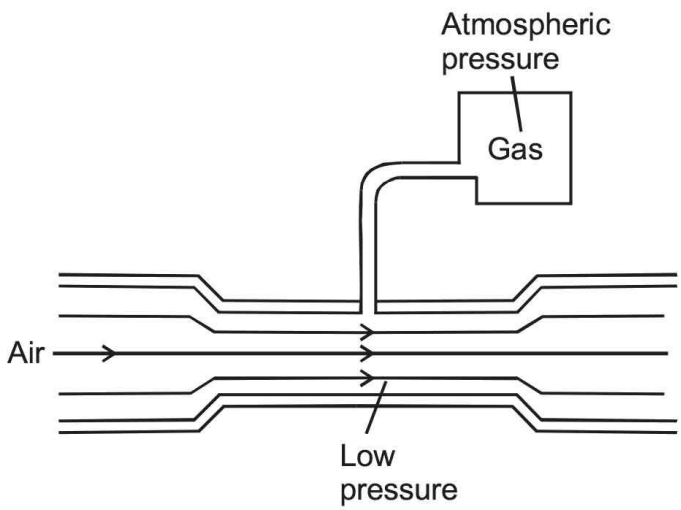
Ans. We know that according to Bernoulli's principle "the pressure will be low where the speed of fluid is high and vice versa therefore when two row boats are moving parallel in the same direction then the speed of water between the boats will be fast and pressure will be low while on the opposite sides of the boats the speed of water will be small so pressure will be high, thus a force will act from high pressure to low pressure therefore two boats are pulled towards each other.

6.9 Explain, how the swing is produced in a fast moving cricket ball.

Ans. We know that according to Bernoulli's principle "the pressure will be low where the speed of the fluid is high and vice versa". Therefore when a cricket ball is thrown by a fast bowler, the speed of air on the shining side will be fast and pressure will be low while on the rough side the speed of air is less and pressure is high. So a face will act from high pressure to the low pressure and the ball moves in a curved path called swing.

6.10 Explain the working of a carburetor of a motorcar using Bernoulli's principle and non viscous liquid is constant; thus.

Ans. Carburetor of car engine uses a venturi duct to feed the correct mixture of air and petrol to the cylinders. Air is drawn through the duct along a pipe to the cylinders. A tiny inlet at the side of duct is fed with petrol. The air through the duct moves very fast, creating a low pressure in the duct, which draws petrol vapour into air stream as shown in figure.



6.11 For which position will the maximum blood pressure in the body have the smallest value. (a) Standing up right (b) Sitting (c) Lying horizontally (d) Standing on one's head?

Ans. The blood pressure is measured at the level of heart. When lying horizontally heart does not has to work as hard as to pump against gravity because all parts of the body are in level with heart. So (c) is correct.

6.12 In an orbiting space station, would the blood pressure in major arteries in the leg ever be greater than the blood pressure in major arteries in the neck?

Ans. No, under weightlessness condition the blood pressure will be equal in major arteries of leg and neck in an orbiting space station.