According to new syllabus of all intermediate boards of Sindh.

Prof. Rawala's ……..

PHYSICS

HELPING BOOK

For
Class XI
(All science students)

UNIT -6

Fluid statics

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Thoroughly revised and updated 2026 – 2027

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Unit. 6…..

Fluid statics

Fluids:

Q.No.1: What is a fluid?

Ans: There are three states of matter. States of matter that can flow are called ***fluids***. Since liquids and gasses can flow therefore, broadly speaking they are called **fluids**.

Q.No.2: What is fluid statics?

Ans: **Fluid statics** is a branch of physics in which we study properties of a stationary fluid (i.e. a fluid at rest).

Similarities and differences between physical properties of liquids and gasses:

Physical property	*Gasses*	*Liquids*
Volume.	No fixed volume, assumes volume of the container.	Fixed volume (although there is a slight change in volume when high external pressure is applied).
Shape.	No fixed shape.	No fixed shape.
Density.	Low density.	Higer density compared to gasses.
Compressibility	Highly compressible.	Low compressibility.
Viscosity.	Negligibly low viscosity.	Higher viscosity, some liquids are highly viscose.

Q.No.3: What is an ideal fluid?

Ans: An ***ideal fluid*** is that which is ***incompressible***, it means that its volume cannot be changed by applying external pressure on its surface.

Since **density is mass per unit volume**, therefore, **density of an ideal fluid remains constant** (its mass and volume both are not changing when external pressure is applied).

In other words, since volume of liquids **do not change appreciably** on applying external pressure on their free surface, therefore, they **can be considered as ideal fluids** in ordinary sense.

On applying external pressure, volume of gasses change, therefore, gasses are **not ideal fluids**.

Pascal's law:

Q.No.4: State Pascal's law.

Ans: According to Pascal's law:

"When pressure is changed at any point in a stationary fluid, this change in pressure is equally transmitted to all points in the fluid".

Applications of Pascal's law:

Q.No.5**: *Describe some applications of Pascal's law.***

Ans: **(*1*) *Hydraulic brake system***:

Hydraulic brake system of cars is an application of Pascal's law. Brake system of a car has a cylinder, called **master cylinder**, it is attached to the brake padel. When the driver presses the brake padel this increased pressure pushes the piston in the master cylinder. This increased pressure is transmitted equally to each brake cylinder provided with rear wheels in a front wheel drive car. Increased pressure is transmitted to entire braking system through the incompressible brake fluid (brake oil) filled in each cylinder and a strong metallic tube that connects all the cylinders with each other. In modern cars front wheels are provided with strong metallic disc rotating along with the wheel.

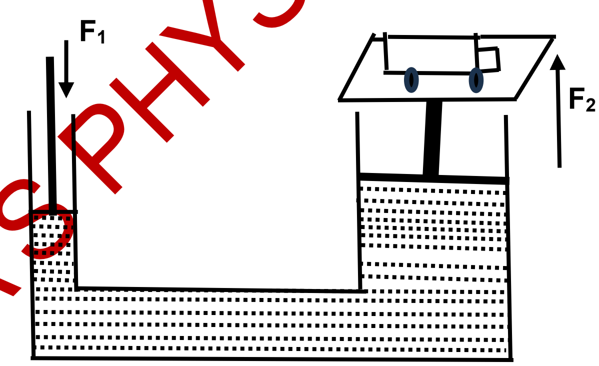
Increased transmitted pressure opens the brake pad which applies a strong force of friction to the rotating wheel drum, forcing the car to slow down. As soon as the brake padel is released pistons in all cylinders move back to their original positions, a spring pulls back the brake shoe and the car is again able to move as before.

(*2*) *Hydraulic lift*:

Pascal's law is applied to lift heavy objects such as a heavy car by applying a small force as in hydraulic lift.

Hydraulic lift has a U-shaped container filled with an ***incompressible*** liquid (a liquid that cannot be compressed on applying force on it, so that its volume does not change keeping its density constant. Real liquids show a slight change in their volume on being compressed).

