Matter

Q1. What is meant by Matter?
Ans: MATTER: Anything which has mass and occupied space is called Matter.
Example: Table, book, earth and etc.

Q2. Give the molecular theory of Matter?
Ans: MOLECULAR THEORY OF MATTER:
i. According to this theory, matter is made of tiny particle called Molecules and atoms.
ii. The molecules of matter are in c continues and rapid motion.
iii. The difference between solid, liquid and gases states are due to the distance between the molecules and due to violent motion of the molecules.

Q3. How many state of matter are?
Ans: There are three state of matter.
(i)Solid
(ii) Liquid
(iii) Gas

Q4. Give the molecular theory of Solid.
Ans: **MOLECULAR THEORY OF SOLID:**
I. In solids, the molecules are closely packed due to the strong force of attraction.
II. Molecules cannot move freely but they can move to and fro about their mean position.
iii. Solids have definite volume and shape due to their force of attraction and very Tiny space between them.
iv. It is not easy to compress solid but they broken down.

Q5. Give the molecular theory of Liquids?

Ans: **MOLECULAR THEORY OF LIQUIDS:**
i. The liquid molecules can move freely from one place to another place as compared to solids.
ii. Liquids have definite volume due to some force of attraction between their molecules, but no definite shape due to weak force of attraction between their molecules.
iii. The distance between liquid molecules is larger as converted to solid molecules.

Q6. Give the molecular theory of Gases?
Ans: **MOLECULAR THEORY OF GASES:**
I. Gases have no definite shape and volume because of very large distance between their molecules and very least force of attraction between their molecules.
ii. The force of attraction can be negligible between gases molecules due to this the gases molecules can freely move from one place to another.
iii. The molecules of a gas collide with one another and with the walls of the container and exert pressure on the walls.
iv. Gases expand on heating because the kinetic energy of molecules is increased and distance between them is also increased.

Q7. Differentiate between solids, Liquids and Gases?
Ans: SOLIDS LIQUIDS GASES
SOLIDS:
(i) They have definite shape and volume.
(ii) The molecule of solids has vibratory motion.
(iii) They have greater .density.
(iv)The distance between molecules solids is very short
LIQUIDS:
(i) They have definite volume but not shape.
(ii)The molecules of liquids have random motion.
(iii)They have low density as compared to solids.
(iv)The distance between Molecules of liquids is greater than solids.
GASES:
(i)They have not definite shape and volume.
(ii)The molecules of gas moves in a straight line.
(iii)They have very low density as compared to solids and liquids.
(iv)The distance between Molecules of gases is much Greater than solids & liquids.

Q8. What is meant by Brownian motion?
Ans: Brownian motion:
In 1827, a scientist named Robert Brown observed the movement of dust particles in air seems to very irregular motion. He also observed the movement of pollen grains suspended in water with a microscope and noticed that they were continuously moving in zigzag path as shown in figure. The zigzag motion of these particles is called Brownian motion.

Q9. Define Elasticity and Elastic Limit with example.
Ans: Elasticity:
First Definition:
If we apply a force to pull rubber band, it is stretched. When the force is removed. The rubber band comes to its originals shape. This behavior of any body is called Elasticity.
Second Definition:

Such characteristic of matter in which it tends to oppose every deforming force is called Elasticity.

Examples:

(i) If a wooden meter rod can bent into an arc by applying force. When force is removed, it straightens

(ii) Similarly, elasticity is also present in steel rod.

ELASTIC LIMIT:

If we bent a wooden meter into an arc and increases our force then at certain stage the wooden meter can be break. It means we reached at the elastic limit of wooden meter.

So, it is defined as: "Such maximum force applied by a body to oppose, every deforming force is called elastic Limited." If we increase our force from elastic limit of a body then it does not comes to its original position.

Q10. Explain elasticity of bodies on the basis of molecular theory.

