

What is Fluid Mechanics?

Worksheet

Fluid mechanics studies the behavior of fluids - liquids and gases - under forces, covering fluid statics (fluids at rest, e.g. hydrostatic pressure $P = \rho gh$) and fluid dynamics (fluids in motion, e.g. flow rate and Bernoulli's principle).

$$A_1 v_1 = A_2 v_2$$

Questions

1. What does hydrostatic pressure depend on?
 - A) Density, gravity, and depth
 - B) Only the fluid's color
 - C) Only the container's shape
 - D) Only the fluid's temperature
2. Which branch of fluid mechanics studies fluids at rest?
 - A) Fluid dynamics
 - B) Fluid statics
 - C) Thermodynamics
 - D) Aerodynamics
3. According to Pascal's law, pressure in an enclosed fluid is...
 - A) Transmitted equally in all directions
 - B) Only felt at the bottom
 - C) Zero at the surface
 - D) Only in the direction of gravity
4. What SI unit measures pressure?
 - A) Newton
 - B) Joule
 - C) Pascal
 - D) Watt
5. Find the water pressure at a depth of 10 m ($\rho = 1000 \text{ kg/m}^3$, $g = 9.8 \text{ m/s}^2$).
6. An oil tank holds oil of density 800 kg/m³. Find the pressure at 5 m depth.
7. Find the pressure difference between depths of 3 m and 8 m in water.
8. Define: What is fluid mechanics?
9. Define: What is fluid statics?
10. Define: What is fluid dynamics?

Answer Key

1. A) Density, gravity, and depth - $P = \rho gh$ - pressure depends on density, gravity, and depth below the surface.
2. B) Fluid statics - Fluid statics deals with fluids with zero velocity.
3. A) Transmitted equally in all directions - Pascal's law: pressure change is transmitted undiminished throughout the fluid.
4. C) Pascal - Pressure is measured in pascals ($\text{Pa} = \text{N/m}^2$).
5. $P = \rho gh$ $P = 1000 \cdot 9.8 \cdot 10$ $P = 98,000 \text{ Pa} = 98 \text{ kPa}$
6. $P = \rho gh$ $P = 800 \cdot 9.8 \cdot 5$ $P = 39,200 \text{ Pa} = 39.2 \text{ kPa}$
7. $P = \rho g(h_2 - h_1)$ $P = 1000 \cdot 9.8 \cdot (8 - 3)$ $P = 1000 \cdot 9.8 \cdot 5 = 49,000 \text{ Pa}$
8. The study of how liquids and gases behave at rest (statics) and in motion (dynamics) under applied forces.
9. The study of fluids at rest, e.g. hydrostatic pressure $P = \rho gh$.
10. The study of fluids in motion, governed by continuity and Bernoulli's equation.

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