This U-shaped container has **two cylinders** at its two ends; both provided with pistons. One of the cylinders is **narrower** than the other cylinder. Wider cylinder carries a platform on which a car can be parked easily.



Hydraulic lift

If a force F_1 is applied on the piston of **narrower cylinder** of area A_1, then pressure applied on it will be $P_1 = F_1/A_1$. Since the liquid in the tube is assumed to be **incompressible**, therefore, according to Pascal's law, this increased pressure will be **equally transmitted** throughout the liquid. Pressure on piston of **wider cylinder** will be **same** as the pressure on piston of **narrower cylinder**, but since this piston is of large area "A_2" therefore, force on this piston will also be large so that pressure on this piston is the same. If F_2 is the output force at piston of **wider cylinder** of area A_2 the pressure on it will be $P_2 = F_2/A_2$.

But input pressure P_1 = Out put pressure P_2 (**Pascal's law**)

Therefore, $$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$\therefore \qquad \frac{F_2}{F_1} = \frac{A_2}{A_1}$$

$$\boxed{F_2 = \frac{A_2}{A_1} F_1}$$

We can see from this formula that the value of output force "F_2" (Force required to lift heavy load i.e. a car) can be increased to any desired value by increasing the area "A_1" of output (larger) piston that carries the car.

Since both pistons are circular in shape, therefore, $A_1 = \pi r_1^2$ and $A_2 = \pi r_2^2$.

$$F_2 = \frac{\cancel{\pi} r_2^2}{\cancel{\pi} r_1^2} F_1 \qquad \text{OR} \qquad \boxed{F_2 = \frac{r_2^2}{r_1^2} F_1}$$

Where "r_1" is radius of smaller and "r_2" is the radius of larger piston. This formula shows that if ratio (r_2^2 / r_1^2) is 10 (suppose) then force F_2 applied on smaller piston will be able to lift 10 times heavier load.

***<u>Mechanical advantage of hydraulic lift</u>*:** Mechanical advantage of any machine is the ratio of output force to input force (Load lifted to effort applied). It tells you about how many times the force required to lift a load will be **<u>greater</u>** than the applied force.

In this case:

$$\text{Mechanical advantage of a Hydraulic lift} = \frac{F_2}{F_1}$$

If mechanical advantage of a lift is 100 then that machine will be able to lift a 100 times heavier load, ***<u>it means that</u>*** this particular machine will be able to lift a 10000 Newton car by applying only 100 Newton on the smaller piston.

***<u>Example</u>*:** Let the radius of smaller piston be 25 cm. (= 0.25 m), radius of wider piston be 1 m. and the applied force is 90 N, then:

$$F_2 = \frac{A_2}{A_1} F_1 = \frac{\pi r_2^2}{\pi r_1^2} F_1$$

$$F_2 = \frac{r_2^2}{r_1^2} F_1 = \frac{(1)^2 \times 90}{(0.25)^2} = 16 \times 90 = \mathbf{1440\ N}$$

From this example you can see that output force can be increased by 16 times i.e. only **90 N** input force will be needed to lift **1440 N** load (this is for an ideal lift, free of friction, if there is friction then a part of input energy will be wasted to overcome friction).

Mechanical advantage of this lift will be: $\dfrac{\text{Output force}}{\text{input force}} = \dfrac{F_2}{F_1} = \dfrac{1440}{90} = 16$

***<u>Upthrust or Buoyant force</u>*:**

<u>Q.No.6</u>*: *What is upthrust (or Buoyant force)?

***<u>Ans</u>*:** When a body is immersed in a fluid (any liquid or any gas) it experiences an upward force, exerted by the fluid, this force is known as ***<u>upthrust or buoyant force</u>*.**

Pressure in a fluid depends mainly upon its density and depth, as a body is immersed deeper into a fluid there will be a difference in pressure of the liquid between lower and upper surfaces of the body.

