Pressure

1. Tick (✓) the best answer

a. When you open the door of a single-door room suddenly, the half-open curtain of the window is seen pressed? Which law best describes such observation?

⇒

i. Archimede's principle
ii. Pascal's law ✓
iii. Law of floatation
iv. Newton's Law

b. Which of the following conditions predicts rising up of wooden piece immersed in water?

i. Weight of wooden piece = weight of displaced water
ii. Weight of wooden piece > weight of displaced water
iii. Weight of wooden piece < weight of displaced water ✓
iv. Weight of wooden piece = volume of displaced water

c. Which of the following equipment is not based on Pascal's law?

i. ⇒ Hydraulic brakes
ii. Hydraulic press
iii. Ship ✓
iv. Hydraulic lift

d. A brick showed separate weights while weighing in different media such as air, water, salt solution and kerosene randomly: which one could be the weight of brick in air?

→

i. 20N ✓ ii. 14N iii. 16N. iv. 17N

e. If two solid boxes made of different materials experienced the same upthrust while placing in water, which of the following quantities can be same in both of them?

→

i. mass ii. weight

iii. density iv. volume ✓

2. Answer these questions in one sentence.

a. What is relation between force and pressure?

→ Pressure is defined as the force acting perpendicular on unit area.

$$\text{pressure} = \frac{\text{Force}}{\text{Area}}$$

b. Define one pascal pressure.

→ one pascal pressure is defined as the pressure created when 1 Newton force acts on the area of $1m^2$.

$$P = \frac{F}{A}$$

If $F = 1\,N$ and $A = 1\,m^2$

$P = 1$ pascal.

c. State the law of floatation.

→ An object that floats on liquid displaces the liquid equal to its own weight.

d. Name the factors on which liquid pressure depends.

→ height (h), density of liquid (d), accelration due to gravity (g) are the factors on which liquid pressure depends.

Liquid pressure = d x g x h

e. What is archimede's principle?

→ When an object is immersed fully or partially in a liquid, it experiences an upthrust which is equal to weight of liquid displaced by it.

f. What kinds of vehicles use hydraulic brakes?

→ Heavy vehicles mostly use hydraulic brakes.

g. Name two instruments that are based on the law of floatation.

→ Hydrometer and Lactometer are two instruments that are based on the law of floatation.

h. At what condition does a body float on liquid?

→ Upthrust acting on the body equals to the weight of body.

upthrust = weight of body

3. Differentiate between

a) Force and pressure

	Force	Pressure
1.	It is an external agency that changes or tries to change the state of rest or motion of a body in straight line.	1. Force acting perpendicularly on unit area is called pressure.
2.	Its SI unit is Newton.	2. Its SI unit is pascal.
3.	It is a vector quantity.	3. It is scalar quantity
4.	It is cause of pressure.	4. It is the effect of force.

b) Archimedes principle and law of floatation

	Archimede's principle	law of floatation
a.	When an object is immersed fully or partially in a liquid, it experiences an upthrust which is equal to weight of liquid displaced by it.	a. An object that floa on liquid displaces the liquid equal to its own weight.
b.	It is equally applicable to floating as well as sinking objects.	b. It is applicable to the floating objects only.

c) Density and relative density

Density	Relative density
1. The mass of substance per unit volume is called its density.	1. Relative density is defined as the ratio of the mass of a certain of the substance to the mass of equal volume of water at 4°C
2. Its ~~sun~~ SI unit is kg/m^3.	2. It has no unit

d) Pressure and upthrust

Pressure	Upthrust
1. Pressure is the amount of force acting on a body per unit area.	1. It is the upward force exerted by a fluid on a body submerged in it
2. It SI unit is N/m^2	2. Its SI unit is newton.

e) Descending of hot air-filled balloon in air and flying of hot air-balloon in air.

→

Descending of hot air	flying
* Hot air inside balloon is cooler than flying and is denser than outside air.	* Hot air inside is less dense than outside air.
* weight of balloon is greater than upthrust so balloon goes down.	* upthrust is greater than weight of balloon so balloon goes up.

Give reason

a. We experience our body to be lighter while floating in water.

→ We feel lighter while floating in water because water exerts an upward force called upthrust on our body, upthrust balances our part of body which makes us feel lighter.

b. If the wooden cork is dipped in water with force, it comes to surface immediately after the force is removed.

→ It is because upthrust is greater than weight of cork, wood is less dense than water. So the water pushes it immediately after force is removed.

c. hydraulic brakes uses special kind of oil.
→ It is because special kind of oil is non-corrosive, works in wide temperature range and doesnot damage brake components.

d. It is easier to swim in salty water than in the fresh water pond.
→ It is because salty water is denser and gives more upthrust than fresh water. This helps body to float more resulting in easy swimming.

e. If the number of people seated in a boat is more than the carrying capacity the boat can sink in water.
→ It is because increasing number of people increase total weight of boat which may exceed upthrust given by water which may cause boat sink in water.

f. An iron nail sinks in water but floats on mercury.
→ It is because iron nail density is higher than water so upthrust is less than its weight but in case of mercury iron nail density is lower than mercury so upthrust is higher than weight of iron nail so floats in iron nail.

g) The size of an air bubble continues to increasing while rising upwards through water.

→ It is because water pressure decreases as it goes up, as a result air inside bubble expands which makes air bubble grow larger.

h) A swimmer feels to be lighter while floating in water.

→ It is because water exerts an upward force on swimmer's body which balances part of swimmer's body which makes swimmer feel lighter.

i) A steel ball sinks in water but a ship made up of steel floats.

→ It is because steel ball is compact and displaces less water so upthrust is less than its weight but ship is hollow and displaces more water, so the upthrust becomes equal to or greater than its weight and it floats.

J) A loaded ship sinks more than an empty ship.

→ It is because of the weight of ship, loaded ship is heavier so it has to displace more water to balance its weight but empty sink is less heavy so has to displace less water. so, loaded ship sinks more than empty ship.

K) A balloon filled with hydrogen gas rises up but the balloon filled with air falls down

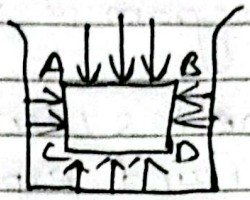
→ It is because hydrogen is less dense than the air so the upthrust is greater than its weight but balloon filled with ~~hydrogen~~ air is of same density, ~~over~~ upthrust is not enough to lift both balloon and air so it falls down.

L) Deep sea divers wear diving suits.

→ It is because under deep sea there is high water pressure so to protect themselves deep sea divers wear diving suits.

8. Diagrammatic question

a, b, c Study the diagram and answer the questions



i. In which side of body will pressure be maximum? why?

→ The bottom side (CD) of body will feel maximum pressure.

Because in liquid pressure increases as height increases. CD side of body is at ~~greater~~ deeper height.

ii. In which side of body will the upthrust be maximum? why?

→ Bottom side of body will experience maximum upthrust

Because upthrust is due to result of pressure difference so greater pressure greater upthrust.

iii. write the formula to calculate upthrust experienced by this body.

→

upthrust = ~~P x d~~ d x g x V

where

d is density of liquid

g is accelration due to gravity

V is volume of object submerged.

iv. Is this diagram related to any law of liquid pressure? State it.

→ This diagram is related to archimede's principle.

Archimede's law states that body immersed in a fluid experiences upthrust equal to the weight of fluid displaced by it.

b

i. 10N - 1N = 9N (10N reading - 1N weight of beaker)
upthrust is 9N equal to displaced water.

ii. weight of displaced water is 9N.

iii. Archimede's principle.