Ans: EXPLANATION OF ELASTICITY:

i. Due to very small distance between the molecules of a solid, there is quite strong force between the molecules and they are closely packed...

ii) If a certain force is applied on a body, then it changes the place of molecules. Therefore, change in shape volume or length may take place. When force is withdrawn the molecules may become the original place due to strong internal molecular force of attraction.

iii) Elasticity of a body depends upon the nature of a body. For example, the force, of attraction between rubber molecules is less as compare to steel. So, less force is required to deformate rubber as compared to steel...

Q11. Define deformation. Explain with the types.

Ans: DEFORMATION:

If a force is applied on a body to change the shape, then that state is called Deformation.

TYPES OF DEFORMATION:

Linear Deformation:

If a force is applied on a body to change in length, then this state is called Linear deformation.

Cubic Deformation:

If the volume of a body changes due to applying force, then that state is called Shearing deformation.

Q12. Define Stress. Give its unit in different systems.

Ans: STRESS:

When a force is applied to change the length, volume or shape of a body. The value of This force per unit area is called Stress.

OR

"The magnitude of force applied per unit area of the body is called Stress." Mathematically:

It a force "F" Newton is applied on unit area "A". The stress can be written as

$$\text{Stress} = \text{Force/Area}$$

$$\sigma = F/A$$

Where σ Greek word is called "ETA".

SYSTEMS - UNITS OF STRESS

System	Unit of Stress
S.I.System	Newton / metre^2 or N/m^2
C.G.S. System	Dynes / centimetre^2
B.E - System	Lbs / ft^2

Q.13. Write the types of Stress.

Ans: There are three types of Stress.

i. Linear Stress.

ii. Cubic Stress.

iii. Surface Stress.

1. Linear Stress:

When change in length of a body, due to stress is called Linear Stress.

2. Cubic Stress:

When change in length, width and height of a body due to stress is called Cubic Stress.

3. Shearing Stress:

When change in surface of a body due to stress is called Shearing stress.

Q14. What is meant by Strain and Longitudinal Strain?

Ans: STRAIN:

"Such change in volume, length or shape produced by Stress is called Strain."

LONGITUDINAL STRAIN:

The ratio between the change in length and original length is called Longitudinal Strain or Linear Strain.

Mathematically:

If "L" is the original length and "l "is change in length of a body then,

Strain = Change in Length/Original Length

$$\text{Strain} = \frac{\Delta l}{L}$$

Where "Є" denotes Strain.

$$\epsilon = = \frac{\Delta l}{L}$$

UNIT:

Strain has not unit because it is a ratio between two similar quantities.

Q15. Differentiate between Stress and Strain.

Ans:

STRESS	STRAIN

It is the ratio between changed in length per unit original length.	The force per unit area of a body is called stress.
It is a ratio between two quantities	It is a scalar quantity
It has no unit.	In S.I system, its unit is N/m2
Its formula is $\epsilon = \Delta l/L$	Its formula is $\sigma = F/A$

Q16. State Hook's law. Explain with the help of Graph.

Ans: SATEMENT:

The law state the within elastic limit the deformation of body is directly proportional to the force producing it. "OR "

In an elastic limit, Stress is directly proportional to strain the relation is called Hook's Law.

Mathematically:

$$\text{Stress} \propto \text{Strain}$$

$$\text{Stress} = \text{Constant (Strain)}$$

$$\text{Constant} = \frac{Stress}{Strain}$$

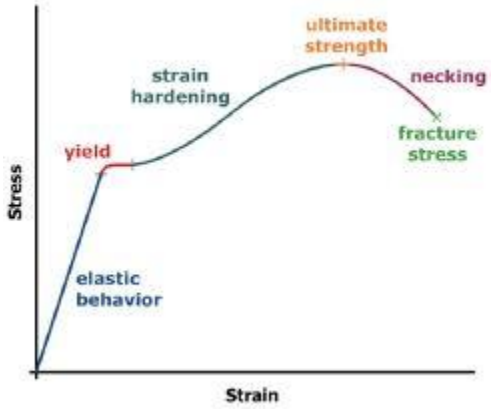
Hook's law also defined as "The force acting on a body is directly proportional to Deformation within elastic limit."

$$\mathbf{F \propto -x}$$

$$\mathbf{F = -kx}$$

Where "k" is Hook's constant and x is deformation.