We know that pressure in a fluid is equal at all points and acts in all directions lying at the same depth, hence when a body is fully immersed into a fluid then pressure exerted by the fluid on the upper surface of the body is less than the pressure at its lower surface (Lower surface is deeper)

This difference in pressure results in an upward directed force acting on lower side of the body, called ***<u>upthrust or buoyant force</u>*.**

***Q.No.7*: Why does a body appear to be lighter when immersed in a fluid?**

***Ans*:** Due to upthrust body appears to be lighter when immersed in a fluid i.e. its apparent weight is less than its true weight.

Upthrust helps io support a body and tends to prevent it from sinking.

Since density of liquids is more than the density of gasses due to which liquids exert more pressure, ***in other words***, upthrust in liquids is much more than in gasses.

- If density of object is ***less*** than the density of liquid, the object will ***float***
- If density of object is ***equal*** to the density of liquid, the object will ***remain suspended in the liquid*** just like a fish.
- If density of object is ***more*** than the density of liquid the object will ***sink***, because the upthrust will be smaller than weight of the body and will not be enough to support it.

Archimede's principle:

***Q.No.8*: State Archimede's principle.**

***Ans*:** According to Archimede's principle:

"When an object is immersed into a liquid it experiences upthrust equal to weight of the liquid displaced."

The magnitude of upthrust depends upon:

- ***Volume of the body immersed***, because more is the volume of the body immersed more is the volume of fluid displaced, more will be the upthrust.
- ***Density of the fluid*** more is the density of fluid more will be the upthrust.

Due to ***upthrust***, exerted by the liquid the object appears to loss some of its weight. Hence a body immersed in a liquid appears to be **lighter**.

In other words:

Volume of liquid displaced = volume of body immersed. If a body is fully immersed then the volume of liquid displaced is equal to total volume of the body but if a body is partially immersed then volume of liquid displaced will be equal to volume of the body inside the liquid.

Apparent weight of a body = its actual weight – upthrust

The magnitude of upthrust or buoyant force, according to Archimede's principle, is given by:

Buoyant force = density of fluid × Volume of fluid displaced × acceleration due to gravity.

$$\boxed{\text{Buoyant force} = \rho V g}$$

Density ρ = mass m / volume V
mass of liquid displaced m = density of liquid ρ × volume V of liquid displaced.
$m = \rho \times V$
Weight of liquid displaced (Buoyant force)= m g
$\boxed{\text{Weight of liquid displaced (Buoyant force)} = \rho V g}$

Principle of floatation:

A needle made of steel sinks in water whereas huge cargo ships made of steel do not sink, instead they float. The reason for this observation is that a needle displaces a small volume of liquid and the weight of liquid displaced is quite small as compared to weight of the needle. Hence the upthrust acting on the needle is not enough to support it, therefore, it sinks. A huge cargo ship because of its shape and because of large empty spaces inside the ship displaces large volume of liquid. Weight of this large volume of liquid displaced is enough to support a loaded cargo ship and prevents it from sinking.

In other words:

" ***A floating object displaces weight of fluid equal to its own weight***".

Ships and submarines are designed on this principle; principle of floatation is based on Archimede's principle.

***In gasses (e.g air)*:**

***"An object (e.g. a balloon) surrounded by air experiences a force equal to weight of air displaced"*.**

Airships and hot air balloons etc. displace large quantity of air, such that if weight of air displaced is ***more*** than balloon's own weight than balloon **rises** up (because there will be **more upthrust**).

But if weight of air displaced is ***less*** than balloon's own weight then balloon **descends** (because there will be **less upthrust**).

If weight of air displaced is ***equal*** to balloon's own weight than balloon **hovers** at a constant altitude. (because there will be **equal upthrust**).

Surface tension:

Q.No.9*: *What is surface tension?

