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[TENDER HEART HIGH SCHOOL ; SEC-33B, CHD]

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CLASS- IX

Sub:- PHYSICS ; CH-5 (c) [FLOATATION]

⇒ Condition for the floatation of a body :→

Weight of body = wt. of liquid displaced by the submerged part of the body

OR $\boxed{W = F_B}$

F_B – Buoyant force

∴ Apparent weight of the floating Body = 0 (Zero)

Q1 State Principle of floatation ?

Ans It states that the weight of the floating body is equal to the liquid displaced by ~~the~~ its submerged part.

Qus2– Write applications of the principle of floatation ?

Ans :– (1) floatation of iron ship
(2) floatation of a human Body
(3) floatation of Submarines

Q3 :→ Why a ship floats in water ?

Ans :→ Ships are made of iron and hollow from inside. ∴ Empty space inside the ship Contains air which makes its volume large and average density less than that of water ($\because$ density = $\frac{\text{mass}}{\text{Volume}}$). Therefore weight

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of the water displaced by the submerged part of the ship becomes equal to the total weight of ship and so it floats.

Q4 :→ What is Plimsoll Line ?

Ans :→ It is a white line painted on its side indicates the safe limit for loading the ship in water of density $10^3 kg\,m^{-3}$.

Q5 :→ Give reasons :—

(a) A loaded ship is submerged more while unloaded ship is less submerged.

(b) It is easier to swim in sea water than in fresh water for a man.

Ans 5(a) A loaded ship due to its weight sinks more to displace more water so that weight of the water displaced by its submerged part becomes equal to the weight of loaded ship. While unloaded ship is less submerged because when a ship is unloaded ship will rise in water till the weight of the water displaced balances the weight of unloaded ship.

5(b) The density of sea water is more (∵ of presence of minerals) i.e $1.026\ g/cm^3$ than that of fresh water ($1.0\ g/cm^3$). So, for a smaller portion of body submerged in sea water, weight of the water displaced becomes equal to the total weight of body. But in fresh water, large portion of the body will have to be submerged in water. So, it is quite difficult to swim in fresh (river) water.

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* **Floatation of Ice bergs:** → The density of ice is (0.917g/cm³) is lesser than density of water. ∴ icebergs (Huge masses of ice) are able to float with major part inside the water.

⇒ **Floatation of fish:** → * When a fish has to rise up in water, it diffuses oxygen gas from its blood to the bladder, thereby increases the volume and decreases the average density. Therefore volume of water displaced by fish is also increases. This will further increase the upthrust (Buoyant force) due to which fish rises up. (∵ larger is the volume of submerged part of body, greater is the upthrust)

* When the fish has to come down in water, it emptics its bladder to the required extent thereby decreasing volume and increasing density. So upthrust will decrease & fish goes down in water.

⇒ **Rising of Balloons:** → Helium balloons rise because helium gas inside the balloon is less dense or lighter than air. So balloon becomes lighter than air outside the balloon. So, buoyant force will push the balloon upwards. We know here buoyant force is equal to the weight of the air displaced by the balloon which is more than that of weight of the gas filled balloon. Therefore, it rises up. (because of greater upthrust.

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Q The Balloon does not rise indefinitely in air explain briefly?

Ans density of air decreases with altitude. So, as the balloon goes up, weight of the air displaced by the balloon (i.e upthrust) decreases. The balloon will Continue to rise until it reaches an altitude where the air becomes equal to the density of the balloon. At this point, buoyant force will be equal to the weight of balloon so it stops rising.

Qus Explain the following :—

(a) An Egg sinks in fresh water, but floats in a strong salt solution? Explain?

Ans As salt solution is more denser than fresh water (density of salt solution is high). density of egg is less So It will float Or Salt solution exerts more upthrust on egg that balances it weight so egg will float

(b) A toy balloon filled with Hydrogen gas rises to ceiling but if filled with Carbon-dioxide sinks to the floor Why?

Ans Density of carbondioxide gas is much more than density of hydrogen gas. So, weight of the air displaced by Carbon-dioxide gas is less than the weight of the balloon filled with Carbondioxide gas So It will sink to bottom.
While in Case of Hydrogen gas, upthrust is more than weight of balloon So it rises up.