EXPLANATION OF HOOK'S LAW BY GRAPH:



In this graph, if we increase stress then strain will also increase. Even a body reaches to a point "x ", here elasticity maintained. If stress kept continues then the body will go to Plastic region. It means elasticity

of elastic body finished. In plastic region, we increased More stress then the body will break. The point is called Breaking point. The above Graph proved the following point.
i. Stress is directly proportional to Strain.
ii. More Stress finished the elasticity of a body.
iii. To known about elasticity of a body.

Q17. State the law of Young's Modulus and verifies Hook's law.
Ans: YOUNG'S MODULUS:
The ratio between Stress and Longitudinal strain is called Young's Modulus.
Mathematically:

$$Young's\ Modulus = \frac{Stress}{Longitudinal\ Strain}$$

$$\mathbf{Y} = \frac{\boldsymbol{\sigma}}{\boldsymbol{\epsilon}}$$

$$\boldsymbol{\epsilon} = \frac{\boldsymbol{\Delta l}}{\boldsymbol{L}}$$

$$\boldsymbol{\sigma} = \frac{\boldsymbol{F}}{\boldsymbol{A}}$$

So, equation (i) becomes,

$$\mathbf{Y} = \frac{\frac{\boldsymbol{F}}{\boldsymbol{A}}}{\frac{\boldsymbol{\Delta l}}{\boldsymbol{L}}}$$

$$\boldsymbol{Y} = \frac{\boldsymbol{F.L}}{\boldsymbol{A.\Delta l}}$$

Where Y is denoting Young's Modulus.

VERIFICATION OF THE HOOK'S LAW
According to Hook's law

$$\text{Stress} \propto \text{Strain}$$

$$\frac{\boldsymbol{F}}{\boldsymbol{A}} \propto \frac{\boldsymbol{\Delta l}}{\boldsymbol{L}}$$

For an elastic limit, the above equation becomes

$$\frac{F}{A} = K.\frac{\Delta l}{L}$$

$$F = AK.\frac{\Delta l}{L}$$

$$F = \Delta l.\frac{AK}{L} \text{ Where } \frac{AK}{L} = constant$$

$$F \propto \Delta l$$

Q18. Write the characteristics of stationary liquids.
Ans: Characteristics of Stationary Liquids:
i. The pressure exerted by the liquid acts perpendicular to the walls of vessel in which it is kept.
ii. Pressure exerted on the liquid is transmitted equally in all directions.
iii. In liquids, the pressure at the same depth is equal in all directions.

Q19. Define and explain Pressure. Give its unit in different system?
Ans: Pressure:
The perpendicular force acting on the unit area of a body is called Pressure.
Explain:
i. If we push a drawing pin with a sharp pointed tip into a piece of wood. It will penetrate the wood.
ii. Under the tip of the drawing pin the force is very high on the small area of the tip of the pin. Hence it penetrates into the wood.
iii. Now it is difficult to cut things with a blunt knife because the area of the blunt edge of the knife is relatively more and the force over this area is less as compared to the sharp edge.
Mathematically:

Pressure = Force / Area
P = F / A

SYSTEM UNITS OF PRESSURE

SYSTEM	UNIT OF PRESSURE
M.K.S. System	Newton / metre^2 or N/m ^{2}
S.I. System	Pascal (Pa)
C.G.S. System	Dynes / centimeter ^{2}
B.E. System	Lbs/ft 1

Q20. What is meant by Pressure of Liquids and on what factors does it depend?
Ans: PRESSURE OF LIQUIDS:

Water contained in a glass has weighed. As the weight is a force what acts downward, therefore the water exerts a pressure on the bottom of the glass. Similarly, every liquid exerts force per unit area of container, which is called Pressure of Liquid.
Pressure of Liquids depends upon following factors:
i. **Density of Liquid:** If a liquid more dense then pressure is more.
ii. **Depth of Liquid:** If the depth of liquid is greater than the pressure is greater.