***Ans*:** Surface tension of a liquid may be defined as:

"***The force per unit length acting on either side of an imaginary line drawn on the liquid surface at rest. Direction of this force is along tangent to the surface and is perpendicular to the line"***

$$\text{Surface tension} = \frac{F}{L} \quad \text{(SI unit N/m)}$$

Due to surface tension, surface of a liquid acts as a **membrane**. It is the surface tension due to which surface of a liquid tends to have **minimum surface area**. Due to surface tension, a liquid **supports** a needle, liquid surface assumes a **concave shape**, liquid **rises in a capillary tube**, due to capillary action, water rises from roots to the top most points of the tallest threes on the our beautiful little EARTH and a liquid **bubble is spherical** in shape and so on.

***<u>Section–A Multiple-Choice Questions MCQs</u>*:**

***<u>Q.No.1</u>*:** A completely submerged object always displaces its own ………

(A) weight of fluid. (B) volume of a fluid
(C) density of a fluid. (D) Area of a fluid.

***<u>Q.No.2</u>*:** The pressure exerted on the ground by a man is greater when:

(A) he stands with both feet flat on the ground
(B) he stands flat on one foot.
(C) he stands on the toes of one foot.
(D) he lies down on the ground.

***<u>Q.No.3</u>*:** In a stationary homogeneous liquid:

(A) pressure is the same at all points.
(B) pressure depends on the direction.
(C) pressure is independent of any atmospheric pressure on the upper surface of the liquid.
(D) pressure is the same at all points at the same level.

***<u>Q.No.4</u>*:** one piston in a hydraulic lift has an area that is twice the area of all others. When the pressure at the smaller piston is increased by Δp the pressure at the larger piston:

(A) increases by 2 Δp (B) increases by $\Delta p/2$
(C) increases by Δp. (D) increases by 4 Δp

***<u>Q.No.5</u>*:** In vacuum, an object has:

(A) No buoyant force. (B) no mass.
(C) no weight. (D) none of these.

***<u>Q.No.6</u>*:** The pressure at the bottom of a pond does NOT depend on:

(A) Water density. (B) depth of the pond.
(C) surface area of the pond (D) None of these

***<u>Q.No.7</u>*:** A rock suspended by a weighing scale weighs 5 N out of water and 3 N when submerged in water. What is the buoyant force on the rock?

(A) 2 N. (B) 5 N. (C) 8 N. (D) 15 N.

***<u>Q.No.8</u>*:** "An object completely submerged in a fluid displaces its own volume of fluid". This is:

(A) Pascal's paradox. (B) Archimede's principle
(C) Pascal's principle.(D)true, but none of the above

***<u>Q.No.9</u>*:** Salt water has greater density than freshwater. A boat floats in both freshwater and salt water. The buoyant force on the boat in saltwater is …………. that in freshwater.

(A) equal to (B) smaller than
(C) larger than (D) same as

***<u>Q.No.10</u>*:** You fill a tall glass with ice and then add water to level the glass's rim, so some fraction of the ice floats above rim. When ice melts, what happens to water level?

(A) water overflows the rim.
(B) water level drops.
(C) water level stays at the rim.
(D) it depends on the difference in density between water and ice.

<u>Q.No.11</u>*:** The S.I unit of surface tension is: (2025 Karachi Board***)

(A) N. (B) $\frac{N}{m}$ (C) $\frac{N}{m^3}$ (D) $\frac{m}{N}$

<u>Q.No.12</u>*:** The buoyant force on an object in salt water compared to that in fresh water will be: (2026 Karachi Board***)

(A) the same. (B) smaller.
(C) Zero. (D) Greater.

Answers:

(1) (A) weight of fluid.
(2) (C) he stands on the toes of one foot.
(3) (D) pressure is the same at all points at the same level.
(4) (C) increases by Δp.
(5) (A) No buoyant force.
(6) (C) surface area of the pond.
(7) (A) 2 N.
(8) (N) Archimede's principle
(9) (C) Larger than
(10) (C) Water level stays at the rim.
(11) (B) $\frac{N}{m}$
(12) (D) Greater.

