Chapter 15. Fluids

I. Density

The mass of an empty 5-gallon container is 1 kg. The mass of the same container filled with unknown fluid is 6 kg. What is the density of the fluid? (Give the answer is SI units).

II. Pressure

1. Calculate the force exerted on a hollow shell of radius $r = 2$ m by the atmospheric pressure.

III. Static Equilibrium in Fluids: Pressure and Depth

1. A fluid occupies a cylindrical container of height $h = 30$ cm. What is the gauge pressure at the bottom of the container if the density of the fluid is 1100 kg/m^3?

IV. Archimedes' Principle and Buoyancy

1. A hollow cube floats in an unknown fluid with 30% of its volume submerged. What force would you have to apply to the cube in order to fully submerge it into this fluid if the density of the fluid is $\rho = 900$ kg/m^3 and the side of the cube is equal 1 m.

V. Applications of Archimedes' Principle and Buoyancy

1. Find the density of a solid sphere if it floats in water with 30% of its volume submerged.

VI. Fluid Flow and Continuity

1. A colored fluid flows through a round hose of radius $r = 10$ cm with a speed of 2 m/s. At some point the fluid enters a tube of a smaller radius and its speed increases by 1 m/s. What is the radius of the smaller tube? Give your answer in SI units.