Q21. Prove that the pressure of liquids depends upon density and depth or P = phg.
Ans: Suppose water contained in a gas, exerts force per unit area is called Pressure. If "F" is force, "A" is area and Pressure is "P" then.

$$P = F / A \quad \text{_____1}$$

We know that

$$F = mg \quad \text{_____2}$$

Mass per unit volume is called Density and it is denoted by (RHU) OR "p "

$$P = m / V$$
$$m = Pv$$

The volume is, V = Length x Width x Height

$$V = L \times W \times h$$
$$V = A \times h$$

So, **m = P (A x h) put in equation – No.2**

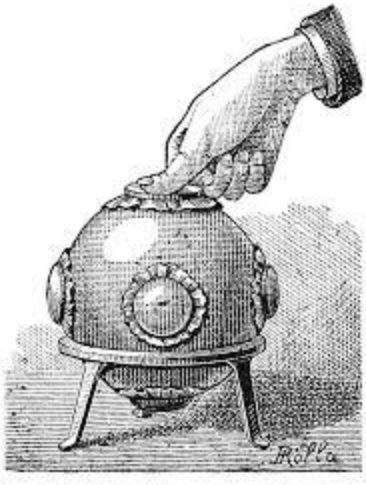
$$F = mg$$
$$F = P (A \times h) g$$

Now put the value of "F" in equation No.1

$$P = \frac{P(A \times h)g}{A}$$
$$P = phg$$

Where "p" is density, h = depth, g = acceleration due to gravity. Hence it proved the pressure of liquid depends upon depth and density.

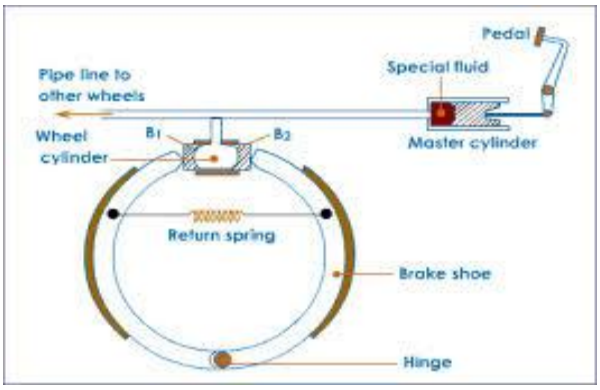
Q22. Give the principle of Pascal.
Ans: PRINCIPLE:



According to this principle, if a pressure is applied to a liquid contained in a vessel, it is transmitted pressure equally in all direction and acts perpendicularly to the walls of the container. This was discovered by Blaise Pascal, and is known as Pascal's Principle.
Explanation: It is explain with the help of following experiment.
Experiment:
i. Take a vessel which is connected with four Similar pistons.
ii. Fill it with water.
iii. Apply a force to one end of the pistons.
iv. The other three pistons simultaneously move through small distance outwards.
v. Thus it can be proved that the pressure has been transmitted in all directions throughout the water.

Q23. How many types of Hydraulic Machines.
Ans: TYPES OF HYDRAULIC MACHINES:
There are three types of Hydraulic Machines.
i. Hydraulic Break system.
ii. Hydraulic Lifts.
iii. Hydraulic Press.

Q24. What do you know about Hydraulic break system?
Ans: HYDRAULIC BREAK SYSTEM:



System is used in vehicle, consists of a master cylinder joined by tubes to four smaller cylinder, one for each wheel of vehicle. The master cylinder and each of the brake cylinders are provided oil tight pistons. When we push on the brake pedal it causes a force on the piston in the master cylinder. This pressure transmits equally in all directions.

