

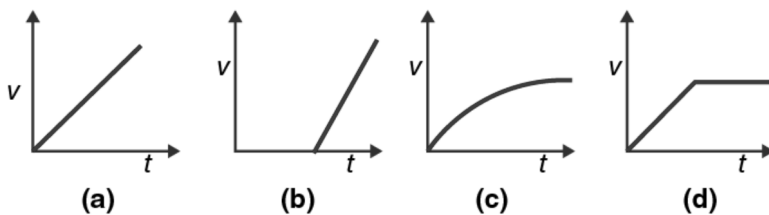
## Class 11 Physics Chapter 9: Mechanical Properties of Fluid

### Multiple Choice Questions I

1. A tall cylinder is filled with viscous oil. A round pebble is dropped from the top with zero initial velocity. From the plot shown in figure, indicate the one that represents the velocity ( $v$ ) of the pebble as a function of time ( $t$ ).

Options:

- (a) Linear increasing velocity
- (b) Constant acceleration after initial phase
- (c) Velocity increasing initially then becoming constant (terminal velocity)
- (d) Velocity with oscillating behavior

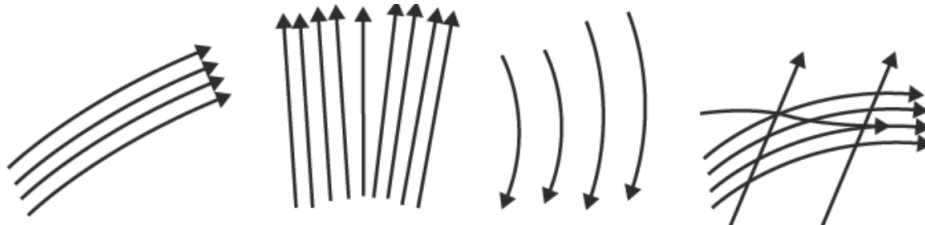


Answer: c)



**Explanation:** When a pebble falls through a viscous medium, it initially accelerates due to gravity. As velocity increases, the viscous drag force increases. Eventually, the drag force equals the gravitational force, resulting in terminal velocity where the pebble moves at constant speed.

2. Which of the following diagrams does not represent a streamline flow?



Answer: d)

**Explanation:** Streamline flow is characterized by smooth, non-intersecting flow lines. The diagram that shows intersecting or chaotic flow patterns does not represent streamline flow.

**3. Along a streamline****Options:**

- (a) the velocity of a fluid particle remains constant
- (b) the velocity of all fluid particles crossing a given position is constant
- (c) the velocity of all fluid particles at a given instant is constant
- (d) the speed of a fluid particle remains constant

**Answer:** b) the velocity of all particles crossing a given position is constant**Explanation:** In streamline flow, at any fixed point on a streamline, all fluid particles that pass through that point have the same velocity (both magnitude and direction).**4. An ideal fluid flows through a pipe of circular cross-section made of two sections with diameters 2.5 cm and 3.75 cm. The ratio of the velocities in the two pipes is****Options:**

- (a) 9:4
- (b) 3:2
- (c)  $\sqrt{3} : \sqrt{2}$
- (d)  $\sqrt{2} : \sqrt{3}$

**Answer:** a) 9:4**Solution:** Using continuity equation:  $A_1v_1 = A_2v_2$ 

- $A_1 = \pi(1.25)^2 = \pi(1.25)^2$
- $A_2 = \pi(1.875)^2 = \pi(1.875)^2$
- $v_1/v_2 = A_2/A_1 = (1.875)^2/(1.25)^2 = (3.75/2.5)^2 = (1.5)^2 = 2.25 = 9/4$

**5. The angle of contact at the interface of water-glass is  $0^\circ$ , ethylalcohol-glass is  $0^\circ$ , mercury-glass is  $140^\circ$ , and methyl iodide-glass is  $30^\circ$ . A glass capillary is put in a trough containing one of these four liquids. It is observed that the meniscus is convex. The liquid in the trough is****Options:**

- (a) water
- (b) ethylalcohol
- (c) mercury
- (d) methyl iodide

**Answer:** c) mercury**Explanation:** A convex meniscus forms when the angle of contact is greater than  $90^\circ$ . Only mercury has an angle of contact ( $140^\circ$ ) greater than  $90^\circ$ .**Multiple Choice Questions II****6. For a surface molecule****Options:**

- (a) the net force on it is zero

- (b) there is a net downward force
- (c) the potential energy is less than that of a molecule inside
- (d) the potential energy is more than that of a molecule inside

**Answer:**

- b) there is a net downward force
- d) the potential energy is more than that of a molecule inside

**Explanation:** Surface molecules have fewer neighboring molecules above them, resulting in a net inward (downward) force and higher potential energy compared to interior molecules.

### 7. Pressure is a scalar quantity because

**Options:**

- (a) it is the ratio of force to area and both force and area are vectors
- (b) it is the ratio of the magnitude of the force to area
- (c) it is the ratio of component of the force normal to the area
- (d) it does not depend on the size of the area chosen

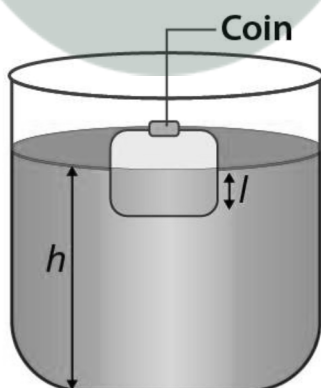
**Answer:**

- b) it is the ratio of the magnitude of the force to area
- c) it is the ratio of component of the force normal to the area

**Explanation:** Pressure is defined as the normal component of force per unit area, which gives it scalar properties.

8. A wooden block with a coin placed on its top, floats in water as shown in figure. The distance  $l$  and  $h$  are shown in the figure. After some time the coin falls into the water. Then

**Options:**



- (a)  $l$  decreases
- (b)  $h$  decreases
- (c)  $l$  increases
- (d)  $h$  increases

**Answer:**

- a)  $l$  decreases
- b)  $h$  decreases

**Explanation:** When the coin falls into the water, the total weight of the floating system decreases, so less volume needs to be submerged. Both  $l$  and  $h$  decrease.

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**9. With increase in temperature, the viscosity of**

**Options:**

- (a) gases decreases
- (b) liquids increases
- (c) gases increases
- (d) liquids decreases

**Answer:**

- c) gases increases
- d) liquids decreases

**Explanation:** In gases, molecular motion increases with temperature, causing more molecular collisions and increased viscosity. In liquids, increased thermal energy overcomes intermolecular forces, reducing viscosity.

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**10. Streamline flow is more likely for liquids with**

**Options:**

- (a) high density
- (b) high viscosity
- (c) low density
- (d) low viscosity

**Answer:**

- b) high viscosity
- c) low density

**Explanation:** High viscosity stabilizes flow and prevents turbulence. Low density reduces inertial effects that can cause turbulence.