Numericals:

***Q.No.1*: In a hydraulic press a force of 20 N is applied to a piston of area 0.20 m^2. The area of the other piston is 2.0 m^2. What is:**

(a) Pressure transmitted through the fluid

(b) The force on the piston.

***Data*:**

Force on smaller piston $F_1 = 20$ N

Area of smaller piston $A_1 = 0.20$ m^2

Areas of larger pistons $A_2 = 2.0$ m^2

(a) Pressure transmitted $P = ?$

(b) Force on the piston (Larger) $F_2 = ?$

***Solution*:**

(a) Pressure is equally transmitted everywhere (Pascal's law), Hence pressure on smaller piston:

$$P = \frac{F_1}{A_1} = \frac{20}{0.20} = \mathbf{100\ N/m^2 \text{ or } 100\ Pa.}$$

(b) Force on the larger piston is given by:

$\therefore \quad F_2 = P A_2 = 100 \times 2.0 \qquad \boxed{F_2 = \mathbf{200\ N.}}$

***Q.No.2*: The pressure in a water pipe on the ground floor of a building is 4×10^5 Pa but three floors up it is only 2×10^5 Pa. What is height between the ground floor and the third floor? Water in the pipe may be assumed to be stationary, density of water =1×10^3 kg/m^3.**

***Data*:**

Pressure of water at ground floor $P_1 = 4\times10^5$ Pa

Pressure of water at third floor $P_2 = 2\times10^5$ Pa

Density of water $\rho = 1\times10^3$ kg/m^3.

Height between the floors $h = ?$

***Solution*:**

Difference of pressures $= P_1 - P_2$

But $P_1 - P_2 = \rho g h$

$\therefore \quad 4\times10^5 - 2\times10^5 = 1\times10^3 \times 9.8\ h$

$2\times10^5 = 9.8 \times10^3\ h$

$\therefore \quad h = \dfrac{2\times10^5}{9.8\times10^3} \qquad \boxed{h = \underline{\mathbf{20.4\ m}}}$

***Q.No.3*: The small piston of hydraulic press has an area of 10.0 cm^2. If the applied force is 50.0 N, what must the area of the large piston be to exert a pressing force of 4800 N ?**

***Data*:**

Area of small piston $A_1 = 10.0$ cm$^2 = 0.001$m^2

Applied force $F_1 = 50.0$ N

Output force $F_2 = 4800$ N

Area of large piston $A_2 = ?$

***Solution*:**

According to Pascale's law:

$P_1 = P_2$ OR $F_1/A_1 = F_2/A_2$

$$\therefore \quad A_2 = \frac{F_2 A_1}{F_1} = = \frac{4800 \times 0.001}{50.0}$$

$$\boxed{A_2 = \underline{\mathbf{0.096\ m^3}} = \underline{\mathbf{960\ cm^3}}}$$

***Q.No.4*: Mechanical advantage of a hydraulic jack is 420. Find weight of the heaviest automobile that can be lifted by an applied force of 55 N.**

***Data*:**

Mechanical advantage M.A = 420

Applied force F = 55 N.

Heaviest weight lifted W =?

***Solution*:**

By definition: $M.A = \dfrac{W}{F} = \dfrac{\text{Output force (Load lifted)}}{\text{Input force (applied force)}}$

W = M.A × Input or applied force F

$W = 420 \times 55 \qquad \boxed{\underline{\mathbf{W = 23100\ N.}}}$

***Q.No.5*: A flat-bottom river barge is 30 ft wide, 85 ft long and 15 ft deep.**

(a) how many ft^3 of water will displace while the top stays 1 m. above the water.

(b) What load in tons will the barge contain under these conditions if the empty barge weighs 160 tons in dry dock.

***Data*:**

Length L = 85 ft. Width (breadth) b = 30 ft.

Depth h = 15 ft

(a) Volume of water displaced V=?

(b) Load in the barge = ?

Weight of barge W =160 tons.