This pressure effects the points present in the wheel cylinder. These pistons force the brake shoes to expand and resulting friction stops the wheel. It is an example of Pascal's Law.

Q25. Write note on Hydraulic Press.

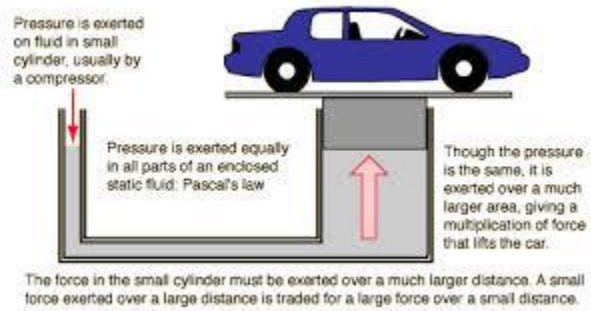
Ans: HYDRAULIC PRESS:

The working of hydraulic press is same hydraulic lift, in a hydraulic press the piston 'B' is used to compress any material over it a rigid roof material is placed between roof and piston 'B'. When force is applied on piston 'n' then B moves upwards. It compresses cotton into a compact bale.

Q26. Write short note on Hydraulic lift.

Ans: HYDRAULIC LIFT:

In Hydraulic lift, narrow cylinder 'A' connected with wider cylinder B and they are fitted with air tight pistons.



It is filled with some incompressible fluid. By pressing cylinder 'A', the pressure is transmitted equally according to Pascal's principle to the piston of the cylinder 'B' and B moves upward. The piston 'B' is used as a platform for a car or any heavier object to be lifted.

Q27. What is meant by Pressure of gases? On what factor it depends?
Ans: PRESSURE OF GASES:
When a gas is closed in a cylinder in a container, then molecules of gas collide with each other and also strike against the walls of the container. During collision, the molecules exert force per unit area of container; this force is called Pressure of gases.

FACTORS ON WHICH PRESSURE OF GASES DEPENDS:
The pressure of gases depends upon the following two factors:
i. Volume of Gas If the volume of gas is greater than pressure is increased.
ii. Temperature of Gas If the temperature of a gas is increased then the molecules of gas collide with The walls firstly and exerted greater pressure on the walls of container.

Q28. Explain Atmospheric pressure. Give also the experiment of Von Guericke.
Ans: ATMOSPHERIC PRESSURE:
The air is mixture of Nitrogen, Oxygen and many other gases. These gases exerts pressure is called Atmospheric pressure.
The density of air changes from sea level to different altitudes. It is most dense at sea level, its density decreases with increase of height above sea level.
At sea level the pressure of air is about 100,000 Pa. We do not normally feel atmospheric pressure as the pressure inside our bodies is almost the same as that outside.

EXPERIMENT OF VON GUERICKE:

i. The existence of atmospheric pressure was first performed by a German scientist Von Guericke.
ii. He took two hollow metallic hemispheres which were made to fit with each tightly?
iii. Air inside the hemispheres was removed through a small hole by means of an air pump.
iv. It was found that the hemispheres could not be pulled apart when the air had been removed.
v. The hemispheres were so tightly hold that it looks two teams each of eight horses to separate them.

Q29. What is barometer and how many types of Barometer are.

Ans: BAROMETER:

A device for measuring the atmospheric pressure is called barometer. There are two types of Barometer.
(i) Mercury Barometer (ii) Aneroid Barometer

Q30. Write a note on Mercury barometer.

Ans: MERCURY BAROMETER:

Atmospheric pressure is measured in a laboratory by a device called Mercury Barometer.

CONSTRUCTION:

A barometer consists of a thick walled glass tube 1 meter length which is opened at one end and closed from the other side. To start with the tube is filled with mercury. The open end is firmly covered with a thumb and then carefully inverted in a vessel containing mercury. Some of the mercury from the leaving a space at the closed end. It is found to be approx. 760 mm. The length of mercury in tube equal to the atmospheric pressure.

