

THEORY

When a body is placed in a fluid, it experiences an upward force called buoyant force. This force is equal to the weight of the fluid displaced by the body. If the buoyant force is greater than the weight of the body, the body will float. If the buoyant force is less than the weight of the body, the body will sink. If the buoyant force is equal to the weight of the body, the body will be suspended in the fluid.

The buoyant force is given by the equation:

$$F_b = \rho_f V_d g$$

where F_b is the buoyant force, ρ_f is the density of the fluid, V_d is the volume of fluid displaced, and g is the acceleration due to gravity.

The weight of the body is given by the equation:

$$W = \rho_b V_b g$$

where W is the weight, ρ_b is the density of the body, V_b is the volume of the body, and g is the acceleration due to gravity.

For a body to float, the buoyant force must be equal to the weight of the body:

$$\rho_f V_d g = \rho_b V_b g$$

which simplifies to:

$$\rho_f V_d = \rho_b V_b$$

Since the volume of fluid displaced is equal to the volume of the body submerged, we can write:

$$\rho_f V_{sub} = \rho_b V_b$$

which gives us the ratio of the submerged volume to the total volume of the body:

$$\frac{V_{sub}}{V_b} = \frac{\rho_b}{\rho_f}$$

This ratio is known as the specific gravity of the body. It is a dimensionless quantity that indicates how dense the body is relative to the fluid it is in.