***Solution*:**

(a) Volume displaced V= L b (depth immersed)

Volume displaced $V = 85 \times 30 \times (15 - 3.28)$

(1m above water =3.28ft) $= \underline{\mathbf{29886\ ft^3}}$.

But 1 m^3 = (3.28)^3 ft^3.

$\therefore$ Volume displaced $V = \dfrac{29886}{(3.28)^3}$ m^3= $\underline{\mathbf{847\ m^3}}$.

(b) Weight of water displaced =Bouncy = $\rho V g$

$= 1 \times 10^3 \times 847 \times 9.8 = 8300.6$ N

(Density of water is taken as $\rho = 1 \times 10^3$ kg/m^3)

But 1 tone = 9807 N

$\therefore$ Bouncy = $\dfrac{8300.6}{9807}$ tones = $\underline{\mathbf{846.4\ tones}}$.

Load in the barge=Bouncy – weight of the barge

Load in the barge = 846.4 –160 = $\underline{\mathbf{686.4\ tones}}$

Q.No.6: A canal lock gate is 20 m wide and 10 m deep. Calculate the thrust acting on it assuming that the water in the canal is in level with the top of the gate. Density of water is 1000 kg/m^3.

***Data*:**

Width $W = 20$ m, Depth $h = 10$ m

Density of water $\rho = 1000$ kg/m^3.

Thrust $F = ?$

***Solution*:**

Average pressure on the gate $P = \rho\, g$ (average depth)

$$= 1000 \times 9.8 \times \frac{10}{2} = 49000 \text{ N/m}^2.$$

Thrust $F = P\,A = 49000\,(20 \times 10)$

Thrust $F = \underline{\mathbf{9800000\ N}} = \underline{\mathbf{9.8 \times 10^6\ N}}$.

Q.No.7: A tank 4 m long, 3 m wide and 2 m deep is filled to the brim with paraffin (density 800 kg/m^3). Calculate the pressure on the base.

What is the thrust on the base?

***Data*:**

Length $L = 4$ m. width (or breadth) $W = 3$ m

Depth $h = 2$ m density $\rho = 800$ kg/m^3

Pressure $P = ?$ Thrust $= ?$

***Solution*:**

Since $P = \dfrac{\text{Force}}{\text{Area}} = \dfrac{mg}{L\,b}$

Density $\rho = \dfrac{\text{mass}}{\text{Volume}} = \dfrac{m}{L\,b\,h}$ $\quad m = \rho\, L\, b\, h$

$\therefore \quad P = \dfrac{\rho\, L\, b\, h\, g}{L\, b} = \rho\, g\, h$

Pressure on the base $P = 800 \times 9.8 \times 2$

$= \underline{\mathbf{15680\ N/m^2.(or\ Pa)}}$

Thrust on the base = Pressure $\times$ Area

Thrust $= 15680 \times L\,b = 15680 \times 4 \times 3 = \underline{\mathbf{188160\ N}}$.

Q.No.8: A rectangular boat is 4.0 m wide, 8.0 m long and 3.0 m deep.

(a) How much water will it displace if the top stays 1 m above the water?

(b) What load will the boat contain under these conditions if the empty boat weighs 8.60×10^4 N in dry dock?

***Data*:**

Length $L = 8.0$ m. Width $W = 4.0$ m

Depth of boat inside water $h = 3.0 - 1.0 = 2.0$ m.

(a) Volume of water displaced $V = ?$

(b) Load in the boat $W = ?$

***Solution*:**

(a) Water displaced = volume of boat submerged

$= L\,W\,h = 8.0 \times 4.0 \times 2.0 = \underline{\mathbf{64.0\ m^3}}$.

(b) Bouncy = Weight of boat + Load in the boat

But Bouncy = weight of liquid displaced $= \rho\, g\, V$

$\therefore \quad \rho\, g\, V$ = Weight of boat + Load in the boat

$\therefore \quad$ Load in the boat $= \rho\, g\, V$ – Weight of boat

Load in the boat $= 1000 \times 9.8 \times 64 - 8.60 \times 10^4$

Load in the boat $= 627200 - 8.60 \times 10^4$

$\therefore \quad$ Load in the boat = $\underline{\mathbf{541200\ N}}$.

