

Modern Language School

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Write a note on Archimedes principle.

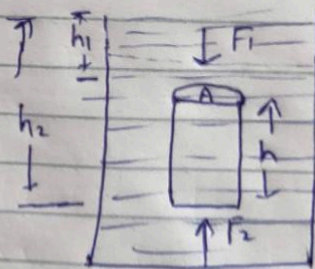
Statement :- "When an object is totally or partially immersed in a liquid an upthrust acts on it equal to the weight of the liquid it displaces."

Explanation :-

When a balloon or an object is immersed in liquid, the liquid puts an outward force on the object, this upward force is called upthrust and due to this force the weight of the object in the liquid reduces. Upthrust is equal to the weight of the object.

Mathematical Portion :-

Consider a cylinder of height "h" and cross-sectional area "A" is immersed in liquid. Upthrust acts upon it.



$$h = h_2 - h_1 \quad (\text{difference in height})$$

If P_1 and P_2 are pressure
at top and bottom respectively

$$P_1 = \rho g h_1$$

$$P_2 = \rho g h_2$$

then force F_1 and F_2 are

$$P_1 = \frac{F_1}{A}, \quad P_2 = \frac{F_2}{A}$$

$$F_1 = P_1 A, \quad F_2 = P_2 A$$

upward force, downward force

$$\text{Net force} \Rightarrow F_2 - F_1 = P_2 A - P_1 A$$

$$F_2 - F_1 = \rho g h_2 A - \rho g h_1 A$$

$$F_2 - F_1 = \rho g A (h_2 - h_1)$$

$$F_2 - F_1 = \rho g A h$$

$$F_2 - F_1 = \rho g V$$

this net force is equal to
upthrust of liquid
upthrust = $\rho g V$

$$\text{upthrust} = mg$$

$$\boxed{\text{upthrust} = \text{weight}}$$

Prove that upthrust of liquid is

equal to weight of object immersed
Principle of floatation:-

"A floating object displaces a fluid having weight equal to the weight of object."

According to this

Object sink when upthrust is less than weight

Object floats when weight is ~~and~~ less than upthrust

Object in liquid when upthrust and weight are equal.

Why stone or needle is sink in water but big ships floats.

Needle sink in water because its weight is greater than upthrust

while ships are design in such a way that their weight is always less than upthrust.

IF a small hole come in ship, its weight start increasing and it sinks.

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2) How Submarine goes into the water and comes out?

Submarine have tanks of water which can be filled or empty. When tanks are empty weight of submarine is less than upthrust so it floats on water. When submarine is need to go into water, its tanks full with water and its weight become equal to upthrust of water and it remains in water.

2) How density of object can be find using Archimedes principle?

Archimedes principle is helpful in determine the density of an object. Ratio of the weight of body with an equal volume of liquid is same as their densities.

$$\frac{D}{\rho} = \frac{W_1}{W_2}$$

$$D = \frac{W_1}{W_2 - W_1} \times \rho$$

$$\dots (W = W_2 - W_1)$$

here W_1 is weight of object and W_2 is weight of object in liquid. D is density of object and ρ is density of liquid.