TEST YOUR SELF

TEST YOURSELF 5.1 (GASEOUS STATE)

i. Why the rate of diffusion of gases is rapid than that of liquids?

Ans: The rate of diffusion of gases is rapid than that of liquids because, gas molecules have insignificant attractive forces more kinetic energy and more empty spaces are present between their molecules, as compare to liquids.

ii. Why the gases are compressible?

Ans. Gases are highly compressible due to empty spaces between their molecules. When pressure is applied on gases the molecules come closer to one another and occupy less volume as compared to the volume in uncompressed state.

iii. What do you mean by Pascal? How many Pascals are equal to 1 atm?

Ans. Pascal:

Pascal is equal to a force of one Newton that acts upon an area of one metre square.

It is unit for pressure.

One Pascal = (Pa) = $1Nm^{-2}$

$101325Nm^{-2}$ = 101325 Pa = 1atm

iv. Whether the densities of a gas decrease on cooling?

Ans. No, the density of a gas does not decrease on cooling. It increases on cooling because on cooling their volume decreases and density is inverse to volume.

As $d = \frac{m}{v}$

For example, at normal atmospheric pressure the density of oxygen gas is 1.4g dm^{-3} at 20°C and 1.5gdm^{-3} at 0°C.

v. Why is the density of gas measured in g dm^{-3} while that of a liquid is expressed in g cm^{-3}?

Ans. Gases have low densities due to small mass and more volume occupied by the gas molecules. Therefore gas density is expressed in grams per dm^3, whereas liquid and solid densities are expressed in gram per cm^3 because liquids and solids are 1000 times denser than gases.

The gas molecules are far apart to each other due to very weak intermolecular forces among them. Gases occupy more spaces at normal condition as compare to liquids that is why, a smaller unit of volume measurement is used for liquids.

vi. Convert the followings

(a) 70 cm Hg to atm **(b) 3.5 atm to torr** **(c) 1.5 atm to Pa**

Ans: (a) 70 cm Hg to atm:

We know that:

760 cm Hg = 1 atm (As 760mmHg=76cmHg)

1 cm Hg = $\frac{1}{760}$

70 cm Hg = $\frac{1}{760} \times 70 = 0.0921$ atm

70 cm Hg = 0.0921 atm

(b) 3.5 atm to torr:

We know that:

1 atm = 760 torr

3.5 atm = 760 × 3.5
= 2660
3.5 atm = 2660 torr

(c) 1.5 atm to Pa

We know that

1 atm = 101325 Pa
1.5 atm = 101325 × 1.5
= 151987.5
1.5 atm is = 151987.5 Pa

TEST YOURSELF 5.2 (BOYLE'S LAW)

i. Is the Boyle's law applicable to liquids?

Ans: No, Boyle's law is only applicable to gases.

$$PV = \text{constant}$$

Temperature is constant.

ii. Is the Boyle's law valid at very high temperature?

Ans: Yes, the Boyle's law is valid or applicable at very high but constant temperature.

iii. What will happen if the pressure on a sample of gas is raised three times and its temperature is kept constant?

Ans: If the pressure on a sample of gas is raised three times at constant temperature, according to Boyle's Law the volume will also decrease three times of its original.

TEST YOURSELF 5.3 (CHARLE'S LAW)

i. Which parameters are kept constant in Charle's law?

Ans: Mass and pressure are kept constant in Charle's Law while volume and temperature are variable parameters.

$$\frac{V}{T} = \text{Constant}$$

ii. Why volume of a gas decreases with increase of pressure?

Ans: Volume of gas decreases with increase of pressure because according to Boyle's Law volume and pressure both are inversely proportional to each other. So when we increase pressure, the gas molecules come closer to one another and volume of a gas decreases.

iii. What is absolute zero?

Ans: *Absolute zero it is the temperature at which an ideal gas would have zero volume.* Kelvin scale starts from absolute zero, represented as 0K (Zero Kelvin). It is equal to -273°C.

iv. Does Kelvin scale show a negative temperature?

Ans: The Kelvin scale does not show negative value, as

$$0K = -273.15°C$$

v. When a gas is allowed to expand, what will be its effect on its temperature?

Ans: When a gas is allowed to expand, it temperature decreases because gas molecules consume energy for expansion by the gas molecules on its own. This decreases their temperature.

vi. Can you cool a gas by increasing its volume?

Ans: Yes, when a highly compressed gas is allowed to expand into a region of your pressure the low pressure, it consumes energy for the expansion by the gas molecules on its own this decreases their temperature.

TEST YOURSELF 5.4 (LIQUID STATE)

i. Why does evaporation increase with the increase of temperature?

Ans: Evaporation increases with increase of temperature because kinetic energy of the molecules increases to such an extent that they overcome the intermolecular forces and

rapidly evaporate.

ii. What do you mean by condensation?

Ans: *The process of changing of gas or vapour into liquid is called condensation. It is reverse of evaporation.*

$$\text{Liquid} \underset{\text{Condense}}{\overset{\text{Vaporize}}{\rightleftharpoons}} \text{vapours (Gas).}$$

iii. Why is vapour pressure higher at high temperature?

Ans: The vapour pressure is higher at high temperature than at low temperature because at elevated temperature, the kinetic energy of the molecules increases enough to enable them to vapourize and exert more pressure.

iv. Why is the boiling point of water higher than that of alcohol?

Ans: Boiling point of water is higher than that of alcohol because water is a polar liquid and has high intermolecular forces than alcohol.

v. What do you mean by dynamic equilibrium?

Ans: *The state at which two processes take place in the opposite direction at equal rates simultaneously is called dynamic equilibrium.*

OR

The state at which the rate of evaporation becomes equal to the rte of condensation is called dynamic equilibrium.

$$\text{Liquid} \underset{\text{Condense}}{\overset{\text{Vaporize}}{\rightleftharpoons}} \text{Vapours.}$$

vi. Why are the rates of diffusion in liquids slower than that of gases?

Ans: The rate of diffusion in liquids is slower than that of gases because liquids have stronger intermolecular forces than gases and very less empty spaces and kinetic energies.

vii. Why does rate of diffusion increase with increase of temperature?

Ans: The rate of diffusion increases with increase in temperature because at high temperature the kinetic energy of molecules increase intermolecular forces decrease. As a result gas molecules can move freely and fastly.

viii. Why are the liquids mobile?

Ans: *The ease of flow of a liquid is called mobility.*

The mobility of liquids depends upon the intermolecular forces and K.E of molecules. Liquids are mobile because liquid molecules possess high kinetic energy and weak intermolecular forces.

TEST YOURSELF 5.5 (PROPERTIES OF SOLIDS)

i. Which form of sulphur exists at room temperature?

Ans: Rhombic form of sulphur exists at room temperature.

ii. Why is white tin available at room temperature?

Ans: White tin is available at room temperature because it is stable at above 13.2°C, which is transition temperature of grey and white tin.

$$\underset{\text{Cubic}}{S(n)} \overset{13.2^\circ C}{\rightleftharpoons} \underset{\text{Tetragonal}}{Sn(\text{white})}$$

iii. Why is the melting point of a solid considered its identification characteristic?

Ans: The solid particles possess only vibrational kinetic energy. *Melting point is the temperature at which the solid starts melting and co-exists in dynamic equilibrium with liquid state.* Therefore melting point of a solid is considered its identification characteristic.

Example: Melting point of NaCl is 801°C

iv. Why amorphous solids do not have sharp melting points while crystalline solids do have?

Ans: Amorphous solids do not have sharp melting points because in these solids particles are not held in a regular three dimensional arrangement on the other hand crystalline solids have sharp melting points because in these solids particles are held in a regular three dimensional arrangements.

v. Which is lighter one, aluminum or gold?

Ans: Aluminium is lighter than gold because the density of aluminium (2.70 g cm^{-3}) is less than gold ($9.3 gcm^{-3}$).

vi. Write the molecular formula of a sulphur molecule?

Ans. Molecular formula of sulphur molecule is S_8.

vii. Which allotropic form of carbon is stable at room temperature (25°C)?

Ans: There are three allotropic forms of carbon i.e. diamond, graphite and bucky balls, which are stable at room temperature. Among these allotropic forms graphite is energetically slightly more stable than diamond.

viii. State whether allotropy is shown by elements or compounds or both?

Ans: Allotropy is shown by elements only. It is the existence of an element in more than one forms in same physical state.

For example:

a. Allotropic forms of carbon are diamond, graphite and bucky balls,

b. Allotropes of oxygen are O_2 and O_3.