Q.No.9: A hot air ballon has a volume of 2200 m^3. The density of air at temperature of 20°C is 1.205 kg/m^3. The density of the hot air inside the ballon at a temperature of 100°C is 0.946 kg/m^3.

How much weight can the hot air balloon lift?

***Data*:**

Volume of balloon volume of displaced air $V = 2200$ m^3

Density of air inside the ballon $\rho_1 = 0.946$ kg/m^3.

Density of air outside the ballon $\rho_2 = 1.205$ kg/m^3.

Weight lifted $W = ?$

***Solution*:**

Weight of balloon $= \rho_1\, g\, V = 0.946 \times 9.8 \times 2200$

$= 20395.76$ N

Upthrust $= \rho_2\, g\, V = 1.205 \times 9.8 \times 2200$

$= 25979.8$

But Upthrust = Weight of balloon + Weight lifted

$\therefore$ Weight lifted = Upthrust – Weight of balloon

$\therefore \quad$ Weight lifted $= 25979.8 - 20395.76$

$\therefore \quad$ Weight lifted = $\underline{\mathbf{5584.04\ N}}$.

(This gives us maximum load that can be lifted)

Q.No.10: A spherical balloon has a radius of 7.15 m and is filled with helium. How large a cargo can it lift, assuming that the skin and structure of the balloon have a mass of 930 kg? Neglect the buoyant force on the cargo volume itself.

***Data*:**

Radius of balloon $r = 7.15$ m

Volume of balloon $V = \dfrac{4}{3}\pi r^3 = \dfrac{4}{3} \times \dfrac{22}{7}(7.15)^3$

Volume of balloon $V = 1531.73$ m^3.

Mass of balloon $m = 930$ kg

Cargo lifted $W = ?$

Density of Helium $\rho_1 = 0.179$ kg/m^3.

Density of air $\rho_2 = 1.29$ kg/m^3.

Solution:

Upthrust = Weight of balloon + Weight of helium + Cargo lifted

$\therefore$ Cargo lifted = Upthrust – Weight of balloon – Weight of helium

$\therefore$ Cargo lifted = ρ_2 g V – m g – ρ_1 g V

(volume of air displaced=volume of helium or of balloon)

$\therefore$ Cargo lifted = $1.29\times9.8\times1531.73 - 930\times9.8 - 0.179\times9.8\times1531.73$

$\therefore$ Cargo lifted = $19364.13 - 9114 - 2686.96$

$\therefore$ Cargo lifted = $19364.13 - 11800.96$

$\therefore$ Cargo that can be lifted **= <u>7563.17 N</u>.**

***Q.No.11*: A tank 4 m long, 3 m wide and 2 m deep is filled to the brim with paraffin of density 800 kg/m^3.**

Calculate the pressure on the base.

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Data:

Length L=4 m. width (or breadth)W= 3 m

Depth h = 2 m density ρ = 800 kg/m^3

Pressure P = ?

Solution:

Since $P = \dfrac{\text{Force}}{\text{Area}} = \dfrac{mg}{L\,b}$

Density $\rho = \dfrac{\text{mass}}{\text{Volume}} = \dfrac{m}{L\,b\,h}$ $\quad$ m = ρ L b h

$\therefore$ $P = \dfrac{\rho\,L\,b\,h}{L\,b}\,g = \rho\,g\,h$

Pressure on the base P = $800 \times 9.8 \times 2$

= **<u>15680 N/m^2.(or Pa)</u>**

***Q.No.12*: The small piston of hydraulic press has an area of 10.0 cm^2. If the applied force is 50.0 N, what must the area of the large piston be to exert a pressing force of 4800 N ?**

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Solution: See solution of Q.No.3 of this chapter.