Q31. Write note on Aneroid Barometer.

Ans: ANEROID BAROMETER:

The aneroid barometer is commonly used for household i purposes. It consists of a corrugated steel box 'A' partially evacuated of air. The top of the box pressure against a strong spring 'S'. If the air pressure rises, the top of the bon is pressed inwards and If the pressure decreases the top moves upwards. The movement of the top due to changes in pressure is magnified by a system of lever connected to a small rod fixed on the top of 'A'. The movement of the lever enables a printer 'P' to move over a suitable calibrated scale.

Q32. Write the application of atmospheric pressure.
Ans: The following are uses of atmospheric pressure.
(i) It is used to make siphons. Ii) It is used to make pumps.
(iii) It is used to make syringes.

Q33. State Archimedes Principle.
Ans: ARCHIMEDES PRINCIPLE:
When a body is wholly or partially immersed in a liquid, then a force acts on the lower surface of the body, this force equal to the volume of body and called upward thrust. So, a body immersed in a liquid it experiences and upward thrust equal to the weight of the liquid these its weight is decreased in water. This principle was first observed by Archimedes. So it called Archimedes Principle.

Q34. Give the experimental proof of Archimedes Principle.
Ans: EXPERIMENTAL PROOF OF ARCHIMEDES PRINCIPLE:
For experimental verification of Archimedes Principle, consider the following experiment. Consider a cylindrical object of area 'A' and height 'h' immersed in a liquid of density p; four sides for acting on that body in which two from left and right and other two from up and downward. The force acting from left and right cancel the effect of each other and also up downward forces do the same. The force acting upon surface of a body.

The force acting upon surface of a body $F_1 = Ah_1pg + Apa$
The force acting lowers the surface of the body.
$F_2 = Ah_2pg + Apa$
Up thrust = F_2 F_1
Up thrust = $(Ah_2pg + Apa) - (Ah_1pg + Apa$
Up thrust = $Ap_2pg + Apa - Ah_1pg – Apa$
Up thrust = Ah_2 pg - Ah_1pg
= $Ap(h_2\ h_1)g$
= Aphg
= ρ g(l x h x w)
= pgV
We know that Mass
density = volume
$\rho = \frac{m}{V}$

ρ V = m

Put the value in equation (i)

Up thrust = ρ Vg

= mg

Up thrust = W

W = mg

Up thrust = Weight of the body.

We can now draw the following conclusions for floating bodies in fluids.

i. The up-thrust force depends upon density an volume.

ii. Up-thrust force equal to the weight of the body.

iii. These results prove Archimedes Principle.

Q35. Write the conditions for the floatation of the bodies.

Ans: CONDITIONS:

i. If the weight of the body is greater than the upward thrust the body will sink in the liquid which is providing upward thrust.

ii. If the weight of body is less than the upward thrust, the body will rise up and float on the surface of the liquid..

iii. If the weight of the body is equal to the upwards thrust the body will float partially immersing into the liquid.

Q36. Explain why an Iron ship floats while a piece of stone sinks in water.

Ans: A ship is constructed in ship in such a way that the density of the ship be will less than the density of water displaced by it to move over. The volume of ship is very large and hence the upward thrust on it is also very large. This upward thrust not only neutralizes the weight of ship but provides some additional upward force on the ship. The ship, therefore, does not sink in water.

A piece of stone sinks in water because its weight is greater than the upward thrust of water.

Q37. Write the condition for the motion of submarines in water.

Ans: CONDITION FOR THE MOTION OF SUBMARINES IN WATER:

Submarines can float on the surface of water and when is needed they can dive in water. Submarines are fitted with large hollow ballast tank. To dive in water, the submarine takes water into its hollow tanks. This increases the weight of submarine and it submerges in water.

Diving submarine: