Sardar Kaurey Khan Public Higher Secondary School Muzaffargarh

CLASS: 9TH

WINTER VACATION TASK

CHEMISTRY

	Diffusion	Effusion
1	Diffusion is a spontaneous mixing up of molecules by random motion and collisions to from a homogeneous mixture.	Effusion is a process of gas molecules in which escaping of gas molecules through a tiny hole in to a space with lesser pressure.
2	Example:- H_2 and O_2 diffuses but the rate of diffusion of H_2 is four times faster than O_2.	Example: When a tyre gets punctured, air effuses out.

4.   Why is the density of gas measured in gdm^{-3} while that of liquid in gcm^{-3}?

Ans: <u>Density of gas measured in gdm^{-3} while that of liquid in gcm^{-3}:</u>
Gases have low density than liquids and solids. Density of gas measured in gdm^{-3} while that of liquid and solids in gcm^{-3} because liquids and solids are 1000 times denser than gases.

5.   Explain any two factors which affect the rate of diffusion.

Ans: <u>Factors affecting Diffusion:-</u>
1. **Intermolecular Forces:** Liquids having weak forces of attraction diffuse faster.
2. **Size of Molecules:** Big size molecules diffuse slowly like honey diffuse slowly than water.
3. **Temperature:** Diffusion increases by increasing temperature.

6.   What is pressure. Write its unit?   **(10 times) (2019=3 times)**

Ans: <u>Pressure:-</u> *Pressure in defined as force per unit area.*

$$Pressure = \frac{Force}{Area}$$

$$P = F/A$$

<u>Unit:</u>   The SI unit of pressure is $N\ m^{-2}$. It is also called Pascal (Pa).
One Pascal (Pa) $= 1\ N\ m^{-2}$

7.   Why densities of Gases are lower than that of Liquids?   **(2 times)**

Ans: <u>Density of Gases:-</u> Density of gases are less than liquids because gases have lower mass and occupy more volume. So density of gases is less.

8.   What is compressibility? / How gases produce Homogeneous mixture? **(12 times)**

Ans: <u>Compressibility:-</u> Gases are highly compressible due to empty spaces between their molecules, When the gases are compressed, the molecules come closer to one another and occupy less volume as compared to the volume in uncompressed state.

<u>Gases produce Homogeneous mixture:</u>
Gases can diffuse very rapidly due to random motion and collisions to form homogeneous mixture.

9.   What is the effect of temperature on density of gasses?

Ans: <u>Effect of temperature on density of gasses:</u>
The density of gases decreased on high temperature and increases by cooling, because their volume decreases. For example at normal atmospheric pressure the density of oxygen gas is $1.4\ g\ dm^{-3}$ at 20 ºC and $1.5\ g\ dm^{-3}$ at 0ºC.

Topic No: 5.2   Laws Related to Gases

10.   What is hypertension and what is its value?

Ans: <u>Hypertension:</u>
High blood pressure due to tension and worries in the daily life is called hypertension. The usual critarian for hypertension is a blood pressure greater than 140/90.

11.   Define systolic pressure.

Ans: <u>Systolic pressure:</u>   Blood pressure is reported to two values such as 120/80, hich is a normal blood pressure, the first measurement shows the maximum pressure when the heart is pumping. It is called systolic pressure.

12.   Convert 50 ºC into Kelvin scale.

Ans: <u>Conversion of 50 ºC into Kelvin scale:</u>
Formula: $(T)K = (T)ºC + 273$
            $(T)K = 50 ºC + 273 =$ 323K

13. Convert-30 °C to Kelvin Temperature.

Ans: <u>Conversion of -30 °C to K:</u>

Formula: $(T)K = (-30)°C + 273$

$(T)K = -30 + 273 = 243K$

14. Differentiate between Boyle's law and Charles law?(44 times) (2019=3 times)

Ans: <u>Difference Between Boyle's Law and Charles's Law:</u>

<u>Boyle's Law</u>

"The volume of a given mass of a gas is inversely proportional to its pressure at constant temperature".

Mathematical formula: It can be written as:

$$\text{Volume} \propto \frac{1}{\text{Pressure}}$$

$$V \propto \frac{1}{P}$$

<u>Charles's Law:</u>

The volume of a given mass of a gas is directly proportional to the absolute temperature if the pressure is kept constant.

$$\text{Volume} \propto T \quad \text{(at constant P)} \quad .... (1)$$

$$V = kT \quad .... (2)$$

15. Convert 750ºC to Kelvin temperature.

Ans: <u>Conversion of 750ºC to Kelvin temperature</u>

$(T)K=(T)°C+273$

$(T)K=(750)°C+273=1023K$

Topic No: 5.3   Typical Properties of Liquids

16. In which unit's body temperature is measured?

Ans: <u>Measurement of Body Temperature:</u> Body temperature is measured in Fahrenheit scales. Normal body temperature is 98.6 °F which is equivalent to 37°C. This temperature is close to average normal atmospheric temperature.

17. Write two properties of liquid state of matter.

Ans: <u>Properties of liquid state of matter:</u>

(i). **Evaporation:** *The process of changing of a liquid into a gas phase is called evaporation.*

(ii). **Boiling Point:** *The temperature at which vapour pressure of a liquid becomes equal to atmospheric pressure is called as a boiling point.*

18. What is meant by condensation? **(5 times)**

Ans: <u>Condensation:-</u> *The process of conversion of gas molecules / vapours to liquid state is called condensation.* e.g., Conversion of water vapours in the environment to convert into liquid form outside the cold bottle of water.

19. Evaporation causes cooling why? **(10 times) (2019=1 times)**

Ans: <u>Evaporation causes cooling:-</u> Evaporation is a cooling process. When the high kinetic energy molecules vaporizes, the temperature of the remaining molecules falls down. To compensate this deficiency of energy, molecules of liquid absorbed energy from the surroundings. As a result temperature of surroundings decrease and we feel cooling.

20. What is vapour pressure? Write two factors which depends upon? / Describe two factors on which vapour pressure depends upon? **(10 times)(2018)**

Ans: <u>Vapour Pressure:</u> *The pressure exerted by the vapours of a liquid at equilibrium with the liquid at a particular temperature is called vapour pressure of a liquid.*

(i) **Nature of liquids:** Polar liquids have low vapour pressure then non-polar liquids at the same temperature. Polar liquids have stronger intermolecular forces.

(ii) **Temperature:** Vapour pressure of liquids is higher at high temperature because kinetic energy of molecule increases at high temperature.

21. What is boiling point. How it varies with altitude from sea level? **(8 times) (2019=1 times)**

Ans: <u>Boiling Point:</u> *The temperature at which vapour pressure of a liquid becomes equal to atmospheric pressure is called as a boiling point or any external pressure* e.g. Boiling point of water at sea level is 100 °C as there is a maximum air present at sea level.

At high alt
decrease re
hills is 97 °C

22. What is the

Ans: <u>Effect of ex</u>
Boiling poin
is controlled
pressure an

Topic No:5.4

23. What do y

Ans: Malleabilit
sheets.

24. Why solids

Ans: <u>Solids sho</u>
positions. T

25. Define free

Ans: **Freezing Po**
dynamic eq
Melting Po
coexist in d

Topic No: 5.5

26. Why salt is u

Ans: Table salt is
quantities.
water out o
species of u

27. Distinguish

Ans: <u>Amorphous</u>
not regularly
solids. They
amorphous
<u>Crystalline</u>
dimensional
faces. Each
Example of

Topic No: 5.6

28. Define Tran

Ans: <u>Transition</u>
into anothe
Example:

S_8

i. Why the

Ans: Gas mole
of diffus

ii. Why are

Ans: Gases ar
When g
volume

iii. What d

Ans: The pre
Pascal
One Pa
1atm=

At high altitude, the concentration of air decreases, so atmospheric pressure decrease resultantly boiling point decreases. Like boiling point of water at Murree hills is 97 °C at the Mount Everest is 69°C.

22. **What is the effect of external pressure on boiling point of a liquid?**
Ans: **Effect of external pressure on boiling point:**
Boiling point of a liquid depends upon external pressure. Boiling point of a liquid is controlled pressure in such a way, that it can be increased by increasing external pressure and vice versa. This principle is used in the working of 'Pressure Cooker'

Topic No:5.4   Typical Properties of Solids

23. **What do you mean by malleability?**   **(2019=2 times)**
Ans: Malleability is the property by virtue of which a metal can be rolled into sheets.

24. **Why solids show rigidity?**   **(2 times)**
Ans: **Solids show Rigidity:** The particles of solids are not mobile. They have fixed positions. Therefore, solids are rigid in their structure.

25. **Define freezing point and melting point.**
Ans: **Freezing Point:** A temperature at which liquid and solid coexist in dynamic equilibrium with one another is called freezing point of a liquid.
Melting Point: The temperature at which the solid starts melting and coexist in dynamic equilibrium with liquid state is called melting point.

Topic No: 5.5   Types of Solids

26. **Why salt is used to preserve meat.**   **(2018)**
Ans: Table salt is most important ingredient for curing meat and is used in large quantities. Salt kills and inhibit the growth of putrefying bacteria by drawing water out of meat. Concentration of salt is up to 20% are required to kill most species of unwanted bacterial.

27. **Distinguish between amorphous solid and crystalline solid.**
                    (36 times)(2019=5 times)
Ans: **Amorphous solids:-** Amorphous means shapeless. *Solids in which the particles are not regularly arranged or their regular shapes are destroyed are called amorphous solids.* They do not have sharp melting points. Plastic, Rubber and Glass are amorphous solids as they do not have any sharp melting points.
Crystalline solids:- *Solids in which particles are arranged in definite three dimensional pattern are called crystalline solids.* They have definite surface or faces. Each face has definite angle with the other. They have sharp melting points. Example of crystalline solids are diamond, sodium chloride etc.
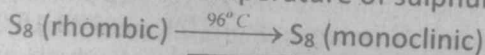
Topic No: 5.6   Allotropy

28. **Define Transition Temperature.**   **(10 times) (2019=1 times)**
Ans: **Transition Temperature:** The temperature at which one allotrope changes into another is called transition temperature.
Example: Transition temperature of sulphur is 96 °C.

$$S_8 \text{ (rhombic)} \xrightarrow{96° C} S_8 \text{ (monoclinic)}$$

Test Yourself 5.1

i. **Why the rate of diffusion of gases is rapid than that of liquids?**
Ans: Gas molecules have week intermolecular forces and move freely. So the rate of diffusion of gases is rapid than that of liquids.

ii. **Why are the gases compressible?**
Ans: Gases are highly compressible due to empty spaces between their molecules. When gases are compressed, the molecules come closer and occupy less volume as compared to uncompreseed state.

iii. **What do you mean by Pascal. How many Pascals are equal to 1 atm?**
Ans: The pressure equal to one Newton per square metre is called Pascal. Pascal is the SI unit of pressure.
One Pascal = 1 Nm^{-2}
1atm = 101325 Pa

vi. Convert the following
a. 70 cm Hg to atm
Ans: We know that
760 mm Hg = 1 atm
76 cm Hg = 1 atm $(\because$ 1cm=10mm)
(as 760 mm Hg = 76cm Hg)

$$1cm\ Hg = \frac{1}{76}\ atm$$

$$70cm\ Hg = \frac{1}{76} \times 70\ atm$$
$$= 0.92\ atm$$

b. 3.5 atm to torr
Ans: 1 atm = 760 torr
3.5 atm = 760 x 3.5
= 2660 torr

c. 1.5 atm to Pa
Ans: 1 atm = 101325 Pa
1.5 atm = 101325 x 1.5 = 151987.5 Pa

Test Yourself 5.2

i. Is the Boyle's law applicable to liquids?
Ans: **Application of Boyle's law:**
Boyle's law is not applicable to liquids, because there are no empty spaces and can not be compressed like gases.

ii. Is the Boyle's law valid at very high temperature?
Ans: Gases behave ideally at very high temepratur and low pressure. Boyle's law is valid only if gases behave ideally. Boyle's law is valid at high temperature if temperature is kep constant in this law.

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, the volume will also decrease three times of its original volume.

Test Yourself 5.3

ii. Why volume of a gas decreases with increase of pressure?
Ans: One increasing pressure, gas molecules come closer to each other and empty spaces among gas molecules decrease. **(3 times)(2018)**

iii. What is absolute zero?
Ans: **Absolute Zero:-** This scale of temperature starts from 0 K or -273.15 °C, which is given the name of Absolute Zero. It is the temperature at which an ideal gas would have zero volume.

iv. Does Kelvin scale show a negative temperature?
Ans: The Kelvin scale does not show negative value, as 0K = 273.15°C, which is absolute zero temperature.

vi. Can you cool a gas by increasing its volume?
Ans: Yes, when a highly compressed gas is allowed to expand, its temperature decreases and gives cooling effect. This is called "Joule Thomson" effect.

Test Yourself 5.4

I. Why does evaporation increase with the increase of temperature?
Ans: **Effects of temperature on evaporation:**
At high temperature, rate of evaporation is high because at high temperature kinetic energy of the molecules increases so high that they overcome the intermolecular forces and evaporate rapidly. For example, water level in a

container with hot water decreases earlier than that of a container with cold water. This is because the hot water evaporates earlier than the cold water.

ii. What do you mean by condensation?

Ans: Condensation is the process in which the vapours (gases) are converted back into liquid phase.

iii. Why is vapour pressure higher at high temperature?

Ans: Temperature: Vapour pressure of liquids is higher at high temperature because kinetic energy of molecule increases at high temperature.

iv. Why is the boiling point of water higher than that of alcohol? (6 times)

Ans: <u>Boiling point of water and alcohol:</u>
Boiling point of water is higher than that of alcohol because water is a highly polar liquid and have strong and more hydrogen bonding. So due to these reasons water have high boiling point than alcohol and other.

v. What do you mean by dynamic equilibrium? (4 times)

Ans: When the rate of evaporation becomes equal to rate of condensation. At that stage, the number of molecules evaporating will be equal to the number of molecules coming back (condensing) to liquid. This state is called dynamic equilibrium.

vi. Why are the rates of diffusion in liquids slower than that of gases? (4 times)

Ans: <u>Rate of Diffusion of Gases is Rapid than Liquids:</u>- Gases have higher K.E. than liquids and inter molecular distance between gases is high. So rate of diffusion of gases is rapid than that of liquids.

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

Ans: By increasing temperature, intermolecular forces weekend or even break down. Hence the speed of molecules increases to move randomly. That is why rate of diffusion increases with increase of temperature.

viii. Why are the liquids mobile?

Ans: The attractive forces among the liquid molecules are less than that of solids, hence they are mobile (move freely).

Test Yourself 5.5

i. Which form of sulphur exists at room temperature?

Ans: Ordinary or "Rhombic" form of sulphur exists at room temperature.

ii. Why is white tin available at room temperature?

Ans: <u>White tin available at room temperature</u>
White tin exist above 13.2°C, So, at room temperature white tin is available.

Sn (grey) cubic $\underset{}{\overset{13.2°C}{\rightleftharpoons}}$ Sn (white) tetragonal.

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

Ans: Pure solids have fixed melting point which can not be changed. Hence it can be considered its identification characteristic.

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

Ans: In amorphous solids, the particles are not regularly arrange or their regular shapes are destroyed. Some parts melt with lesser heat while others need more heat. That is why amorphous solids do not have sharp melting points.

vi. Write the molecular formula of a sulphur molecule?

Ans: <u>Molecular formula of a sulphur:</u>
Molecular formula of a sulphur is S_8.

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

Ans: Diamond and Graphite are stable allotropic forms of carbon at room temperature.

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

Ans: Allotropy is the property of elements only.

Examples:

Example 5.1

A gas with volume 350 cm³ has a pressure of 650 mm of Hg. If its pressure is reduced to 325 mm of Hg. Calculate what will be its new volume?

Data:

$$V_1 = 350 cm^3$$

$$P_1 = 650 mm\ of\ Hg$$

$$P_2 = 325 mm\ of\ Hg$$

$$V_2 = ?$$

Solution   By using the equation of Boyle's Law

$$P_1 V_1 = P_2 V_2$$

$$V_2 = \frac{P_1 V_1}{P_2}$$

By putting the values

$$V_2 = \frac{650 \times 350}{325}$$

$$= 700 cm^3$$

Thus volume of the gas is doubled by reducing its pressure to half.

Example 5.2

750 cm³ of a gas was enclosed in a container under a pressure of 600 mm Hg. If volumes is reduced to 350 cm³, what will be the pressure?

Data

$$V_1 = 785 cm^3$$

$$P_1 = 600 mm\ of\ Hg$$

$$V_2 = 350 cm^3$$

$$P_2 = ?$$

Solution   By using the Boyle's equation

$$P_1 V_1 = P_2 V_2$$

$$P_2 = \frac{P_1 V_1}{V_2}$$

By putting the values

$$P_2 = \frac{785 \times 600}{350} = 1345.7 mm\ of\ Hg$$

$$P_2 = \frac{1345.7}{760} = 1.77 atm$$

Thus pressure is increased by decreasing volume.

Example 5.3

A sample o
up to 700 c
Data

$$V_1 =$$

$$T_1 =$$

$$V_2$$

$$T_2$$

Solution

By using the

$$\frac{V_1}{T_1}$$

$$T_2$$

By putting t

$$T_2 = \frac{700 \times}{250}$$

Thus expans

Example 5.4

A sample of
raised to 10

Data

$$V_1 =$$

$$T_1 =$$

$$T_2 =$$

$$V_2 =$$

Solution

By using th

$$\frac{V}{T}$$

By puttin

Thus vo

2-   Conver
(a)750°C to K
(c) 100K to °C
(a)   T

Example 5.3

A sample of oxygen gas has a volume of 250 cm³ at -30 °C. If gas is allowed to expand up to 700 cm³ at constant pressure, find out its final temperature.

Data

$$V_1 = 250 cm^3$$
$$T_1 = -30^{\circ}C = (-30 + 273) = 243K$$
$$V_2 = 700 cm^3$$
$$T_2 = ?$$

Solution

By using the equation

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$T_2 = \frac{V_2 T_1}{V_1}$$

By putting the value in equation

$$T_2 = \frac{700 \times 243}{250} = 680.4 K$$

Thus expansion is caused due to increasing temperature.

Example 5.4

A sample of hydrogen gas occupies a volume 160 cm³ at 30 °C. If its temperature is raised to 100 °C, calculate what will be its volume if the pressure remains constant.

Data

$$V_1 = 160 cm^3$$
$$T_1 = 30^{\circ}C = 303K \quad . \ (as \ 0^{\circ}C = 273K)$$
$$T_2 = 100^{\circ}C = 373K$$
$$V_2 = ?$$

Solution

By using the equation of Charles' Law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_2 = \frac{V_1 T_2}{T_1}$$

By putting the values in above equation.

$$V_2 = \frac{160 \times 373}{303} = 196.9 \, cm^3$$

Thus volume of the gas has increased by raising the temperature.

NUMERICALS

2-   Convert the following units:

(a) 750°C to K   (b)   150°C to K

(c) 100K to °C   (d)   172K to °C

(a)   T   =   750°C

	K	=	C°	+	273.15
		=	750 + 273.15 = 1023.15K		
(b)	T	-=	150°C		
	K	=	C°	+	273.15
		=	150 + 273.15 = 423.15K		
(c)	T	=	100K		
	C°	=	K	-	273
		=	100 - 273 = -173°C		
(d)	T	=	172K		
	C°	=	K	-	273
		=	172 - 273 = -101°C		

3- A gas at pressure 912 mm of Hg has volume 450cm³ . What will be its volume of 0.4 atm.

Sol:

P_1	=	912mm Hg
V_1	=	450cm³
P_2	=	0.4atm
	=	0.4 x 760 = 304 mm Hg
V_2	=	?

According ot Boyle Law

$$P_1V_1 = P_2V_2$$

$$V_2 = \frac{P_1V_1}{P_2}$$

$$V_2 = \frac{912 \times 450}{304} = 1350 cm^3$$

4- A gas occupies a volume of 800cm³ at 1 atm. What will be its pressure in mm of Hg, when it is allowed to expand up to 1200cm³

Sol:

P_1	=	1 atm
V_1	=	800cm³
P_2	=	0?
V_2	=	1200cm³

According ot Boyle Law

$$P_1V_1 = P_2V_2$$

$$P_2 = \frac{P_1V_1}{V_2}$$

$$P_2 = \frac{1 \times 800}{1200} = 0.66 atm$$

$$= 0.66 \times 760 = 506.66 \text{ mm Hg}$$

5- It is desired to increase the volume of a fixe amount of gas from 87.5 to 118cm³ while holding the pressure constant. What would be the final temperature if the initial temperature is 23°C.

Sol:

V1	=	87.5cm³
V2	=	118cm³
T1	=	23°C + 273 = 296K
T2	=	?

According Charles Law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$T_2 = \frac{V_2 T_1}{V_1}$$

$$T_2 = \frac{118 \times 296}{87.5} = 399K$$

$$T_2 = 399 - 273 = 126^{\circ}C$$

7- A balloon that contain $1.6dm^3$ of air at standard temperature ($0^{\circ}C$) and (1atm) pressure is taken under water to a depth at which its pressure increases to 3.0 atm. Suppose that temperature remains unchanged, what would be the new volume of the balloon. Does it contract or expand?

Sol: P_1 =   1atm

       V_1 = $1.6dm^3$

       P_2 =   3.0 atm

       V_2 =   ?

According to Boyle Law

P_1V_1 = P_2V_2

$$V_2 = \frac{P_1V_1}{P_2}$$

$$V_2 = \frac{1 \times 1.6}{3} = 0.53dm^3$$

8- A sample of neon gas occupies a volume of $75.cm^3$ at very low pressure of 0.4 atm. Assuming temperature remains constant what would be the volume at 1.0 atm pressure?

Sol: P_1 =   0.4atm

       V_1 = $75cm^3$

       P_2 =   1.0 atm

       V_2 =   ?

According ot Boyle Law

P_1V_1 = P_2V_2

$$V_2 = \frac{P_1V_1}{P_2}$$

$$V_2 = \frac{0.4 \times 75}{1} = 30cm^3$$

9- A gas occupies a volume of $35.0 \ dm^3$ at $17^{\circ}C$. If the gas temperature rises to $34^{\circ}C$ at constant pressure, would you expect the volume to double? If not calculate the new volume.

Sol: V1   = $35.0dm^3$

       V2   =   ?

       T1   = $17^{\circ}C + 273 = 290K$

       T2   = $34^{\circ}C + 273 = 307K$

According Charles Law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_2 = \frac{V_1T_2}{T_1}$$

$$V_2 = \frac{35 \times 307}{290} = 37dm^3$$

Chapter No. 5: Exercise (Short Question Answer)

1. What is diffusion, explain with an example.

Ans: Diffusion

Diffusion is a spontaneous mixing up of molecules by random motion and collisions to from a homogeneous mixture.

Example:- H_2 and O_2 diffuses but the rate of diffusion of H_2 is four times faster than O_2.

2. **Define standard atmospheric pressure. What are its units? How is it related to Pascal?**   **(10 times) (2019=3 times)**

Ans: **Standard Atmospheric Pressure:-** It is the pressure exerted by the atmosphere at sea level. It is stated as:

" The pressure exerted by the column of mercury 760mm height at sea level".

Unit: 1 atm = 760mm Hg = 760 torr

The SI unit of pressure is Nm^{-2}. It is also called Pascal (Pa).

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

4- **What do you mean by evaporation. How is it effected by surface area? (2018)**

Ans: **Evaporation:** The process of changing of a liquid into a gas phase is called evaporation. It is reverse of condensation in which a gas changes into liquid. Evaporation is an endothermic process.

Effects of surface area: Evaporation is a surface phenomenon. Greater is surface area, greater is evaporation and vice versa. For example, sometimes, a saucer is used if tea is to be cooled quickly. This is because evaporation from the larger surface area of saucer is more than that from the smaller surface area of a tea cup.

5. **Define the term allotropy with examples.**   **(10 times) (2019=1 times)**

Ans: **Allotropy:-**The existence of an element in more than one forms in same physical state is called allotropy. Allotropes of oxygen are oxygen (O_2) and ozone (O_3).

6. **In which from sulphur exists at 100 °C ?**   **(1 time) (2019=1 times)**

Ans: Sulphur exists at 100 °C in monoclinic form.

7- **What is the relationship between evaporation and boiling point of a liquid?**

Ans: The liquid which has high boiling point will have lower evaporation due strong intermolecular forces. It has inverse relation.

Conceptual Short Questions

1. **Whether the density of gases increases on cooling?**   **(1 time)(2018)**

Ans: **Density of Gases:-** Yes, the density of gases can be increased by cooling. Due to this, volume decreases. As volume decreases, density increases.

2. **Convert -20°C to Kelvin temperature.**

Ans: **Conversion of -20°C to Kelvin temperature**

$(T)K = (T)°C + 273$

$(T)K = (-20)°C + 273 = 253K$

3. **Convert 100°C To Kelvin.**

Ans: **Conversion of 100 °C to K:**

Formula: $(T)K = (100)°C + 273$

             $(T)K = 100 + 273 = 373K$

4. **Why drops of rain fall downwards.**

Ans: **Drops of rain fall downwards:**

Condensation is a process in which a gas changes into liquid. When water vapours combine together in clouds it forms rain. When many vapours combine in clouds those becomes heavy and falls downward due to the gravitational force of the Earth.

5. **Why kerosene oil floats over water and honey settles down.**

Ans: **Kerosene oil floats over water and honey settles down:**

kerosene oil floats over water and honey settles down because kerosene oil is less denser than water and honey is more denser than water.

6. **State whether Allotropy is shown by Elements or Compounds or both?**

Ans: **Allotropy is shown by Elements:** *The existence of an element in more than one forms in same physical state is called Allotropy.*

Allotropes always shows different physical properties but may have same chemical properties.

7.   **Why the density of a gas increases on cooling?**   **(Test Yourself 5.1)**

Ans: The density of gases increases by cooling because their volume decreases. For example at normal atmospheric pressure the density of oxygen gas is 1.4 gdm^{-3} at 20°C and 1.5 gdm^{-3} at 0.0°C.

8.   **Why is the density of gas measured in gdm^{-3} while that of a liquid in gcm^{-3}?**

                                                          (Test Yourself 5.1)

Ans: Gases have low densities due to light mass and more volume is occupied by the gas molecules. That is why 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.

9.   **Which variables are kept constant in Charles's law?**   **(Test Yourself 5.3)**

Ans: Amount of gas (Number of moles) and pressure over gas are kept constant.

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

                                                          (Test Yourself 5.3)

Ans: Whn a gas is allowed to expand, its temperature will decrease and it will causes cooling effect.

11.   **Which is lighter one aluminum or gold?**   **(Test Yourself 5.5)**

Ans: Aluminium is lighter than gold. Because density of aluminium is 2.7 gcm^{-3} while the density of gold is 9.3 gcm^{-3}.

12.   **Why are the densities of gases lower than that of liquids? (Exercise Question)**

Ans: Gases have low densities than liquids. It is due to light mass and large volume occupied by the gas molecules.

Long Questions

1.   **Define Boyle's law and verify it with an example.**

Ans   **Boyle's Law**

In 1662 Robert Boyle studied the relationship between the volume and pressure of a gas at constant temperature. He observed that volume of a given mass of a gas is inversely proportional to its pressure provided the temperature remains constant.

According to this law, the volume (V) of a given mass of a gas decreases with the increase of pressure (P) and vice versa. Mathematically, it can be written as:

$$Volume \times \frac{1}{Pr\,essure} \quad or \quad V \propto \frac{1}{P}$$

$$V = \frac{k}{P} \quad or \quad VP = k = cons\tan t$$

If $P_1 V_1 = k$ Then $P_2 V_2 = k$

Where P_1 = initial pressure P_2 = final pressure

V_1 = initial volume V_2 = final volume

As both equations have same constant therefore, their variables are also equal to each other.

$$P_1 V_1 = P_2 V_2$$

Experimental Verificatoin:

Let us take some mass of a gas in a cylinder having a movable piston and observe the effect of increase of pressure on its volume.

2 atm   4 atm   6 atm   8 atm

1 dm³   0.5 dm³   0.33 dm³   0.25 dm³
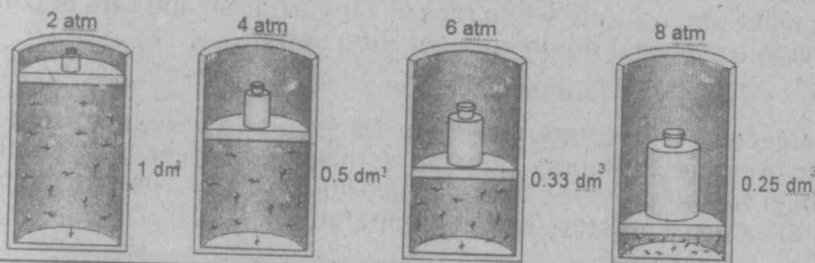
3.3	8	Define boiling point and also explain, how it is affected by different factors **(2019=3 times)**	10 times
3.5	9	Describe the phenomenon of Diffusion in liquids along with factors which influence it. **(2019=1 times)**	4 times
5		**Types of Solids**	
5.2	10	Differentiate between crystalline and amorphous solids.(Types of solids) **(2018)**	3 times

◄ **2018** ►

| | 11 | Define vapour pressure. What is effect of temperature on it? | |

CHAPTER-6 (TOPIC WISE MCQ'S)
BOARD PAPERS-2013-2022

Topic No: 6.1   Solution, Aqueous Solution, Solute and Solvent

1- The solution which is formed by dissolving a substance in water called:
(2 times)
(A) Saturated solution (B) Unsaturated solution
(C) Aqueous solution (D) Super saturated solution

2 A universal solvent on earth is or in an aquous solution the solvent is:
(3 times)(2018)
(A) water (B)alcohol (C) ammonia (D)ether

3- Which one is an example of Suspension: **(1 times) (2019=1 times)**
(A) Solution of Albumin (B) Solution of soap
(C) Solution of Starch (D) Solution of Magnesia

4 The component of solution which is present in smaller quantity is called:
(3 times)
(A) Solvent (B)Saturated solution (C) Solute(d)Unsaturated solution

5- The component of solution which is present in larger quantity is called.
(1 times)
(A)Solute (B)Solvent (C)Mixture (D)Colloidal

6 Which solution has less water. **(2 times) (2019=1 times)**
(A) 0.25 M (B)0.50 M (C) 1.0 M (D) 2.0 M

7 Which one of the solution contains more water? **(1 times)**
(A) 5% (B)10% (C) 15% (D) 20%

8- The minimum components of a solution are:
(A) 2 (B) 4 (C) 5 (D)3

9- The simplest way to distinguish between solution and pure liquid is :
(A) Evaporation (B) Distillation (C) Hydration (D) Halogenation

10- Sea water is a resource of occurring elements? **(2018)**
(A) 43 (B) 63 (C) 71 (D) 92

11 In soft drink the solvent is:
(A) Benzene (B) Water (C) Milk (D) Oil

12 Example of aqueous solution is:
(A) Benzene (B) Petrol (C) Ether (D) Sugar in water

13 Which of the following is the mixture of stainless steel
(A) Co+Ni+Cr (B) Co+Cr+Fe (C) Ni+Cr+Fe (D) Zn+Cr+Fe

14- A homogeneous mixture of two or more substance is called:
(A) Solution (B) Solvent (C) Solute (D) Aqueous

15- Minimum components of a solution are:
(A) 5 (B) 2 (C) 3 (D) 4

16- Brass is a solid solution of:
(A) Mg +Cu (B) Fe+Cu (C) Zn+Cu (D) Na+Cu

Topic No: 6.2 Saturated, Unsaturated, Supersaturated Solutions and Dilution of Solution

17   The concentrated solution of common salt in water in called. (1 times)
(A) brine   (B) benzene   (C) alcohol   (D) toluene
18-   A solution containing maximum amount of solute at a given temperature is called:
(A) Solvent   (B) Unsaturated   (C) Saturated   (D) Dilute

Topic No: 6.3   Types of Solutions

19-   Types of the solutions are.   (1 times)
(A) 3   (B) 6   (C) 9   (D) 12
20-   Which one is a solution of Gas in Gas: (2 times)
(A) Smoke   (B) Mist   (C) Fog   (D) Air
21-   Which one is solid solution of Brass: (4 Time)
(A) Zinc + Carbon   (B) Zinc + Lead   (C) Zinc+Iron   (D)Zinc+Copper
22-   Brass is an example of solution: (2 times)
(A) Liquid in solid   (B) Gas in gas   (C) Liquid in liquid (D)Solid in solid
23   The example of metals Alloy is:.   (2 times)
(A) Liquid in gas   (B)Gas in liquid   (C)Solid in gas   (D) Solid in solid
24   Example of liquid in liquid is.   (2 times)
(A)alcohol in water   (B)butter in water   (C) fog   (D) mist
25   Fog is an example of a solution of: (4 Times)
(a)Liquid in gas   (B)Gas in liquid   (C) Solution   (D) Gas in solid
26   Air is an example of solution: (2 Time)(2018)
(A)liquid in liquid   (B) gas in gas   (C) solid in liquid   (D) solid in solid
27   Opal is an example of solution: (1 times)
(A) liquid in gas   (B) solid in gas   (C)solid in solid   (D)gas in solid
28   Butter is an example of Solution:
(A) Liquid in Gas   (B) Gas in liquid   (C) Liquid in solid   (D) Solid in liquid
29-   Smoke in air is the example of:
(A) Gas in gas solution   (B) gas in liquid solution
(C) Solid in gas solution   (D) Solid in solid solution
30   The example of solution of a solid solute in a solid solvent is:
(A) fog   (B) brass   (C) cheese   (D) air
31   Example of "Gas in Liquid" is:
(A) Air   (B) Oxygen in water   (C) mist   (D) smoke in air
32   Which of the following is solid in gas solution:
(A) Smoke in air   (B) Butter   (C) Brass   (D) Fog

Topic No: 6.4   (4.1)Concentration Units

33-   If 10 cm³ of alcohol is dissolved in 100 cm³ of solution, in percentage it will be.
                                                                             (2 times)

(A) $\%\frac{w}{w}$ (B) $\%\frac{w}{v}$ (C) $\%\frac{v}{w}$ (D) $\%\frac{v}{v}$

34   Number of moles of solute in one dm³ of the solution is called.
                                                        (1 times) (2019=1 times)

(A) solubility   (B) molarity   (C) colloid   (D) suspension
35-   Concentration is Ratio of: (2018)
(A) Solvent to Solute (B) Solute to Solution (C) Solvent to Solution (D) Both A and B
36-   The colour of concentrated solution of potassium permanganate is :
(A) dark red   (B) dark green   (C) dark purple   (D) bright yellow
37   The number of grams of solute dissolved in 100 grams of solution, the percentage is called: (2019=2 times)
(A) Percentage $\frac{mass}{mass}$ (B) Percentage $\frac{mass}{volume}$ (C) Percentage $\frac{volume}{mass}$ (D) Percentage $\frac{volume}{volume}$
38-   The volume in cm³ of solute dissolved in 100g of solution is
(A) %m/m   (B) %m/v   (C) %v/m   (D) %v/v

39- If solute in grams is dissolved in 100cm³ of the solution, it is called: **(2 times)**
(A) %m/m   (B) %m/v   (C) %v/m   (D) %v/v

40- The proportion of a solute in a solution is called:
(A) Percentage   (B) Concentration   (C) Molarity   (D) Solubility

41- If 10g of sugar is dissolved to prepare 100cm³ of solution, it is called: **(2 times)**
(A) %m/m   (B) %v/v   (C) %v/m   (D) % m/v

Topic No: 6.5   Solubility

42- Which one is soluble in carbon tetra chloride?   **(1 times)**
(A) Grease   (B) Alcohol   (C) Sugar   (D) NaCl

43 KCl is soluble in: **(1 times)**
(A) benzene   (B)   ether   (C) carbon tetrachloride (D) water

44- Identify the compound which is not soluble in water: **(4 times)**
(A) C_6H_6 (B) NaCl   (C) KBr   (D) $MgCl_2$

45- Which one can easily dissolve in carbon tetra choride? **(1 times)**
(A) Sodium Chloride   (B) Silver nitrate   (C) Magnesium oxide (D) Iodine

46 Paints and ether are mixable because: **(1 times)**
(A) both are polar   (B) both are non polar
(C) paints are polar but ether is non polar   (D) both have different chemical nature

47 Which one of the following is soluble in water:
(A) alcohol   (B) ether   (C)benzene   (D) petrol

48- The example of suspension is: **(2019=1 times)**
(A) starch   (B) blood   (C) milk   (D) paint

49 Which pair of compounds is soluble:
(A)Ether and water   (B) KCl and water   (C) Benzene and water (D) Petrol and water

50- Polar covalent compounds are soluble in:
(A) Benzene   (B) Ether   (C) Water   (D) Petrol

51- Which is soluble in water?
(A) Naphthalene   (B) Paints   (C) Grease   (D) Sugar

52- Which compound is not soluble in water?
(A) Sugar   (B) Alcohol   (C) Glucose   (D) Benzene

Topic No: 6.6 Comparison of Solutions, Suspensions and Colloids.

53 Which one of the following exhibits the Tyndall effect.   **(1 times)(2018)**
(A) Solution   (B) colloid   (C) suspension   (D) solvent

54 Milk of Magnesia is an example of: **(2 Time)**
(A) Solution   (B)Real Solution   (C) Colloid   (D) Suspension

55 An example of true solution is:
(A) tooth paste   (B) solution of starch (C)solution of soap   (D) ink in water

56 Which one the following is a suspension:
(A) milk of magnesia   (B) sugar solution   (C) ink   (D) milk

57 Which one of the following is the example of colloid: **(2019=1 times)**
(A) starch   (B) paints   (C) milk of magnesia (D) chalk in water

ANSWERS TO MCQ's

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	A	D	C	B	D	A	A	A	D	B	D	C	A	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	A	C	C	D	D	D	D	A	A	B	C	C	C	B
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
B	A	D	B	B	C	A	C	B	B	D	A	D	A	D
46	47	48	49	50	51	52	53	54	55	56	57			
B	A	D	B	C	D	D	B	D	D	A	A			

1- Mist is a
(A) liquid in gas
2- which o
(A) sugar in wat
3- Concent
(A) solvent to so
4- Which o
(A) 2 M
5- A 5 perc
(A) 5 g of sugar i
(C) 5 g of sugar i
6- If the sol
forces. The solu
(A) dissolves rea
(C) dissolves slow
7- Which on
solubility?
(A) KCl
8- Which on
(A) milk
9- Tyndall ef
(A) Sugar solution
10- Tyndall e
(A) blockage of b
(C) scattering of
11- If 10 cm³
(A) % w/w
12- When as
(A) Supersatura
(C) a concentra
13- Molarity
(A) 1 kg of solut

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Topic No: 6
1. What is
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Chapter No. 6: Exercise(MCQ's)

1- Mist is an example of solution:
(A) liquid in gas   (B)gas in liquid   (C)solid in gas   (D)gas in solid
2- which one of the following is a liquid in solid solution?
(A) sugar in water   (B)butter   (C)opal   (D)fog
3- Concentration is ratio of:
(A) solvent to solute   (B)solute to solution   (C)solvent to solution   (D)both a and b
4- Which one of the following solutions contains more water?
(A) 2 M   (B)1 M   (C)0.5 M   (D) 0.25M
5- A 5 percent (w/w) sugar solution means that:
(A) 5 g of sugar is dissolved in 90 g of water   (B) 5 g of sugar is dissolved in 100 g of water
(C) 5 g of sugar is dissolved in 105 g of water   (D) 5 g of sugar is dissolved in 95 g of water
6- If the solute-solute forces are strong enough than those of solute-solvent forces. The solute:
(A) dissolves readily   (B) does not dissolve
(C) dissolves slowly   (D) dissolves and precipitates
7- Which one of the following will show negligible effect of temperature on its solubility?
(A) KCl   (B) KNO_3 (C) $NaNO_3$ (D) NaCl
8- Which one of the following is heterogeneous mixture?
(A) milk   (B) ink   (C) milk of magnesia   (D) sugar solution
9- Tyndall effect is shown by:
(A) Sugar solution   (B) paints   (C) jelly   (D) chalk solution
10- Tyndall effect is due to:
(A) blockage of beam of light   (B) non-scattering of beam of light
(C) scattering of beam of light   (D) passing through beam of light
11- If 10 cm^3 of alcohol is dissolved in 100 g of water, it is called:
(A) % w/w   (B) % w/v   (C) % v/w   (D) % v/v
12- When a saturated solution is diluted it turns into:
(A) Supersaturated solution   (B) saturated solution
(C) a concentrated solution   (D) unsaturated solution
13- Molarity is the number of moles of solute dissolved in:
(A) 1 kg of solution   (B) 100g of solvent   (C) 1 dm^3 of solvent   (D) 1 dm^3 of solution

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13
A	B	B	D	D	B	D	C	C	C	C	D	D

CHAPTER-6(SHORT QUESTIONS AND ANSWERS) (TOPIC WISE) BOARD PAPERS-2013-2022

Topic No: 6.1   Solution, Aqueous Solution, Solute and Solvent

1. What is homogenous mixture of two or more substances?
Ans: A solution is a homogenous mixture of two or more substances.
2. Define Aqueous Solution. Give an example.   (26 times) (2019=1 times)
Ans: Aqueous solution:- A solution which is formed by dissolving substances in water is called an aqueous solution. In aqueous solution water is always in large excess so it acts as solvent. Example of aqueous solution: Sugar in water, Table salt in water.
3. Differentiate between solute and solvent with examples of each.
                                                          (33 times) (2019=3 times)
Ans: A component of solution which is present in smaller quantity is called **solute**, while the component of a solution which is present in larger quantity is called **solvent**. e.g., in Sugar solution, sugar is solute and water is solvent.

Topic No: 6.2 Saturated, Unsaturated, Supersaturated Solutions and Dilution Of Solution

4. Differentiate between saturated and unsaturated solutions.

(18 times) (2019=3 times)

Ans: <u>Saturated Solution:-</u> A solution which contains more amount of the solute at a given temperature is called saturated solution.

<u>Unsaturated Solution:-</u>A solution which contains lesser amount of solute than that which is required to saturated at a given temperature, is called unsaturated solution. Such solution has the capacity to dissolve more solute to become a saturated solution.

5. Compare two characteristics of solution and suspension.

Ans: <u>Characteristics of Solution and Suspension:</u>

<u>Solution:</u> (i)The particles exist in their simplest form i.e. as molecules or ions. Their diameter is about 10^{-8} cm.

(ii) Particles dissolved uniformly throughout and form a homogenous mixture.

<u>Suspension:-</u> (i) The particles are of largest size. They are larger than 10^{-5} cm in diameter.

(ii) Particles remain undissolved and form a heterogeneous mixture. Particles settle down after sometime.

6. What is super saturated solution?   **(6 times)**

Ans: <u>Super Saturated Solution:-</u>

The solution that is more concentrated than a saturated solution is known as supersaturated solution.

Topic No: 6.3   Types of Solutions

(5 times)

7. Define Alloy. Give an example.

Ans: <u>Alloy:-</u> Alloy is a homogeneous mixture of one metal with other metals or non-metals. The best example of alloy is stainless steel which is a combination of Iron, chromium and Nickel.

opic No: 6.4   Concentration Units

8. What do you mean by percentage - volume / mass (% V/m)?

(8 times) (2019=1 times)

Ans: <u>Percentage - volume / mass (% v/m):-</u> It is the volume in cm³ of a solute dissolved in 100 g of the solution.

Formula: $\% \ m/v = \dfrac{\text{Volume of solute}}{\text{Mass of solution}} \times 100$

9. What do you mean by percentage- (Mass/Mass) (% m/m)?

Ans: <u>Percentage Mass/Mass (m/m %):</u> It is the number of grams of solute in 100 grams of solution.

$m/m \ \% = \dfrac{\text{mass of solute}}{\text{mass of solution}} \times 100$

10. What is meant by (%m/v)?

Ans: <u>Percentage mass/volume (m/v %):-</u> It is the mass in grams of a solute dissolved per 100 cm³ of the solution.

$\% \text{age mass/volume} = \dfrac{\text{mass of solute}}{\text{volume by solution}} \times 100$

11. Differentiate between dilute solution and concentrated solution .

(21 times) (2019=4 times)

Ans: <u>Dilute and Concentrated Solution:</u>

Dilute Solution	Concentrated Solution
A solution that contains a relatively small amount of solute is called a dilute solution.	A solution that contains a relatively large amount of solute is called a concentrated solution.

(32 times) (2019=4 times)

12. Define Molarity and write its unit.

Ans: <u>Molarit</u>
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13. Define
Ans: <u>Molar</u>
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Topic No:

15. Define
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iii. Temp

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21. Wh

Ans: <u>Molarity:-</u>   *Number of moles of solute dissolved in one dm^3 of solution is called as Molarity.* It is represented by M. its unit is *$mol\ dm^{-3}$*.

$$Molarity = \frac{No. of\ moles\ of\ solute}{Volume\ of\ solution\ in\ dm3}$$

13. Define molar solution? / How one molar solution is prepared?

Ans: <u>Molar Solution:-</u> Molar solution is a solution which is prepared by dissolving one mole of the solute in sufficient amount of water to make the total volume of the solution up to 1 dm^3.

14. How can you prepare one molar solution of sodium hydroxide (NaOH)?

                                                                (2019=1 times)

Ans: Molarity   = 1 mole dm^{-3}

Moalr Mass of NaOH= 23+16+1= 40 g mol^{-1}

Formula: Mass of solute = Molarity x Molar mass x volume

                Mass of NaOH =   1   x   40   x   1 dm^3

                Mass of NaOH =   40 g

We shall dissolve 40 g of NaOH in sufficient amount of water to make the total volume 1 dm^3.

Topic No: 6.5   Solubility

15.   Define Solubility.   **(5 times) (2019=1 times)**

Ans: <u>Solubility:</u>   *The amount of solute in grams dissolved in 100 g of a solvent to make its saturated solution at a particular temperature is called as solubility.*

16.   Explain 'the effect of temperature on solubility'.

Ans: i).   Solubility usually increases with the increase in temperature.

ii).   In some cases, the solubility of salts decreases with the increase of temperature.

iii).   And in some cases temperature has minimum effect on solubility.

17.   Why benzene is insoluble in water.

Ans: <u>Benzene is insoluble in water:</u>

Benzene is non-polar while water is a polar compound. According to the general principal of solubility "Like dissolves like" non-polar compounds are insoluble in polar compounds.

18.   Why is naphthalene soluble in carbon tetrachloride and not in water?

Ans: <u>Solubility of Naphthalene:</u>

According to general principle of solubility "like dissolves like" naphthalene is a non-polar molecule which is only soluble in non-polar solvent like carbon tetrachloride (CCl_4).

19.   Write down two factors effect solubility.

Ans: <u>Factors:</u>

i.   Like dissolve like

ii.   Solute-solvent interactions

iii. Temperature

Topic No: 6.6 Comparison of Solutions, Suspensions and Colloids.

20.   Differentiate between solutions and colloids?   **(3 times)(2018)**

Ans: <u>Differentiation between solutions and colloids:</u>

Solutions	Colloids
A homogeneous mixture of two or more components is known as solution.	A solution of two or more components in which particles of solute are bigger than the particles of true solution.
Particles of solute dissolve in solvent and cannot be seen through by naked eye.	A colloid appears to be homogeneous but actually it is heterogeneous.
Particles are so small that they cannot scatter the light, thus do not show tyndall effect.	Particles scatter the path of light rays, hence show tyndall effect.

21.   What is meant by solutions? Give an example.   **(5 times)**

Ans: <u>Solution:-</u>   *Homogenous mixture of two or more than two substances is called solution.* e.g., sugar solution (sugar + water).

22. How can distinguish between solution and pure solvent?

Ans: A **solution** is a homogenous mixture of two or more substances. While pure solvent is not a mixture. The simplest way to distinguish between solution and pure solvent is evaporation.

The liquid which evaporates completely, leaving no residue, is a **pure compound** or solvent, while the liquid which leaves behind a residue on evaporation is solution.

23. Why do true solutions not show Tyndall effect?   **(2018)**

Ans: Particles are so small that they cannot scatter the light, thus do not show tyndall effect.

24. What is meant by colloid? Give two examples.   **(5 times)(2018)**

Ans: *A colloid is a heterogeneous solution in which solute particles are larger than the particles present in true solution but these particles do not settle down and cannot be seen by naked eye is called colloid* e.g., Milk, Soap solution etc.

25. What is meant by Suspension? Explain it with an example. **(3 times)(2018)**

Ans: <u>Suspension:-</u> Suspension is a heterogeneous mixture of undissolved particles in a given medium. Particles are big enough to be seen with naked eye. For example chalk

in water or milk of magnesia are examples of suspensions.

26. Why does not the suspension form a homogenous mixture? Suspension do not

Ans: Form a homogeneous mixture because its particles remain undissolved and settle down after sometimes.

27. How can you justify that blood is a collide?

Ans: <u>Blood is a collide:</u>
Blood is a heterogeneous solution in which solute particles are larger than the particles present in true solution but these particles do not settle down and cannot be seen by naked eye. Blood also show tyndall effect so blood is a collide.

Test Yourself 6.1

i. Why is a solution considered mixture?

Ans: <u>Solution is a Mixture:</u> A solution is considered mixture because it always a homogeneous mixture of solute in a solvent.

ii. Distinguish between the following pairs as compound or solution:

(a) water and salt solution   **(b)** vinegar and benzene

(c) carbonated drinks and acetone

Ans:

Compound	Solution
Water	Salt solution
Benzene	Vinegar (acetic acid + water)
Acetone	carbonated drinks

iii. What is the major difference between a solution and a mixture?

                    (7 times) (2019=3 times)

Ans: A mixture may be homogeneous or heterogeneous while solution is always a homogeneous mixture of solute in a solvent.

iv. Why are the alloys considered solutions?

Ans: i. Alloys are homogenous mixtures.
ii. They show the properties of their components.
iii. They have a variable composition.
That's why alloys are considered solutions.

v. Dead sea is so rich with salts that it forms crystals when temperature lowers in the winter. Can you comment why is it named as "Dead Sea"?

Ans: It is called "dead sea" because due to very high concentration of salts, living organisms become dead or can not live any more.

Test Yourself 6.2

i. Does the percentage calculations require the chemical formula of the solute?

Ans: No, the percentage calculations does not require the chemical formula of solute, it requires only mass or volume of solutes.

ii. Why is the formula of solute necessary for calculation of the molarity of the solution?

Ans: The formula of a substance gives the atomic mass, molecular mass or formula mass of the solute, which is being used to find number of moles of solute. For instance

Molarity(M) = No. of moles of solute/ Volume of solution in dm^{-3}.

iii. You are asked to prepare 15 percent (m/m) solution of common salt. How much amount of water will be required to prepare this solution ?

Ans: To prepare 15% m/m solution of common salt 15g solute and 85g water is required which will collectively make 100g of solution.

$$\% \frac{m}{m} = \frac{mass\ of\ solute}{mass\ of\ solute + mass\ of\ solvent} \times 100$$

$$= \frac{15g}{15g+85g} \times 100 = \frac{15}{100} \times 100$$

$$= 15\%$$

iv. How much water should be mixed with 18 cm^3 of alcohol so as to obtain 18 % (v/v) alcohol solution?

Ans: 18cm^3 of alcohol is dissolved in 82cm^3 of water so that the total volume of the solution becomes 100cm^3.

v. Calculate the concentration % (m/m) of a solution which contains 2.5 g of salt dissolved in 50 g of water.

Ans: Mass of salt = 2.5 g
Mass of water = 50g

$$Concentration\ (\%m/m) = \frac{mass\ of\ solute}{Mass\ of\ solute + mass\ of\ solvent} \times 100$$

$$= \frac{2.5}{2.5+50} = \frac{25}{52.5} = 4.7\%$$

Test Yourself 6.3

i. What will happen if the solute-solute forces are stronger than those of solute-solvent forces?

Ans: If the solute-solute forces are stronger than those of solute-solvent forces then solute will not dissolve in the solvent and solution will not formed.

ii. When solute-solute forces are weaker than those of solute-solvent forces? Will solution form?

Ans: When solute-solute forces are weaker than those of solute-solvent forces, then solute will dissolve and solution will form.

iv. Why test tube becomes cold when KNO_3 is dissolved in water? (5 times)

Ans: When KNO_3 is dissolved in water, the test tube becomes cold. It means during dissolution heat is absorbed. This process is endothermic.

Solute + Solvent + heat → Solution
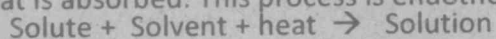
So, solubility of such solutes increases by increasing temperature.

Test Yourself 6.4

i. What is difference between colloid and suspension? (13 times)

Ans: Difference between Colloid and Suspension:-

Colloids	Suspension
1. The solutions in which solute particles are larger than those present in the true solution but not larger enough to be seen by naked eye. e.g., starch solution, soap solution, etc.	1. Suspension is a heterogeneous mixture of undissolved particles in a given medium particles are big enough to be seen with naked eye. e.g., Chalk in water, Milk of Magnesia, etc.
2. Particles scatter the path of light rays thus emitting the beam of light i.e., show tyndall effect.	2. Particles are so big that light is block and difficult to pass i.e., do not show tyndall effect.

ii. Can colloids be separated by filtration, if not why?

Ans: Colloids can not be separated by filtration because the particles of colloids are small and can pass through the filter paper.

iii. Why are the colloids quite stable?

Ans: **Colloids are Quite Stable:-** A colloid appears to be a homogeneous but actually it is a heterogeneous mixture. Hence, they are not true solution. Particles do not settle down for a long time, therefore, colloids are quite stable.   **(3 times)**

iv. Why does the colloid show tyndall effect?

Ans: **Colloids show Tyndall effect:-** Colloids show tyndall effect because particles of colloids are big enough, so they can scatter the beam of light.

v. What is tyndall effect and on what factors it depends?

Ans: **Tyndall effect:-** *The scatting of light through colloids is called as tyndall effect.* It depends upon the size of particles.

vii. How can you justify that milk is a colloid.

Ans: Milk particles are so small that they do not settle down and pass through filter paper which is the character of colloid. Hence milk is colloid. Moreover it also shows Tyndall effect.

Examples

Example 6.1

If we add 5 cm³ of acetone in water to prepare 90 cm³ of aqueous solution. Calculate the concentration (v/v) of this solution.

Solution

$$\% \, volume \, / \, volume = \frac{Volume \, of \, the \, solute}{Volume \, of \, the \, solution} \times 100$$

$$= \frac{5}{90} \times 100 = 5.5$$

Thus concentration of solution is 5.5 percent by volume.

Example 6.2

Calculate the molarity of a solution which is prepared by dissolving 28.4 g of Na_2SO_4 in 400 cm³ of solution.

Solution

Conversion of mass of solute into moles

$$No \, of \, moles \, Na_2SO_4 = \frac{mass \, dissolved \, (g)}{molar \, mass \, (gmol^{-1})}$$

$$= \frac{28.4g}{142 \, gmol^{-1}} = 0.2 \, mol$$

$$Conversion \, of \, volume \, int \, o \, dm^3 = \frac{400cm^3}{1000cm^3} \times 1 \, dm^3 = 0.4 \, dm^3$$

$$Molarity = \frac{no.of \, moles}{volume \, of \, solution \, (dm^3)}$$

$$= \frac{0.2}{0.4} = 0.5 \, mol \, dm^{-3}$$

Example 6.3

How much NaOH is required to prepare its 500 cm³ of 0.4 M solution.

Solution

$$Molar \, mass \, of \, NaOH = 40 \, gmol^{-1}$$

$$Volume \, in \, dm^3 = \frac{500cm^3}{1000cm^3} \times 1 \, dm^3$$

$$= 0.5 \, dm^3$$

Putting the values in formula:

$$Molarity = \frac{mass\ of\ solute\ (g)}{molar\ mass\ (gmol^{-1}) \times volume\ of\ the\ solution\ (dm^3)}$$

$$Mass\ of\ solute = Molarity \times molar\ mass \times volumr$$
$$= 0.4 \times 40 \times 0.5$$

$$= 8g$$

NUMERICALS

1-   If 60cm³ of alcohol is dissolved in 940cm³ of water. What is concentration of this solution?

Sol:
Volume of solute	=	60cm³
Volume of solovent	=	940cm³
Volume of solution	=	60 + 940 = 1000cm³

$$\frac{V}{V}\% = \frac{Volume\ of\ solute}{Volume\ of\ solution} \times 100 = \frac{60}{1000} \times 100 = 6\%$$

2-   12M H₂SO₄ solution is available in the laboratory. We need only 500cm³ of 0.1M solution, how it will be prepared?

Sol:
M1	=	12M
V1	=	?
M2	=	0.1M
V2	=	500cm³
Concentrated solution	=	Dilute Solution
M1V1	=	M2V2
12V1	=	0.1 x 500

$$V_1 = \frac{0.1 \times 500}{12} = 4.16cm^3$$

Take 4.16cm³ of H₂SO₄ having 12M with the help of pipette in 500cm³ measuring flask. Then add water upto mark and prepare 0.1m solution in 500cm³ .

Chapter No.6: Exercise (Short Question Answer)

1. Why suspensions and solutions do not show tynall effect, while colloids do?

Ans: Suspensions do not show Tyndall effect because their particles are so big that the light is blocked.

Solutions do not show Tyndall effect because their particles are so small that they can not scatter the light.

Colloids show Tyndall effect because their particles are big enough to scatter the beam of light.

3. Why the suspension does not form a homogenous mixture?

Ans: Particles in suspension remain undissolved and settle down after some time. Therefore suspension does not form a homogeneous mixture.

4. How will you test whether given solution is a Colloidal solution or not?

                                                                         (2019=1 times)

Ans: <u>Test for Colloidal Solution:-</u>The collide particles scatter light when light is thrown on it. So particles of collide produce scattering of light known as tyndall effect.

5. Classify the following into true solution and colloidal solution or not?
Blood, starch solution, glucose solution, toothpaste, copper sulphate solution, silver nitrate solution.

Ans:

True solutions	Colloidsal solutions
Glucose solution copper sulphate solution. Silver Nitrate solution.	Toothpaste. Starch solution. Blood.

6. Why we stir paints thoroughly before using?   (2019=2 times)

Ans: <u>Paints Stirring:-</u>Paint is type of suspension. In a suspension particles settle down after some time. So a paint is stirred before using.

8. What do you mean, "Like dissolve like". **(11 times) (2019=2 times)**

Ans: The general principle of solubility is **"Like Dissolves Like"**. i.e.,

The polar substance are soluble in polar solvents e.g., NaCl and Alcohol are soluble in water and non-polar substance are soluble in non-polar solvents e.g grease and paint is soluble in carbon tetra chloride.

Example: Iodine is a non-polar molecule which is only soluble in non-polar solvent (CCl_4) according to the principle like dissolve like.

9. How does nature of attractive forces of solute-solute and solvent-solvent affect the solubility?

Ans: Solubility depends upon the relative strength of attractive forces between solute-solute, solvent – solvent and solute –solvent. If new forces between solute and solvent particles overcome the solute-solute attractive forces, then solute dissolves and makes a solution. If forces between solute particles a strong enough than solute-solvent forces, solute remains insoluble and solution is not formed.

10. How you can explain the solute-solvent interaction to prepare a NaCl solution?

Ans: When NaCl is added in water, it dissolves readily because the attractive interaction between ions of NaCl and polar molecules of water are strong enough to overcome attractive forces between Na^+ and Cl^- in solid NaCl. In this way NaCl dissolves in water.

11. Justify with an example that solubility of a salt increases with the increase in temperature. **(5 times)**

Ans: When salts like NH_4Cl, KCl, $NaNO_3$ and KNO_3 etc are added to water, temperature of mixture decreases. It means, during dissolution of these salts heat is absorbed. Such as dissolving process is called "endothermic".

Solvent + Solute + Heat $\longrightarrow$ Solution.

$\Rightarrow$ Solubility usually increases with the increase in temperature for such solutes. It means that heat is reaquired to break the attractive forces between the ions of solute. By increasing temperature. They easily get heat and get dissolved.

Conceptual Short Questions

1. Why water is called a universal solvent?

Ans: **Universal Solvent:** Water is called a universal solvent because it dissolve majority of compounds in earth's crust.

2. If we add 5 cm³ of acetone in water to prepare 90 cm³ of Aqueous Solution. Calculate the concentration (% v/v) of this solution.

Ans: % volume /volume = $\dfrac{\text{volume of the solute}}{\text{volume of the solution}} \times 100$

$= \dfrac{5}{90} \times 100 = 5.5$

3. How much NaOH is required to prepare its 500 cm³ of 0.4 M solution?

Ans: **Mass of NaOH reuqired=?**

Volume of solution	=	500 cm³
Molarity of solution	=	0.4 M
Molar Mass of NaOH	=	23 + 16 + 1 = 40 g/mole

Using formula:

Molarity $= \dfrac{\text{Mass of substance}}{\text{Molar Mass}} \times \dfrac{1000}{\text{Volume of solution in cm}^3}$

Mass of substance $= \dfrac{\text{Molarity} \times \text{Molar Mass} \times \text{vol of sol.in cm}^3}{1000}$

$= \dfrac{0.4 \times 40 \times 500}{1000} = 8\,g$

4. Why test tube becomes warm when Li_2SO_4 dissolved in water? **(2019=1 times)**

Ans: **Test tube becomes warm when Li_2SO_4 dissolved in water**

When Li_2SO_4 is dissolved in water, the test tube becomes warm. i.e. heat is released during this dissolution. It is an exothermic reaction.

Solvent + Solute → Solution + Heat

Solubility decrease with the increase of temperature.

5. Which one of the following solutions is more concentrated: one molar or three molar. **(Test Yourself 6.2)**

Ans: Three molar solution is more concentrated than one molar solution because 3M solution contains 3.0 moles of solute dissolved in 1 dm^3 of solution.

6. Why is iodine soluble in CCl_4 and not in water (11 times) **(Test Yourself 6.3)**

Ans: Iodine is soluble in CCl_4 not in water because iodine is non-polar in nature and CCl_4 is also non-polar but water is polar and forces of attraction do not develop between water molecules and iodine.

7. Identify as colloids or suspensions from the following: Paints, milk, milk of magnesia, soap solution, Jelly. (5 times) (2019=3 times) **(Test Yourself 6.4)**

Ans: <u>Colloids:</u> Soap solution, Milk, Jelly.
<u>Suspensions:</u> Paints, Milk of Magnesia.

8. What is the reason for the difference between solutions, colloids and suspensions? **(Exercise Question)**

Ans: In solution particles are very small. In colloid, particles are larger than solution particles. In suspension particles are big enough to be seen with naked eye and do not dissolve in solvent.

9. Which of the following will scatter light and why? **(Exercise Question)**
Sugar solution, soap solution and milk of magnesia.

Ans: **Sugar solution:**

Sugar solution will not scatter light because particles of solution are so small that they cannot scatter light.

Soap solution:

Soap solution scatter the light beause it is colloidal solution and its particles are large enough that they can scatter light i.e. exhibit the Tyndall affect.

Milk of magnesia:

Milk of magnesia cannot scatter the light because it is suspension and its particles are so big that light is blocked.

10. What do you mean by percentage-volume/volume (v/v %). **(Exercise Question)** (22 times) (2019=3 times)

Ans: <u>Percentage - volume/volume (V/V%):-</u> It is the volume in cm^3 of a solute dissolved per 100 cm^3 of the solution.

$$\% \text{ volume by volume} = \frac{\text{volume of solute}}{\text{volume by solution}} \times 100$$

Long Questions

1. What is saturated solution and how it is prepared?

Ans: **SATURATED SOLUTION**

When a small amount of solute is added in a solvent, solute dissolves very easily in the solvent. If the addition of solute is kept on, a stage is reached when solvent cannot dissolve any more solute. At this stage, further added solute remains undissolved and it settles down at the bottom of the container.
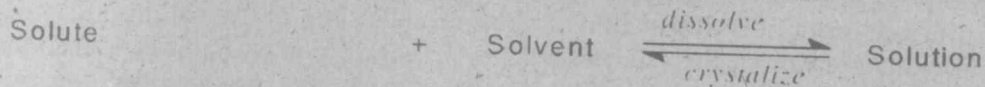
Solute + Solvent $\underset{crystalize}{\overset{dissolve}{\rightleftharpoons}}$ Solution

A solution containing maximum amount of solute at a given temperature is called saturated solution. On the particle level, a saturated solution is the one, in which undissolved solute is in equilibrium with dissolved solute.

Solute (crystallized) $\rightleftharpoons$ Solute (dissolved)
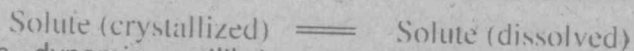
At this stage, dynamic equilibrium is established. Although dissolution and crystallization continues at a given temperature, but the net amount of dissolved solute remains constant.

2. Differentiate between dilute and concentrated solutions with a common example.

CHAPTER-7 (TOPIC WISE MCQ'S)
BOARD PAPERS-2013-2022

Topic No: 7.1　　Oxidation and Reduction Reactions

1　　A process of oxidation is.　　　　　　　　　　　　(1 times)
(A) removal of oxygen (B) gain of electrons (C) loss of electrons (D) addition of hydrogen

2　　Addition of oxygen during in chemical reaction is called?　(2 times)(2018)
(A) Evaporation　　(B) reduction　　(C) conduction　　(D) Oxidation

3-　　Which one of the following reactions is an oxidation reaction:(3 times)
(A) $K^+ + 1e \rightarrow K$　(B) $Cl_2 + 2e \rightarrow 2Cl^-$　(C) $Fe^{+2} \rightarrow Fe^{+3} + 1e$　(D) $Na^{+1} + 1e \rightarrow Na$

4-　　Electrochemistry is branch of chemistry which deals with relationship between:
(A) Carbon and its Compounds　　　　(B) Solute and Solutions
(C) Electricity and chemical reactions　(D) Metals and Non Metals

5-　　Gain of electron is called:
(A) Reduction　　(B) Oxidation　　(C) Redox　　(D) Electrolytes

6-　　The conversion of H_2S to sulphur is:
(A) Reduction　　(B) Oxidation　　(C) Redox　　(D) Addition

7-　　Loss of electron is called:
(A) Oxidation　　(B) Reduction　　(C) Hydration　　(D) Hydrogenation

8　　It is an example of:　$2Z_nO + C \rightarrow 2Zn + CO_2$
(A) Oxidation　　(B) Reduction　　(C) Redox　　(D) Electrolysis

9-　The addition of hydrogen or removal of oxygen during a chemical reaction is defined as:
(A) Oxidation　　(B) Reduction　　(C) Electricity　　(D) Electrolyte

Topic No: 7.2　　Oxidation States and Rules for Assigning Oxidation States

10-　　The oxidation number of group II elements is.　　(1 times)
(A) +1　　　(B) +2　　　(C) +3　　　(D) +4

11-　　The oxidation state of sulphur in H_2SO_4 is　(5 times) (2019=2 times)
(A) +5　　　(B) +6　　　(C) -6　　　(D) +3

12-　　The Oxidation number of group 1 elements is.　(1 times)
(A) -1　　　(B) +1　　　(C) +2　　　(D) -2

13-　　The Oxidation Number of Chlorine in $KClO_3$ is.　(13 Time) (2019=2 times)
(A) +3　　　(B) +4　　　(C) +5　　　(D) +6

14-　　Oxidation number of element in free state is:　(5 times)
(A) +1　　(B) -1　　(C) zero　　(D) -2

15-　　The Oxidation Number of Oxygen in per oxide is:　(3 times)
(A) 1　　(B) 2　　(C) -1　　(D) -2

16-　　The oxidation state of Nitrogen in HNO_3 is:　(6 Time) (2019=1 times)
(A) +3　　(B) +6　　(C) +5　　(D) -6

17-　　What is the oxidation number of oxygen in water?　(1 times)
(A) +1　　(B) -1　　(C) +2　　(D) -2

18　　Oxidation number of hydrogen in HCl is　(1 times)
(A) +1　　(B) -1　　(C) 0　　(D) -2

19　　The oxidation number of oxygen in OF_2 is　(2 times)(2018)
(A) -1　　(B) -2　　(C) +1　　(D) +2

20　　Which metal is coated on iron in galvanizing process:　(2 times)
(A) tin　　(B) chromium　　(C) silver　　(D) zinc

21-　　The apparent charge assigned to an atom of an element in a molecule or in an ion is called
(A) Electronegativity　(B) Oxidation number　(C) Ionization potential　(D) Bond

22-　　The oxidation number of all elements in free state is:
(A) Zero　　(B) +1　　(C) -1　　(D) -2

Topic No: 7.3　　Oxidizing and Reducing Agents.

23　　A specie that reduces a substance by donating electrons to it is called:　(2 Time)
(A) oxidizing agent　　(B) reducing agent　　(C) coloring agent　(D) dehydrating agent

24　　Non met
(A) they are mor
(C) they are neit
(D) they have lo

25-　　In the red
(A) Zn

Topic No: 7.

26-　　Whose r
Zn + CuSO₄→ Z
(A) Zn

27-　　Whose o

(A) Chlorine

28　　The oxid

(A) +1

Topic No: 7.

29　　Types of
(A) 2

30-　　Which o
(A) NaCl

31-　　An exam
(A) HNO_3

32-　　Which is
(A) HCl

33-　　Which is
(A) Sugar

34-　　The exa
(A) NaOH

35　　Electroly
(A) H_2SO_4

36　　Which o
(A) Common sa

37　　Pure wa
(A) weak electr

38-　　The Con
(A) Fluid

39-　　Which o
(A) Down's cell

40-　　The exa
(A) CH_3COOH

41-　　Example
(A) CH_3COO

42-　　Acetic a
(A) Strong elec

43　　The sol
(A) NaCl
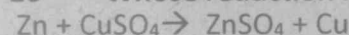
Topic No: 7

44　　Anode
(a) Steel

45　　What i
(A) NaOH

46　　Which
(A) Nelson's ce

24 Non metals act as oxidizing agents because (1 times)
(A) they are more electropositive (B) they are more electronegative
(C) they are neither electropositive nor electronegative
(D) they have low value of ionization energy

25- In the redox reaction between Zn and HCl, the reducing agent is:
(A) Zn (B) H^+ (C) Cl^- (D) H_2

Topic No: 7.4 Oxidation-Reduction Reactions.

26- Whose reduction is occurring in the following reaction? (1 times)
$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
(A) Zn (B) Cu (C) S (D) O

27- Whose oxidation occurring in the reaction: $Zn + HCl \rightarrow ZnCl_2 + H_2$
(1 times)
(A) Chlorine (B) Zinc (C) Hydrogen (D) Oxygen

28 The oxidation number of hydrogen in metal hydrides is:
(4 times) (2019=3 times)
(A) +1 (B) -1 (C) +2 (D) -2

Topic No: 7.5 Electrochemical Cells

29 Types of electrochemical cell are. (2 times)
(A) 2 (B) 3 (C) 4 (D) 5

30- Which one is weak Electrolyte? (6 times) (2019=2 times)
(A) NaCl (B) NaOH (C) CH_3COOH (D) H_2SO_4

31- An example of weak Electrolyte is: (2 Time) (2019=1 times)
(A) HNO_3 (B) HCl (C) H_2SO_4 (D) $Ca(OH)_2$

32- Which is not a strong electrolyte? (4 times)
(A) HCl (B) CH_3COOH (C) NaOH (D) H_2SO_4

33- Which is strong electrolyte? (1 times) (2019=1 times)
(A) Sugar (B) NaCl (C) Benzene (D) CH_3COOH

34- The example of non-electrolyte is. (3 times)
(A) NaOH (B) CH_3COOH (C) NaCl (D) Benzene(C_6H_6)

35 Electrolyte...........produces less ions in water. (2 times)
(A) H_2SO_4 (B) NaOH (C) $Ca(OH)_2$ (D) NaCl

36 Which one of the following is strong electrolyte? (4 Time)
(A) Common salt solution (B) sugar solution (C) pure water (D) benzene

37 Pure water is an example of: (2 times)(2018)
(A) weak electrolyte (B) strong electrolyte (C) strong acid (D) strong base

38- The Concentrated solution of NaCl is called: (1 times)
(A) Fluid (B) Brass (C) Brine (D) Plasma

39- Which one of the following is not an electrolytic cell? (2 TIMES)(2018)
(A) Down's cell (B) Nelson's cell (C) Galvanic cell (D) both A and C

40- The example of strong electrolyte is:
(A) CH_3COOH (B) $Ca(OH)_2$ (C) C_6H_6 (D) NaOH

41- Example of non-electrolyte is:
(A) CH_3COOH (B) Sugar (C) NaOH (D) NaCl

42- Acetic acid is an example of:
(A) Strong electrolyte (B) Weak electrolyte (C) strong acid (D) strong base

43 The solution of which of the following salt is called brine:
(A) NaCl (B) KCl (C) KNO_3 (D) KBr

Topic No: 7.6 Electrochemical Industries

44 Anode of Down's cell is made of : (2 times)(2018)
(a) Steel (B) Copper (C) Zinc (D) Graphite

45 What is obtained from Fused NaCl?: (1 times)
(A) NaOH (B) sodium metal (C) both A and B (D) none

46 Which one of following method is used for production of sodium metal:
(1 times)
(A) Nelson's cell (B) Down's cell (C) galvanic cell (D) electro plating

47- Which cell used to prepare caustic soda? **(1 times)**
(A) Nelson cell   (B) Down cell   (C) Dry cell   (D) Daniel 'cell

Topic No: 7.7 – Corrosion and its Prevention

48   The process of coating a thin layer of zinc on iron is called: **(1 times)**
(A) oxidizing   (B) reducing   (C) galvanizing   (D) alloying
49-   Depositing of one metal over the other by means of electrolysis is:
(A) Corrosion   (B) Reduction   (C) Oxidation   (D) Electroplating
50-   The electrolyte used in electroplating of silver is
(A) Silver Nitrate Solution   (B) $Cr_2(SO_4)_3$ Solution
(C) H_2SO_4 Solution   (D) $CuSO_4$ Solution
51-   Slow and continuous eating away of a metal by surrounding medium is called:
(A) Paint   (B) Alloy   (C) Corrosion   (D) Stains

ANSWERS TO MCQ's

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	D	C	C	A	B	A	C	B	B	B	B	C	C	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	D	A	D	D	B	A	B	B	A	B	B	B	A	C
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
D	B	B	D	C	A	A	C	C	D	B	B	A	D	B
46	47	48	49	50	51									
B	A	C	D	A	C									

Chapter No. 7: Exercise(MCQ's)

1-   Spontaneous chemical reactions take place in:
(A) Electrolytic cell   (B) Galvanic cell   (C) Nelson's cell   (D) Downs cell
2-   Formation of water from hydrogen and oxygen is:
(A) Redox reaction   (B) Acid-base reaction (C) Neutralization   (D) Decomposition
3-   Which one of the following is not an electrolytic cell?
(A) Downs cell   (B) Galvanic cell   (C) Nelson's cell   (D) Both a and C
4-   The oxidation number of chromium in $K_2Cr_2O_7$ is:
(A) +2   (B) +6   (C) +7   (D) +14
5-   Which one of the following is not an electrolyte?
(A) Sugar solution   (B) Sulphuric acid solution
(C) Lime solution   (D) sodium chloride solution
6-   The most common example of corrosion is:
(A) Chemical decay   (B) Rusting of iron   (C) Rusting of aluminium   (D) Rusting of tin
7-   Nelson's cell is used to prepare caustic soda along with gases. Which of the following gas is produced at cathode:
(A) Cl_2 (B) H_2 (C) O_3 (D) O_2
8-   During the formation of water from hydrogen and oxygen, which of the following does not occur:
(A) hydrogen and oxidized   (B) oxygen has reduced
(C) Oxygen gains electrons   (D) Hydrogen behaves as oxidizing agent
9-   The formula of rust is:
(A) $Fe_2O_3.nH_2O$ (B) Fe_2O_3 (C) $Fe(OH)_3.nH_2O$ (D) $Fe(OH)_3$
10-   In the redox reaction between Zn and HCl, the oxidizing agent is:
(A) Z_n (B) H^+ (C) Cl^- (D) H_2

ANSWERS

1	2	3	4	5	6	7.	8	9	10
B	A	B	B	A	B	B	D	A	B

CHAPTER-7 (SHORT QUESTIONS AND ANSWERS) (TOPIC WISE) BOARD PAPERS-2013-2022

Topic No: 7.1 Oxidation and Reduction Reactions

1. Define electrochemistry. (14 times) (2019=1 times)

Ans: <u>Electrochemistry:-</u> The branch of chemistry which deals with the conversion of chemical energy into electrical energy and electrical energy into chemical energy. Electrochemistry deals with relationship between electricity and chemical reactions.

2. How can you prove with example that conversion of an ion to an atom is a reduction process? (29 times) (2019=6 times)

Ans: <u>Conversion of an ion to an atom:</u>
Reduction is a gain of electron by an atom or ion.
For example, $2H^+_{(aq)} + 2e^- \rightarrow H_{2(g)}$

Topic No: 7.2 Oxidation States and Rules for Assigning Oxidation States

3. Define oxidation number with an example?

Ans: <u>Oxidation number:</u> oxidation number is the apparent charge on an atom in a molecule. e.g., oxidation number of oxygen is - 2 in H_2O and - 1 in H_2O_2.

4. Write two rules for assigning oxidation number. (2018)

Ans: <u>Rules for assigning oxidation number:</u>
(i). The oxidation number of all elements in the free state is zero.
(ii). The oxidation number of an ion consisting of a single element is the same as the charge on the ion.

Topic No: 7.3 Oxidizing and Reducing Agents.

5. Non-metals act as oxidizing agents. Why?

Ans: <u>Non-Metal as oxidizing agents:</u>
Non-Metals are electron deficient. Non-metals oxidize the other substance by taking electrons from them and get reduced itself. So, these act as oxidizing agents.

Topic No: 7.4 Oxidation-Reduction Reactions.

6. Define redox reaction. Give an example. (17 times) (2019=3 times)

Ans: <u>Redox Reaction:</u>A chemical reaction in which oxidation and reduction reaction involved simultaneously is called Oxidation-Reduction reaction or redox reaction. e.g.,

$$Zn^0 + 2H^{+1}Cl^{-1} \longrightarrow Zn^{+2}Cl_2^{-1} + H_2^0$$

(Oxi) (Red)
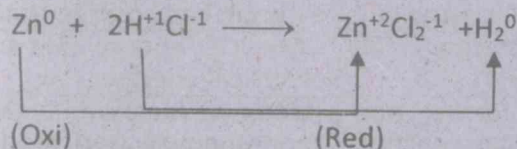
7. Define oxidation and Reduction reactions (23 times)(2018)

Ans: <u>Oxidation:-</u> It is defined as "*The addition of oxygen or removal of hydrogen during a chemical reaction is called oxidation.*"
<u>Reduction:-</u> It is defined as "*The addition of hydrogen or removal of oxygen during a chemical reaction.*"

Topic No: 7.5 Electrochemical Cells

8. What is electrochemical cell? Write the name of its types. (11 times) (2019=3 times)

Ans: <u>Electrochemical Cell:-</u> *It is a system in which two electrodes are dipped in the solution of an electrolyte which are connected to the battery.*
Types of Electrochemical Cells:-
* Electrolytic Cells * Galvanic Cells

9. What is the difference between Anode and Cathode? (2018)

Ans: <u>Difference between Anode and Cathode:</u>

Anode:The electrode connected to positive terminal of battery is called anode .

Cathode: The electrode connected to negative terminal of battery is called cathode.

10. What are Non-Electrolytes? Give an example.   (22 times) (2019=4 times)

Ans: Non-Electrolyte: *The substances which cannot conduct electricity in their solution or molten form are called Non-electrolytes.* e.g., sugar solution and benzene etc.

11. Define electrolyte. Give an example.   (5 times) (2019=1 times)

Ans: Electrolyte: *A substance, which can conduct electricity in their aqueous solution or in molten states is called electrolytes.* For Example, Solutions of salts, acids and bases are good electrolytes.

12. What are Electrolytic Cells? / What is Electrolysis? Give one example
                                      (13 times)(2018)

Ans: Electrolytic Cells:-   The type of electrochemical cells in which a non-spontaneous redox reaction takes place when electric current is passed through the solution is called an electrolytic cell e.g., Down's cell.

Electrolysis:- The chemical decomposition of a compound into its component by passing current thought the solution of the compound or in a molten state of compound. For example: Down's cell , Nelson cell.

13. What is meant by Brine?

Ans: Brine:- Aqueous solution of NaCl is called as Brine. Industrially caustic soda (NaOH) is produced by electrolysis of brine in Nelson's cell.

14. What type of reaction takes place at anode in electrolytic cell?

Ans: Reaction at Anode of Electrolytic Cell:-   The electrode connected to positive terminal of battery is called anode. Oxidation reaction takes place at the anode of electrolytic cell.

15. What is salt bridge? What is its basic function?   (4 times) (2019=2 times)

Ans: Salt Bridge:- Salt bridge is a U shaped glass tube. It consists of saturated solution of strong electrolyte supported in a jelly type material. The ends of the U tube are sealed with porous material like glass wool.

Function of salt Bridge:- The function of salt bridge is to keep the solutions of two half cells neutral by providing a pathway for migration of ions.

16. Write down any two differences between electrolytic cell and galvanic cell

Ans: Difference between Electrolytic Cell and Galvanic Cell: (7 times)(2018)

	Electrolytic Cell	Galvanic Cell
1	It consists of one complete cell, connected to a battery.	It consist of two half cells connected through a salt bridge.
2	Anode has positive charge while cathode has negative charge.	Anode has negative charge while cathode has positive charge.
3	Electrical energy is converted into chemical energy.	Chemical energy is converted into electrical energy.
4	Current is used for a non spontaneous chemical reaction to take place.	Redox reaction takes place spontaneously and produces electric current.

17. What do you know about the construction of electrolytic cell?

Ans: Construction of an Electrolytic Cell:- An electrolytic cell consists of a solution of an electrolyte, two electrodes (anode and cathode) that are dipped in the electrolytic solution and connected to the battery.

Topic No: 7.7

18. Write down the uses of electroplating. Write down the principle of electroplating?   (16 times) (2019=2 times)

Ans: The process of electroplating is used for decoration, protection and repairing of metals.

Principle of electroplating:

Principale of electroplating is to establish an electrolytic cell in which anode is made of the metal to be deposited and cathode of the object on which the metal is to deposit.

19. What is meant by alloying? **(3 times) (2019=3 times)**

Ans: **Alloying:** Alloy is a homogeneous mixture of one metal with other metals or non-metals. The best example of alloying is the 'stainless steel', which is a good combination of iron, chromium and nickel.

20. Define metallic coating. In which industry it is used much? Or Tin coating.

Ans: **Metallic Coating:**
The best method for protection against the corrosion of metals exposed to acidic conditions is coating the metals with other metals. Corrosion resistant metals like Zn, Sn and Cr are coated on the surface of iron to protect it from corrosion. It is the most widely applied technique in the food industry where food is "tin-packed". The container of iron is coated with tin or chromium to give it a longer life. Metallic coating can take place by physical as well as electrolytic methods.

21. Does aluminium rust?

Ans: **Rusting of aluminium:**
Aluminium corrode but does not rust. Rust refer only to iron or steel corrosion. A very hard material aluminium oxide protects the aluminium form further corrosion.

22. How impure copper is refined to pure copper?

Ans: **Refining of copper:**
Refining of copper is carried out in electrolytic cell. Impure copper acts as anode and pure copper plate acts as cathode. Oxidation takes place at anode as:

$$Cu_{(s)} \rightarrow Cu^{+2}_{(aq)} + 2e^-$$
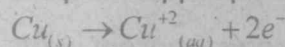
Reduction reaction takes place at the cathode. Copper ions present in the solution are attracted to the cathode. Where they gain electrons from the cathode and become neutral and deposit on the cathode.

$$Cu^{+2}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$$
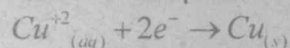
Test Yourself 7.1

i. How can you justify that a reaction between magnesium and oxygen is a redox reaction, while the reaction shows only addition of oxygen (oxidation).

$$2Mg + O_2 \longrightarrow 2MgO$$
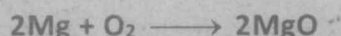
Ans: A redox reaction is defined in two ways:
  i.   in terms of gain or loss of e^-s.
  ii. in terms of addition or removal of oxygen
  iii. Addition or removal of hydrogen.

Loss of 2es⁻(oxidation)

$$2Mg^0 + O_2 \longrightarrow 2Mg^{+2}O^{-2}$$

Gain of 2es⁻(Reduction)
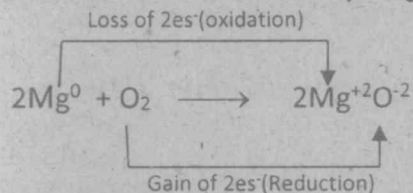
Magnesium atoms are changed into Mg^{+2} ions which is infact loss of electrons (oxidation).
At the same time oxygen molecule is changed into O^{-2} ion which is gain of electrons (Reduction)
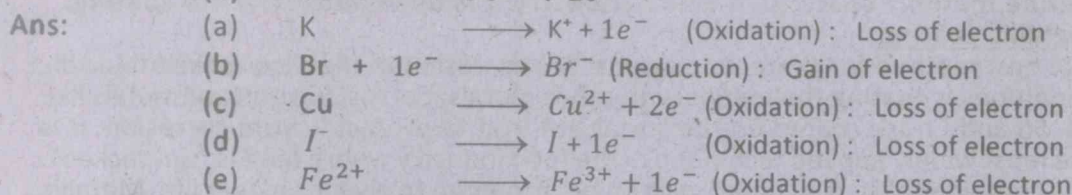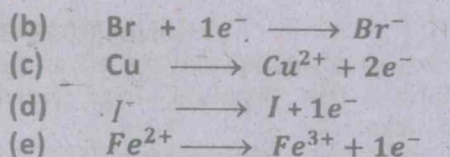Hence it is Redox reaction.

ii. A reaction between carbon and oxygen involved only addition of oxygen (oxidation), but, it is called a redox reaction. Comment on this.

Ans: $$C + O_2 \longrightarrow CO_2$$
Carbon gets oxygen hence it is oxidized. Oxygen in this reaction shows a negative oxidation state (O^{-2}) means gain electrons. That means O_2 is reduced. Hence it is a Redox reaction.

**iv.** Identify which of the following is oxidation or reduction reaction.

  (a) $K \longrightarrow K^+ + 1e^-$

(b) $Br + 1e^- \longrightarrow Br^-$

(c) $Cu \longrightarrow Cu^{2+} + 2e^-$

(d) $I^- \longrightarrow I + 1e^-$

(e) $Fe^{2+} \longrightarrow Fe^{3+} + 1e^-$

Ans: (a) $K \longrightarrow K^+ + 1e^-$ (Oxidation) : Loss of electron

(b) $Br + 1e^- \longrightarrow Br^-$ (Reduction) : Gain of electron

(c) $Cu \longrightarrow Cu^{2+} + 2e^-$ (Oxidation) : Loss of electron

(d) $I^- \longrightarrow I + 1e^-$ (Oxidation) : Loss of electron

(e) $Fe^{2+} \longrightarrow Fe^{3+} + 1e^-$ (Oxidation) : Loss of electron

vi.   How can you justify that the following reaction is not only an oxidation reaction but also a complete redox reaction.

$$FeO + CO \longrightarrow Fe + CO_2$$
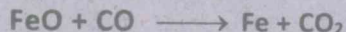
Ans: FeO (Iron oxide) loses oxygen atom and is therefore reduced. While CO gains oxygen atom to form CO_2 is oxidized. Hence it is a Redox reaction.

Gain of oxygen (oxidation)

$$FeO + CO \longrightarrow Fe + CO_2$$

Loss of Oxygen (Reduction)
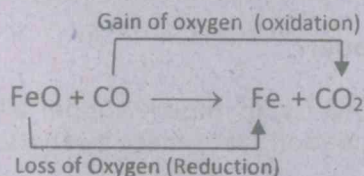
vii.   Explain the term oxidation on the basis of electronic concept with an example.

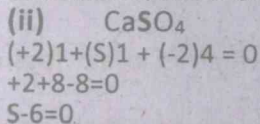**Ans:** Oxidation is the loss or removal of electron by an atom or ion. e.g

$Na^0 \xrightarrow{Oxidation} Na^{+1} + 1e^-$ (By atom)

$Mg^0 \xrightarrow{Oxidation} Mg^{+2} + 2e^-$ (By atom)

$Fe^{+2} \xrightarrow{Oxidation} Fe^{+3} + 1e^-$ (By ion)
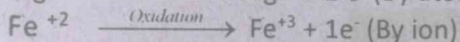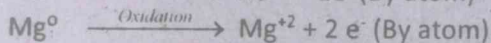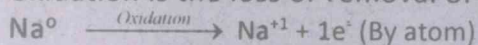
Test Yourself 7.2

i.   Find out the oxidation numbers of the following elements marked in bold in the formulae:

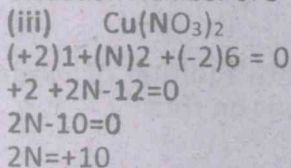$$Ba_3(PO_4)_2 , CaSO_4 , Cu(NO_3)_2 , Al_2(SO_4)_3$$

Ans: (i) $Ba_3(PO_4)_2$

$(+2)3 +(P)2 + (-2)8 = 0$

$+6 +2P -16 = 0$

$2P-10 = 0$

$2P = +10$
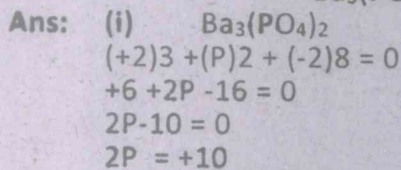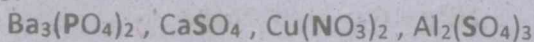
$\dfrac{\cancel{2}P}{\cancel{2}} = +\dfrac{10}{2}$

Oxidation Number of P= +5 Ans.
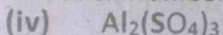
(ii) $CaSO_4$

$(+2)1+(S)1 + (-2)4 = 0$

$+2+8-8=0$

$S-6=0$

Oxidation Number of S= +6   Ans.

(iii) $Cu(NO_3)_2$

$(+2)1+(N)2 +(-2)6 = 0$

$+2 +2N-12=0$

$2N-10=0$

$2N=+10$

$N = +\dfrac{10}{2}$

Oxidation Number of N= +5   Ans.

(iv) $Al_2(SO_4)_3$

$+(3)2 +(S)+(-2)12 = 0$

$+ 6 +3S-24=0$

$3S-18=0$

$3S = +18$

$S = +\dfrac{18}{3}$

Oxidation Number of S= +6 Ans.

iii.   **Why the oxidation number of oxygen in OF_2 is +2**

Ans: In OF_2, Fluorine is more electronegative than oxygen. And we know that oxidation number of "F" (Halogen) is "-1". So

$OF_2 = 0$

(Oxidation no. of oxygen) $+ (-1)2 =0$

O. N of oxygen $-2 = 0$

O. N of "O" (oxygen) = +2

So oxidation number of oxygen is OF_2 is +2.

iv.   **In H_2S, SO_2 and H_2SO_4 the sulphur atom has different oxidation number. Find out the oxidation number of sulphur in each compound.**

Ans: **(a)** H_2S

$(+1) 2 +S = 0$

$+2 +S = 0$

Oxidation Number of S= -2   Ans.

(b)

$SO2$

$S+(-2)2 = 0$

$S-4 = 0$

Oxidation Number of S=+4   Ans.
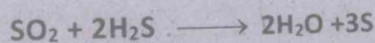
(c)

H_2SO_4

$(+1)2+S+(-2)4 = 0$

$+2 + S -8 = 0$

$S-6 = 0$

Oxidation Number of S= +6   Ans.

Test Yourself 7.3

i.   **In the following reaction, how can you justify that H_2S is oxidized and SO_2 is reduced.**

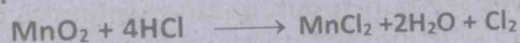$$SO_2 + 2H_2S \longrightarrow 2H_2O +3S$$

Ans: $S^{+4}O_2^{-2} +2H_2^{+1}S^{-2} \longrightarrow 2H_2^{+1}O^{-2} + 3S^0$

In SO_2, sulphur atom is reduced from +4 to zero oxidation state in the product, hence SO_2 is reduced.

In H_2S, sulphur atom is oxidized from -2 to zero oxidation state in the product hence H_2S is oxidized.

ii.   **The reaction between MnO_2 and HCl is a redox reaction written as balance chemical equation.**

$$MnO_2 + 4HCl \longrightarrow MnCl_2 +2H_2O + Cl_2$$

Find out:

   a.   The substance oxidized.

   b.   The substance reduced.

   c.   The substance which acts as an oxidizing agent.

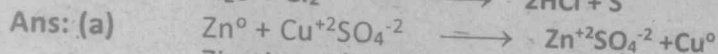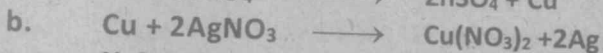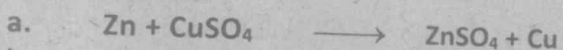   d.   The substance which acts as a reducing agent.

Ans:

$$Mn^{+4}O_2^{-2} + 4H^{+1}Cl^{-1} \longrightarrow Mn^{+2}Cl_2^{-1} +2H_2^{+1}O^{-2} + Cl_2^0$$
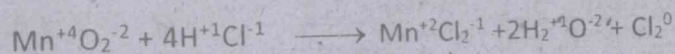
   (a) Cl^{-1} is oxidized to Cl_2^0. (Loss of electron)

(b) Mn^{+4} is reduced to Mn^{+2} (Gain of electrons)

(c) MNO_2 is oxidizing agent.

(d)   HCl is reducing agent.

iii.   **The following reactions are redox reactions.**
Find out the element which has been reduced and the element which has been oxidized.
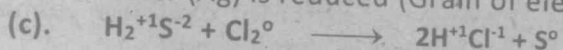
a. $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$

b. $Cu + 2AgNO_3 \longrightarrow Cu(NO_3)_2 + 2Ag$

c. $H_2S + Cl_2 \longrightarrow 2HCl + S$

Ans: (a) $Zn^o + Cu^{+2}SO_4^{-2} \longrightarrow Zn^{+2}SO_4^{-2} + Cu^o$

Zinc is oxidized (Loss of electrons)

Copper is reduced (Gain of electrons)

(b) $Cu^o + 2Ag^{+1}NO_3^{-1} \longrightarrow Cu^{+2}(NO_3^{-1})_2 + 2Ag^o$
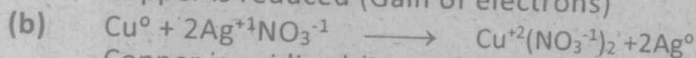
Copper is oxidized (Loss of electrons)

Silver (Ag) is reduced (Grain of electron)

(c). $H_2^{+1}S^{-2} + Cl_2^o \longrightarrow 2H^{+1}Cl^{-1} + S^o$

Sulphur is oxidized (Loss of electron)

Chlorine is reduced (Gain of electron)

iv.   **Why the following reaction is not a redox reaction. Explain with reasons?**

$NaOH + HCl \longrightarrow NaCl + H_2O$

Ans: $Na^{+1}O^{-2}H^{+1} + H^{+1}Cl^{-1} \longrightarrow Na^{+1}Cl^{-1} + H_2^{+1}O^{-2}$
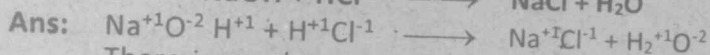
There is no change in the oxidation state of any element. Hence it is not a redox reaction. It is an acid-base reaction.

Test Yourself 7.4

i.   **Why are the strong electrolytes termed as good conductors?**

Ans: Strong electrolytes are completely ionized in aqueous solution and produce more ions. Thus they conduct electric current to a large extent. Hence are called good conductors.

ii.   **Does non-electrolytes forms ions in solution?**

Ans: No, non-electrolyte does not form ions in solution and do not allow current to pass through their solutions.

iii.   **What is difference between a strong electrolyte and a weak electrolyte?**

                                        (22 Times)

Ans:

Strong Electrolytes:	Weak Electrolytes:
The electrolytes which ionize completely in solution and produce more ions are called strong electrolytes. Example of strong electrolytes are aqueous solutions of NaCl, NaOH and H_2SO_4 etc.	The substances which ionize to a small extent when dissolved in water and could not produce more ions are called weak electrolytes. For example Acetic acid (CH_3COOH) and $Ca(OH)_2$

v.   **Which force drives the non-spontaneous reaction to take place?**

Ans;   Non-spontaneous reactions are those which take place in the presence of external agent. This external agent is known as electrical energy in case of an electrolytic cell.

vi.   **Which type of chemical reaction takes place in electrolytic cell?**

Ans: Non-spontaneous chemical reaction takes place with the help of electricity in electrolytic cell.

vii.   **What type of reaction takes place at anode in electrolytic cell?**

Ans: <u>Reaction at Anode of Electrolytic Cell:-</u> Oxidation reaction takes place at the anode of electrolytic cell. $2Cl^-_{(g)} \longrightarrow Cl_{2(g)} + 2e^-$

viii.   **Why the positively charged electrode is called anode in electrolytic cell?**

Ans: The positively charged electrode is called anode because it is connected to the positive terminal of the battery and the oxidation takes place at this electrode.

ix. **In the electrolysis of water, towards which terminal H⁺ ions move?**

Ans: In the electrolysis of water, H^+ ions move towards cathode and reduce to liberate hydrogen gas.

xi. **Towards which electrode of the electrolytic cell moves the cations and what does they do there?**

Ans: The cations move towards cathode and gain electrons from cathode and are reduced to neutral atoms.

xii. **How the half-cells of a galvanic cell are connected? What is function of salt bridge?**

Ans: The two half cells are connected with the help of a salt-bridge. The function of salt-bridge is to keep the solutions of two half cells neutral by providing a pathway for migration of ions.

Test Yourself 7.5

i. **Anode of Down's cell is made of a non-metal, what is its name? What is the function of this anode?**

Ans: In Down's cell, there is a large block of graphite (carbon) which acts as anode. The chloride ions (Cl⁻) are oxidized at anode and Cl_2 gas is produced.

$$2Cl^- \longrightarrow Cl_2 + 2e^-$$

ii. **Where does the sodium metal is collected in Downs cell?**

Ans: **Collection of Sodium Metal in Down's Cell:** In Down's cell, sodium metal is collected at cathode in molten form and floats over molten sodium chloride solution, from where it is collected in separate container.
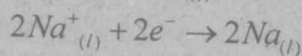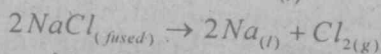Molten NaCl is ionizes as:

$$2NaCl_{(s)} \rightarrow 2Na^+_{(l)} + 2Cl^-_{(l)}$$
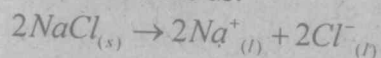
Half cell reaction at anode (oxidation) $2Cl^-_{(l)} \rightarrow Cl_{2(g)} + 2e^-$
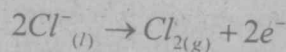
Half cell reaction at cathode (reduction) $2Na^+_{(l)} + 2e^- \rightarrow 2Na_{(l)}$

Overall reaction of two half cells: $2NaCl_{(fused)} \rightarrow 2Na_{(l)} + Cl_{2(g)}$

iii. **What is the name of the by-product produced in the Downs cell?**

Ans: **By-Products in Down's Cell:** Down cell is used to prepare Sodium metal, however chlorine (Cl₂) gas is obtained as by product in this cell.

iv. **Are anodes of Down's cell and Nelson's cell made of same element? If yes, what is its name ?**

Ans: Yes, anodes of Down's cell and Nelson's cell are made up of same element. This element is "Graphite" (Carbon).

v. **What is the shape of cathode in Nelson's cell? Why is it perforated?**

Ans: **Shape of Cathode in Nelson cell:** It consists a U shaped perforated iron Sheet. This iron cathode is internally lined with asbestos diaphragm. It is perforated because NaOH produced can get outside from the perforation.

vi. **Which ions are discharged at cathode in Nelson's cell and what is produced at cathode?**

Ans: Hydrogen ions (H⁺) are discharged at cathode and hydrogen gas is produced at cathode along with NaOH.

$$2H^+ + 2e^- \longrightarrow H_2$$
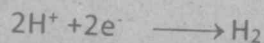
Test Yourself 7.6

i. **What is the difference between corrosion and rusting?**

Ans: **Corrosion:-** *Slow and continuous decay of metals by the surrounding medium is called as corrosion.* The most common example of corrosion is rusting of iron.

Rusting of Iron: Corrosion of iron is called rusting.

ii. **What happens to iron in the rusting process?**

Ans: As a result of rusting, surface of iron gets damaged and rusting process continues until all the pieces of iron is eaten up. Iron is converted into hydrated iron oxide having formula $Fe_2O_3.nH_2O$.

iii. **Rusting completes in how many redox reactions?**

Ans: Rusting completes in two redox reactions.

i. $2Fe + O_2 + 4H^+ \longrightarrow 2Fe^{+2} + 2H_2O$

ii. $2Fe^{+2} + \dfrac{1}{2}O_2 + (2+n)H_2O \longrightarrow Fe_2O_3.nH_2O + 4H^+$
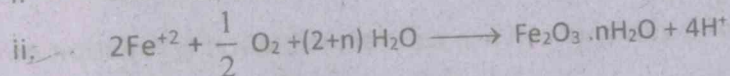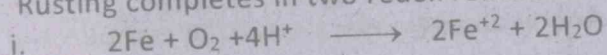
iv. **Explain the role of O_2 in rusting?**

Ans: The free electrons move through iron sheet; until they reach to a region of relatively high oxygen concentration, near the surface surrounded by water layer. This region acts as cathode and electrons reduce the oxygen molecule in the presence of H^+ ions.

$$O_2 + 4H^+ \, 4e^- \longrightarrow 2H_2O$$
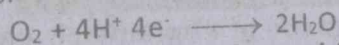
v. **State the best method for protection of metal from corrosion.**

Ans: The best method for protection against the corrostion of metals exposed to acidic conditons is coating the metal. Corrosion resistant metals like Zn, Sn and Cr are used for this method.

vi. **What do you mean by galvanizing?**

Ans: **Galvanizing:-** The process of coating of a thin layer of zinc on iron is called galvanizing. Advantage of galvanizing is that zinc protects the iron against corrosion even after the coating surface is broken.

vii. **What is the advantage of galvanizing?**

Ans: **Advantage of Galvanizing:** Advantage of galvanizing is that zinc protects the iron metal against corrosion even after the coating surface is broken.

viii. **Why tin plated iron is rusted rapidly when tin layer is broken?**

Ans: When tin layer is broken and iron is exposed to the air and water, a galvanic cell is established and iron rusts rapidly.

ix. **Name the metal which is used for galvanizing iron?**

Ans: **Metal used for Galvanizing Iron:**
The process of coating a thin layer of Zinc on iron is called Galvanizing. So metal used for galvanizing iron is Zinc.

Test Yourself 7.7

i. **Define electroplating?**

Ans: **Electroplating:**
The process of deposition of one metal over the other metal by means of the electrolysis is called as electroplating.

ii. **How electroplating of zinc is carried out?**

Ans: The electroplating of zinc is carried out by dipping a clean iron sheet in a zinc chloride bath and then heatignit. After this iron sheet is removed, rolled into molten zinc metal bath and finally air-cooled.

iii. **Which material is used to make cathode in electroplating?**

Ans: **Material is used to make Cathode:**
The cathode in electroplating is made up of the object that is to be electroplated like some sheet made up of iron.

iv. **Why is the anode made up of a metal to be deposited during electrolysis?**

Ans: This is because when the current is passed, the metal from anode dissolves in the solution and metallic ions migrate to the cathode and discharge or deposit on the cathode (object). As a result of this discharge, a thin layer of metal deposits on the object.
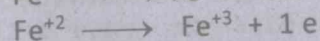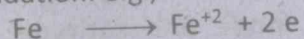
Chapter No.7: Exercise (Short Question Answer)

1. **Define oxidation in term of electrons. Give an example.**
(29 times) (2019=6 times)

Ans: **Oxidation in terms of electrons:**
Oxidation: The process in which loss of electrons take place from an atom or ion is called as oxidation. e.g.,

$$Fe \longrightarrow Fe^{+2} + 2e$$
$$Fe^{+2} \longrightarrow Fe^{+3} + 1e$$

As result of loss of electrons, oxidation number of specie will increase.

2. **Define reduction in term of loss and gain of oxygen or hydrogen. Give an example.**

Ans: **Reduction:-** It is defined as "*The addition of hydrogen or removal of oxygen during a chemical reaction.*"

$$2ZnO + C \longrightarrow 2Zn + CO_2$$
$$H_2S + Cl_2 \longrightarrow S + 2HCl$$
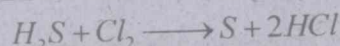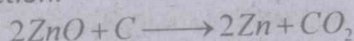
3. **What is the difference between valency and oxidation state?**
(3 times) (2019=1 times)

Ans: **Difference between Valency and Oxidation State:-**
Valency is the combining power of an element with other elements, while **oxidation state** or **oxidation number** is the apparent charge on an atom in a molecule. e.g., Valency of oxygen is 2 while its oxidation number is - 2 in H_2O and - 1 in H_2O_2.

4 **Differentiate between oxidizing and reducing agents.** (31 times) (2019=4 times)
Ans:

Oxidizing Agent (Oxidants)	Reducing Agents (Reductants)
The species that oxidize the other substance by taking electrons from them and get reduced itself.	The species that reduce the other substances by giving electrons to them and themselves get oxidized.
Examples:	**Examples:**
1. Acidified $KMnO_4$ and $K_2Cr_2O_7$	1. Almost all metals are good reductants.
2. Mostly non-metals are oxidants.	2. CO, SO_2, H_2, KI are good reductants.

5. **Differentiate between strong electrolytes and week electrolytes.**
(22 times) (2019=4 times)

Ans: **Strong Electrolytes:**
The electrolytes which ionize completely in solution and produce more ions are called strong electrolytes. Example of strong electrolytes are aqueous solutions of NaCl, NaOH and H_2SO_4 etc.
Weak Electrolytes: The substances which ionize to a small extent when dissolved in water and could not produce more ions are called weak electrolytes. For example Acetic acid (CH_3COOH) and $Ca(OH)_2$

6. **How is electroplating of Tin on steel carried out?** (2 times) (2019=2 times)
Ans: **Electroplating of Tin on Steel:**   Tin is usually electroplated on steel by placing the steel into a container containing a solution of tin salt. The steel is connected to an electrical circuit, acting as cathode. While the other electrode made of tin metal acts as anode. When an electrical current passes through the circuit, tin metal ions present in the solution deposit on steel.

7. **Why is steel plated with Nickel electroplating before the electroplating of Chromium?**
(1 time) (2019=1 times)

Ans: **Nickel electroplating before the electroplating of Chromium:**
Steel is usually plated first with nickel then by chromium because it does not adhere well on the steel surface. It allows moisture to pass through it and metal is stripped off.

10. **Why does the anode carries negative charge in galvanic cell but positive charge in electrolytic cell? Justify with comments.**

Ans: In case of galvanic cell, atoms of anode lose electrons. & these electrons are gathered at anode & make it negatively charged.
In case of electrolytic cell, the anode is attached to the positive terminal of the battery that is why it carry positive charge.

11- Where do the electrons flow from Zn electrode in Daniel's cell?

Ans: The electrons flow from Zn-electrode through the external wire in a circuit to copper electrode.

12. Why do electrodes get their names 'anode' and 'cathode' in galvanic cell?

Ans: In a galvanic cell, the electrode at which electrons are lost by the atoms and oxidation takes place is called anode while an electrode at which reduction takes place and electrons are gained by the atoms is called cathode.

13. What happened at the Cathode in a Galvanic Cell?   (2018)

Ans: <u>Cathode in Galvanic Cell :-</u> In galvanic cell gain of electrons occur hence, reduction takes place at cathode.

14. Which solution is used as an electrolyte in Nelson's cell?

Ans: <u>Electrolyte:</u>
Aqueous solution of sodium chloride called brine is used as electrolyte in Nelson's cell.

15. Name the by-products produced in Nelson's cell.

Ans: <u>By products in Nelson's cell:-</u> By-products produced in Nelson's cell are Hydrogen and Chlorine gas.

16. Why is Galvanizing done?

Ans: <u>Advantage of Galvanizing:</u>   Advantage of galvanizing is that zinc protects the iron metal against corrosion even after the coating surface is broken.

18- Explain the role of oxygen in rusting?   (2 times) (2019=3 times)

Ans: <u>Role of Oxygen in Rusting:</u> The important condition for rusting is moist air (air having water vapours and oxygen in it). The presence of Oxygen is necessary for rusting process. The Fe^{+2} formed spreads throughout the surrounding water and react with O_2 to form the salt Fe_2O_3. n H_2O which is called rust it is also redox reaction.

$$2Fe^{+2}_{(aq)} + \tfrac{1}{2} O_{2(g)} + (2 + n) H_2O_{(l)} \longrightarrow Fe_2O_3. n\ H_2O_{(s)} + 4 H^+_{(aq)}$$

19- In Chromium electroplating, which salt is used as electrolyte.   (5 times)

Ans: <u>Salt Used in Electroplating Chromium:</u>
"Chromium sulphate" $Cr_2(SO_4)_3$.

20- Write the redox reaction taking place during the electroplating of chromium?   (2019=1 times)

Ans: <u>Electroplating of chromium:</u>
Electrolyte produce the following ions:
$$Cr_2(SO_4)_{3\ (s)} \rightarrow 2Cr^{3+}_{(aq)} + 3SO_4^{2-}_{(aq)}$$
At anode oxidation occurs: $4OH^-_{(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$
At cathode reduction occurs: $2Cr^{3+}_{(aq)} + 3e^- \rightarrow Cr_{(s)}$

21- In electroplating of silver, from where Ag^+ comes and where it deposited   (2019=1 times)

Ans: <u>Electroplating of Silver:</u> When the current is passed through the cell the Ag anode dissolves to produce Ag^+ ions, that migrate towards the cathode.
At anode
$$Ag_{(s)} \longrightarrow Ag^+_{(aq)} + e^-$$
At cathode
$$Ag^+_{(aq)} + e^- \longrightarrow Ag_{(s)}$$

Conceptual Short Questions

1. Calculate the oxidation number of HNO_3 , $KClO_3$, H_2SO_4 , OF_2 , $KMnO_4$, $AgNO_3$, HNO_2 , Na_2SO_4 , $CaSO_4$ of underline atoms.   (23 times) (2019=1 times)

Ans: <u>Oxidation Number of "N" in HNO_3:</u>

(oxi.No. of H) + (oxi.No. of N) + 3(oxi. No. of O) = 0

(+1) + (oxi.No. of N) + 3(-2) = 0

(+1) + (oxi.No. of N) - 6 = 0

(oxi. No. of N) = +6 - 1 = +5

Oxidation number of 'Cl' in $KClO_3$:

Oxi.No of K + Oxi.No. of Cl + 3(Oxi. No of O) = 0

+1 + Oxi. No. of Cl + 3 (-2) = 0

+1 + Oxi. No. of Cl - 6 = 0

Oxi. No. of 'Cl' = +6 - 1 = +5

Oxidation number of 'S' in H_2SO_4:-

2(Oxi.No. of H) + Oxi.No. of S + 4 (Oxi. No. O) = 0

2(+1) + Oxi. No. of S + 4 (- 2) = 0

+2 + Oxi. No. of S - 8 = 0

Oxi. No. of S = + 8 - 2 = +6

Oxidation number of oxygen in OF_2:

(Oxi.No. of O) + (Oxi. No of F)2 = 0

(Oxi.No. of O) + (Oxi. No of F)2 = 0

(Oxi.No. of O) + (-1) 2 = 0

(Oxi.No. of O) + (-2) = 0

(Oxi.No. of O) = +2

Oxidation number of Mn in $KMnO_4$:

(Oxi.No. of K) + (Oxi.No.of Mn) + (Oxi. No of O)4 = 0

(+1) + (Mn) + (-2) 4 = 0

+1 + Mn - 8 = 0

Mn = +8 - 1 = +7

Oxidation number of 'N' in $AgNO_3$ and HNO_2:

Oxidation number of 'N' in $AgNO_3$:

(Oxi.No. of Ag) + (Oxi.No. of N) + 3 (Oxi. No. O) = 0

(+1) + Oxi. No. of N + 3 (- 2) = 0

+1 + Oxi. No. of N - 6 = 0

Oxi. No. of N = + 6 - 1 = + 5

Oxidation number of 'N' in HNO_2 :

(Oxi.No. of H) + (Oxi.No. of N) + 2 (Oxi. No. O) = 0

(+1) + Oxi. No. of N + 2 (- 2) = 0

+1 + Oxi. No. of N - 4 = 0

Oxi. No. of N = + 4 - 1 = + 3

Oxidation number of 'S' in Na_2SO_4:-

2(Oxi.No. of Na) + (Oxi.No. of S) + 4 (Oxi. No. O) = 0

2(+1) + (Oxi. No. of S) + 4 (- 2) = 0

+2 + (Oxi. No. of S) - 8 = 0

Oxi. No. of S = + 8 - 2 = + 6

Oxidation number of 'S' in $CaSO_4$:-

(Oxi.No. of Ca) + (Oxi.No. of S) + 4 (Oxi. No. O) = 0

(+2) + (Oxi. No. of S) + 4 (- 2) = 0

+2 + (Oxi. No. of S) - 8 = 0

Oxi. No. of S = + 8 - 2 = + 6

2.   **What are spontaneous and non-spontaneous reactions?**

                                                 (18 times) (2019=3 times)

Ans: **Spontaneous reactions:-**   These are the reactions which take place on their own without any external agent.

For example: voltic cell

Non-spontaneous Reactions:- *These are the reactions which take place in the presence of an external agent.* Example:
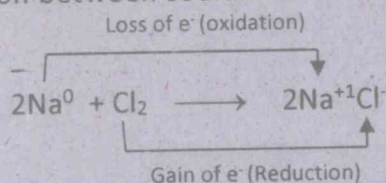
Down's cell   Nelson's cell

3.   **Oxidation and reduction proceed simultaneously. Explain, with an example.**

                                                     (Test Yourself 7.1)

Ans: Reaction between sodium and chloride as

Loss of e⁻ (oxidation)

$$2Na^0 + Cl_2 \longrightarrow 2Na^{+1}Cl^-$$

Gain of e⁻ (Reduction)

Sodium atom (Na) loses one electron to form Na^{+1} ion (Oxidation). At the same time chlorine gains one electron to form Cl^{-1} ion (Reduction).
Hence oxidation and reduction take place at the same time.

4. An element M reacts with another element X to form MX_2. In terms of loss or gain of electrons, identify the element which is oxidized and which is reduced.   **(Test Yourself 7.1)**

Ans: M loses two electrons and is oxidated to M^{+2}.
X_2 gain two electrons and is reduced to $2X^{-1}$.
Hence over all reaction is redox reaction.

Loss of 2es⁻ (oxidation)

$$M^0 + X_2 \longrightarrow M^{+2} + 2X^-$$

Gain of 2es⁻ (Reduction)
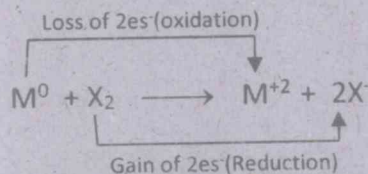
5. In a compound MX_3, find out the oxidation number of M and X.   **(Test Yourself 7.2)**

Ans: We know that "X" means Halogen (F, Cl, Br etc) and the oxidation number of Halogens is "-1". Then
$MX_3 = 0$
$M+(-1)3 = 0$
$M-3 = 0$
$M = +3$
$X = -1$

6. An element X has oxidation state 0. What will be its oxidation state when it gains three electrons?   **(Test Yourself 7.2)**

Ans: Gaining 3 electrons mean gaining -3 charge.
$$X^0 + 3e^- \longrightarrow X^{-3}$$
So, its oxidation state will be "-3". Ans.
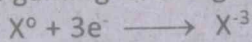
7. An element in oxidation state +7 gains electrons to be reduced to oxidation state +2. How many electrons did it accept?   **(Test Yourself 7.2)**
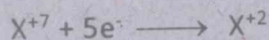
Ans: Suppose the element is "X".
$$X^{+7} + 5e^- \longrightarrow X^{+2}$$
This element will accept five electrons.

8. If the oxidation state of an element changes from +5 to -3. Has it been reduced or oxidized? How many electrons are involved in this process?   **(Test Yourself 7.2)**
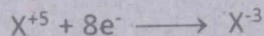
Ans: Suppose the element is "X".
$$X^{+5} + 8e^- \longrightarrow X^{-3}$$
This element gains electrons. Therefore it is reduced.
This element gains 8 electrons or eight electrons are involved in this process.

9. Identify a strong or weak electrolyte among the following compounds:
$CuSO_4$, H_2CO_3, $Ca(OH)_2$, HCl, $AgNO_3$ **(Test Yourself 7.2)**
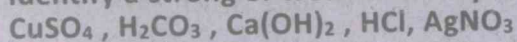
Ans: Strong Electrolytes: $CuSO_4$, $AgNO_3$, HCl
Weak Electrolytes: H_2CO_3, $Ca(OH)_2$
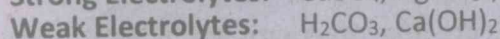
10. In the electrolysis of water, where is the oxygen produced?   **(Test Yourself 7.2)**

Ans: In the electrolysis of water, oxygen is produced at anode as.
Reaction at anode : $4OH^- \longrightarrow 2H_2O + O_2 + 4e^-$

4	Oxidation-Reduction Reactions.	
	5	What do you mean by redox reactions. Explain by giving any two chemical reactions	2 times
5	Electrochemical Cells	
	6	Define Electrolysis. Explain the Electrolysis of water. **(2019=5 times)**	8 times
5.1	7	Define electrolyte. Explain its types with examples.	- 1 time
5.2	8	How electrolytic cell is constructed? Discuss the working of an electrolytic cell.	1 time
	9	Write down a note on electrolytic refining of Copper. **(2018)**	5 times
	10	Write down the construction and working of Nelson's cell in detail. **(2019=1 times)**	1 time
5.3	11	Compare the Electrolytic and Galvanic Cells. **(2019=1 times)**	13 times
	12	Discuss the working and construction of Daniel cell,	4 times
	13	Write any four characteristics of galvanic cell.	1 time
6	Electrochemical Industries	
6.1	14	Describe manufacturing of sodium metal from fused sodium chloride by Down cell **(2019= 2times)**	7 times
6.2	15	How can we prepare NaOH on commercial scale. **(2019=3 times)**	2 times
7	Corrosion and its Prevention	
	16	Define electroplating. How electroplating of tin is carried out? **(2019=1 times)**	1 time
7.1	17	Discuss the redox reaction taking place in the rusting of iron in detail. **(2018)**	6 times
	18	Define Corrosion and describe at least three methods to prevent from corrosion? **(2019=1 times)**	9 times
7.2	19	Define electroplating. How electroplating of chromium is carried out? **(2019=1 times)**	5 times
	20	What is Electroplating? Write down the procedure of Electroplating. **(2018)**	6 times
	21	What is electroplating? How electroplating of silver and zinc are carried out?	4 times
	22	What do you mean by metallic coating? Explain its two physical methods.	2 times

CHAPTER-8 (TOPIC WISE MCQ'S)
BOARD PAPERS-2013-2022

Topic No: 8.1   Metals

1- The most reactive metal is: (4 times)
(A) Sodium   (B)Potassium   (C) Cesium   (D)Calcium

2- What is the colour of sodium metal's flame?   (1 times) (2019=1 times)
(A) Red   (B) Yellow   (C) Violet   (D) Green

3- Which metal exists in liquid state at room temperature?   (1 times)
(A) Copper   (B) Iron   (C) Silver   (D) Mercury

4- The melting point of sodium is: (3 times)
(A) 95 °C   (B) 96 °C   (C) 97 °C   (D) 98 °C

5 Which one of the following is a metal ?   (1 times)
(A) H   (B) C   (C) N   (D) Mg

9th Class

6   Me
(A) Mobil e
(C) They a
7   Me
(A) High io
(C) high ele
8   So
(A) Water
9   Me
(A) acidic o
10   Ato
(A) 160 pm
11   Me
(A) in solid
12-   The
(A) K
13   Bra
(A) Cu+ Zn
14   The
(A) Iron
15   Co
(A) green
16-   The
(A) 4
17-   The
(A) Sodium
18-   The
(A) brilliant
19   Whic
(A) sodium
20   A
(A)Calcium
21   W
(A) Fe
22   The
(A) Alumin
23   W
(A) Sodiu
24   The
(A) Iron
25   One
(A) Silver
26   W
(A) K
27   W
(A) alkali
28-   The
(A) Zinc
29-   It
(A) Pota
Topic
30-   W
(A) Li
31-   W
(A) Heliu
32-   Th
(A) 6

6   Metals are generally good conductors of electricity because?   (1 times)
(A) Mobil electrons are present   (B) Metal cations are present
(C) They are hard enough   (D) Mobile protons are present

7   Metals have generally: (1times)
(A) High ionization value   (B) low ionization value
(C) high electron affinity value   (D) metallic bond

8   Sodium does not react directly with.   (1 times)
(A) Water   (B) Nitrogen   (C) 50% alcohol   (D) hydrochloric acid

9   Metals react with oxygen to form   (1 times)
(A) acidic oxides   (B) basic oxides   (C) amphoteric oxides   (D) carbon mono oxides

10   Atomic size of sodium atom is?   (1 times)
(A) 160 pm   (B) 162   (C) 185 pm   (D) 186 pm

11   Mercury is the metal which exists: (2 times)
(A) in solid state   (B) in liquid state   (C) in gaseous state   (D) plasma state

12-   The least reactive or noble metal is: (1 times)
(A) K   (B) Na   (C) Al   (D) Hg

13   Brass is a solid solution of: (1 times)(2018)
(A) Cu+ Zn   (B) Cu+Ni   (C) Cu+Fe   (D) Cu+Na

14   The least conductor of heat is.   (2 times)
(A) Iron   (B) Gold   (C) Silver   (D) Lead

15   Colour of calcium flame in air is: (2 Time)
(A) green   (B)   white   (C) golden   (D) brick red

16-   The valency of the elements of group-2 is:
(A) 4   (B) 1   (C) 3   (D) 2

17-   The most reactive metal is -------?
(A) Sodium   (B) Zinc   (C) Copper   (D) Gold

18-   The colour of flame of magnesium in air is:
(A) brilliant White   (B) Brick red   (C) golden yellow   (D) Pale yellow

19   Which one of the following metal burns with a golden yellow flame:
(A) sodium   (B) magnesium   (C) Iron   (D) calcium

20   A metal which is soft and can be cut with knife is:
(A) Calcium   (B) Sodium   (C) Magnesium   (D) Iron

21   Which metal is not effected by mineral acid and alkalis:
(A) Fe   (B)   Zn   (C) Au   (D) Na

22   The most abundant metal is:
(A) Aluminium   (B)   Gold   (C)   Silver   (D) Platinum

23   Which one of the following metal is most malleable:
(A) Sodium   (B)   Iron   (C)   Gold   (D) Potassium

24   The heaviest metal is:
(A) Iron   (B) Platinum   (C)   Osmium   (D) Lead

25   One gram of which metal can be drawn into wire of one and half kilometer long:
(A) Silver   (B)   Gold   (C)   Iron   (D) Calcium

26   Which one of the following is the least reactive metal
(A) K   (B)   Al   (C) Pb   (D) Ag

27   Which family has general electronic configuration ns^2?
(A) alkali metals   (B) alkaline earth metals (C) Ionization energy (D) Atomic radius

28-   This metal is used to make jewelry items because of its unique characteristics:
(A) Zinc   (B) Sodium   (C) Platinum   (D) Lead

29-   It is least reactive metal:
(A) Potassium   (B) Calcium   (C) Magnesium   (D) Copper

Topic No: 8.2   Non-Metals

30-   Which one of the following is non-metal?   (1 times)
(A) Li   (B) H   (C) Na   (D) K

31-   Which one of the following is not a noble gas.   (1 times)
(A) Helium   (B) Hydrogen   (C) Neon   (D) Argon

32-   The number of electrons in the valence shell of halogens is:(1 times)
(A) 6   (B) 7   (C) 11   (D) 17

33   Which one of the following non-metals extremely hard:
                                                    (6 times) (2019=2 times)
(A) Graphite   (B)Phosphorous   (C) Iodine   (D) Diamond
34   The elements present in liquid sate: (6 Time)
(A) bromine   (B)fluorine   (C)chlorine   (D)Iodine
35   Human body is composed of nearly ......elements .   (1 times)
(A) 28   (B) 26   (C) 27   (D) 25
36   Human body has carbon upto.................%   (1 times)
(A) 18   (B) 19   (C) 20   (D) 21
37   Major part of a living body with respect to mass is made up of.(1 times)
(A) Benzene   (B) ammonia   (C) urea   (D)water
38   Colour of Fluorine is:
(A)pale yellow   (B)greenish yellow   (C)reddish brown   (D) purple black
39   An element which occur in gaseous state is:
(A)Mercury   (B) Gold   (C) Oxygen   (D) Sodium
40   The non-metal which is present in group 15 of periodic table:
(A) Carbon   (B) Sulphur   (C) Nitrogen   (D)   Iodine

ANSWERS TO MCQ's

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	B	D	C	D	A	D	B	B	D	B	D	A	D	D

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	A	A	A	B	C	A	C	C	B	D	B	C	D	B

31	32	33	34	35	36	37	38	39	40
B	B	D	A	A	A	D	A	C	C

Chapter No. 8: Exercise(MCQ's)

1-   Metals can form ions carrying charges:
(A) Uni-Positive   (B) Di-positive   (C) Tri-positive   (D) Al of them
2-   Which one of the following metal burns with a brick red flame?
(A) Sodium   (B) Magnesium   (C) Iron   (D) Calcium
3-   Sodium is extremely reactive metal, but it does not react with:
(A) Hydrogen   (B) Nitrogen   (C) Sulphur   (D) Phosphorus
4-   Which one of the following is the lightest metal?
(A) Calcium   (B) Magnesium   (C) Lithium   (D) Sodium
5-   Pure alkali metals can be cut simply by knife but iron cannot because of alkali metals have:
(A) Strong metallic bonding   (B) Weak metallic bonding
(C) Non-metallic bonding   (D) Moderate metallic bonding
6-   Which one of the following is less malleable?
(A) Sodium   (B) Iron   (C) Gold   (D) Silver
7-   Metals lose their electrons easily because:
(A) They are electronegative   (B) They have electron affinity
(C) They are electropositive   (D) Good conductors of heat
8-   Which one of the following is brittle?
(A) Sodium   (B) Aluminium   (C) Selenium   (D) Magnesium
9-   Which one of the following non-metal is lustrous?
(A) Sulphur   (B) Phosporus   (C) Iodine   (D) Carbon
10-   Non- metals are generally soft, but which one of the following is extremely hard?
(A) Graphite   (B) Phosphorus   (C) Iodine   (D) Diamond
11-   Which one of the following will not react with dilute HCl ?
(A) Sodium   (B) Potassium   (C) Calcium   (D) Carbon

ANSWERS

1	2	3	4	5	6	7	8	9	10	11
D	D	B	C	B	A	C	C	C	D	D

CHAPTER-8 (SHORT QUESTIONS AND ANSWERS) (TOPIC WISE) BOARD PAPERS-2013-2022

Topic No: 8.1   Metals

1. Metals are good conductor of electricity, Why? or Why electrons move freely in metals. **(1 time)(2018)**

Ans: **Metals are good conductor of electricity:** Metals are good conductors of electricity because metals have free electrons which are mobile in nature. Spaces are present among the atoms. Mobile electrons can move freely in these spaces. Hence, movement/flow of electron is known as electricity that's why metals are good conductor of electricity.

2. Write down two properties of Gold. **(2018)**

Ans: **Properties of Gold**
(i). Gold is a yellow soft metal.
(ii). It is most malleable and ductile of all the metals.
(iii). It is not affected by atmosphere. It is even not affected by any-single mineral acid or base.

3. Write down the names of four very reactive metals. **(3 times) (2019=2 times)**

Ans: **Names of four very reactive metals**
Potassium, sodium, calcium, magnesium and aluminium.

4. Write down the names of any four moderate reactive metals.

Ans: **Moderate reactive metals:-** Moderately reactive metals are those metals which are moderately electropositive in nature. e.g., Zinc (Zn), Iron (Fe), Tin (Sn) and Lead (Pb).

5. How electropositivity depends upon the nuclear charge of an atom?

Ans: **Electropositivity depends on Nuclear Charge:**
Electropositivity (electropositive character) depends upon ionization energy, which in turn depends on size and nuclear charge of the atom. Small size atoms with high nuclear charge have high ionization energy, hence atoms having high ionization energy are less electropositive or less metallic.

6. What is electro positivity OR metallic character? Explain with an example? **(2 times) (2019=1 times)**

Ans: **Electropositivity:-** The tendency of an element (metal) to lose one or more electrons to form a positive ion is called electropositive character or electropositivity.

7. On which factors does ionization energy depends. **(4 times)**

Ans: Ionization energy depends upon size and nuclear charge of the atom. Small sized atoms with high nuclear charge have high ionization energy value and vice versa.

8. Write down any two uses of Magnesium. **(15 times) (2019=2 times)**

Ans: **Uses of Magnesium:**
(a) It is used in flash light photography and fireworks.
(b) For igniting Al powder in thermite process magnesium ribbon in used.
(c) In making Grignard's reagent: (R – Mg – X)
(d) In the manufacture of light Alloys.   (e) As anode for corrosion prevention.

9. Give any two uses of calcium. **(25 times) (2019=5 times)**

Ans: **Uses of Calcium:-** Following are the important uses of calcium.
i. For removal of sulphur from petroleum products. It is used to remove sulphur from petroleum products.
ii. As a Reducing Agent:- Calcium is used as reducing agent to produce Cr, U, and Zr.

10. Describe any two uses of sodium?

Ans: Uses of Sodium:-
        (i)   Sodium-Potassium alloy is used as a coolant in nuclear reactors.
        (ii)   It is used to produce yellow light in sodium vapours lamps.
        (iii)   It is used as a reducing agent in the extraction of metal like Ti.

11.   Compare the alkali metals and alkaline earth metals.(Occurrence)   (2018)
Ans: **Comparison between alkali and alkaline earth metals:**
        A comparison of chemical properties and reactivities of alkali metals and alkaline earth metals s given below:

Alkali Metals	Alkaline Earth Metals
Occurrence: They are very reactive and always occur in combined form.	They are fairly reactive and also occur in combined form.
Electropositivity: These are highly electropositive.	They are less electropositive.

12.   What are noble metals and give two examples.   (2018)
Ans: **Noble Metals:-** These are transition elements of group 11 are known as noble metal because these are not chemically reactive and cannot lose electrons easily. e.g., Copper (Cu), Silver (Ag) and Gold (Au).

13.   Write down two uses of gold.   (2 times)(2018)
Ans: **Uses of gold:**
        (i).   Because of inertness of gold it is used as an ornamental metal
        (ii).   It is used in making coins.
        (iii). Gold is too soft to be used as such. It is always alloyed with copper, silver or some other metal.

14.   Write the unit of purity of gold. OR   What is mean by 24 carat of gold?
Ans: **Unit of purity of gold:**
                Purity of gold is shown by "*carats*" that indicate the number of parts by Wight of gold that is present in 24 parts of alloy.

15.   Why metals are called reducing agents?
Ans: **Metals are reducing agents:** Metals have tendency to lose their valence electrons. Thus metal can reduce by adding electrons to other substance, so metals are reducing agents.

16.   Which factors affect the non-metallic character.
Ans: **Factors affect the non-metallic character:** The non-metallic character depends upon the electron affinity and electronegativity of the atom. Small sized elements having high nuclear charge are electronegative in nature.

17.   Write down any two uses of non metals.
Ans: **Uses of non metals:**
(i)   Non metals are used as eatables like carbohydrates, proteins, fats, vitamins, water, milk etc. which are necessary for the growth and development of body that are made up of non-metals; carbon, hydrogen and oxygen.
(ii)   Non-metals protects us in away, the clothes we wear are made of cellulose (natural fibers) or polymer (synthetic fibre).

18.   Write down the melting point and boiling point of sodium metal?
Ans: **Melting point and boiling point of sodium metal:**
        Melting point sodium metal: 97°C
        Boiling point of sodium metal: 883 °C

19.   Write four properties of platinum?
Ans: **Properties of Platinum:-**
    (i)   Brilliant colour
    (ii)   Extra ordinary strength
    (iii)   Having more flexibility
    (iv)   Have resistance to tarnish

Topic
20.
Ans:

21.

Ans:
(i).

(ii).

22.
Ans:

23.

Ans:
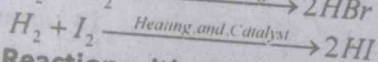
24.
Ans:

25.

Ans:
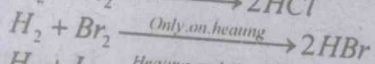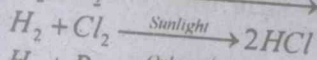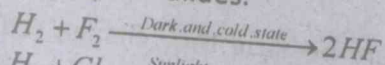
26.
Ans:

Topic No: 8.2   Non-Metals

20. Write two chemical properties of metals and non-metals. (30 times)(2019=2 times)

Ans: **Chemical properties of metals & Non- metals:**

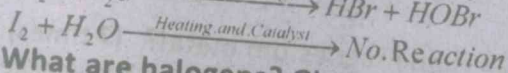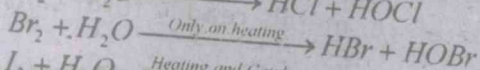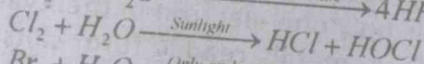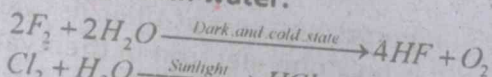|	Metals	Non-metals
1	Metals easily lose electrons and form positive ions.	Non-metals readily accept electrons to complete their valence shell.
2	They usually form ionic compounds with non-metals.	They form ionic compounds with metals and covalent compounds with other non-metals.

21. Write any two chemical properties of halogens. / Write four important chemical reactions of non-metals.   (2 times) (2019=1 times)

Ans: **Chemical properties of halogens:**

(i). **Reaction with hydrogen:**   All halogens combine with hydrogen to give hydrogen halides.

$$H_2 + F_2 \xrightarrow{\ Dark\ and\ cold\ state\ } 2HF$$
$$H_2 + Cl_2 \xrightarrow{\ Sunlight\ } 2HCl$$
$$H_2 + Br_2 \xrightarrow{\ Only\ on\ heating\ } 2HBr$$
$$H_2 + I_2 \xrightarrow{\ Heating\ and\ Catalyst\ } 2HI$$

(ii). **Reaction with water:**

$$2F_2 + 2H_2O \xrightarrow{\ Dark\ and\ cold\ state\ } 4HF + O_2$$
$$Cl_2 + H_2O \xrightarrow{\ Sunlight\ } HCl + HOCl$$
$$Br_2 + H_2O \xrightarrow{\ Only\ on\ heating\ } HBr + HOBr$$
$$I_2 + H_2O \xrightarrow{\ Heating\ and\ Catalyst\ } No. Re action$$

22. What are halogens? Give names of members of it.   (2019=1 times)

Ans: **Halogens:**   Elements of group-17 are called halogens.

Names of elements of Halogens: Fluorine, chlorine, bromine, iodine.

23. Give chemical reaction between methane (CH_4) and chlorine (Cl_2) in the presence of diffused light.

Ans: **Reaction between methane (CH_4) and chlorine (Cl_2) in diffused light:**
In the presence of diffused light, the reaction between methane and chlorine is very slow and following products are achieved.
CH_3Cl (chloromehane), CH_2Cl_2(dichloromethane),$CHCl_3$ (trichloromethane), and CCl_4 (tetra chloromethane).

**24.** In what condition H_2 reacts with I_2 Give equation of the reaction?

Ans: **Chemical reaction:** Reaction is carried out in the presence of heating and catalyst
$$I_2 + H_2 \rightarrow 2HI$$
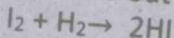
**25.** Show the reaction of Cl_2 and NaOH in cold and hot conditions by chemical equation.

Ans: **Reaction of Cl_2 and NaOH in cold conditions:**
Chlorine react with cold diluted NaOH to give sodium hypochlorite and sodium chloride.
$$2NaOH + Cl_2 \rightarrow \quad NaCl + NaOCl + H_2O$$
$$\text{sodium hypochlorite}$$
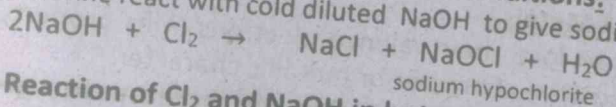
Reaction of Cl_2 and NaOH in hot conditions:
Chlorine react with hot concentrated NaOH to give sodium chlorate and sodium chloride.
$$6NaOH + 3Cl_2 \rightarrow \quad 5NaCl + NaOCl_3 + 3H_2O$$
$$\text{sodium chlorate}$$
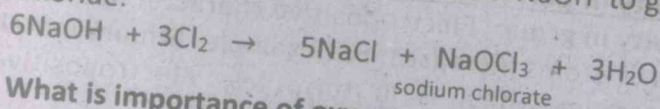
26. What is importance of oxygen and carbon dioxide for plants and animals?

Ans: **Importance of oxygen and carbon dioxide:**

Oxygen and carbon dioxide are essential gases for respiration of animal and plants respectively. Without these gases life would not have been possible. So these gases are essential for the existence of life.

27. What is the significance of water for survival of life?

Ans : <u>Significance of water:</u> Water is not only the major part by mass of animal and plant bodies, but also essential to maintain the life. We can survive without water for days but not for long period. Its shortage may cause death.

Test Yourself 8.1

i. What type of elements are metals?

Ans: The elements which are electropositive and form cations by losing electrons are metals. e.g sodium, iron, silver.

ii. Name a metal which exists in liquid form?

Ans: Mercury is a metal that exist in liquid state at room temperature.

iii. What is the nature of metal oxide?

Ans: <u>Metal:</u> The metallic oxide are basic in nature because they change red litmus paper to blue.
Examples: Na_2O, CaO.

iv. Which group of metals is highly reactive? **(3 times)**

Ans: <u>Alkali metals are reactive:</u>
Alkali metals are extremely reactive elements because of their ns^1 valence shell electronic configuration. As there is only one electron in their valence shell, it can be easily given out. Therefore, metals readily form salts with non-metals.

v. Why sodium metal is more reactive than magnesium metal? **(7 times)(2018)**

Ans: <u>Sodium metal is more reactive than magnesium:</u> Sodium atom have large atomic size and have less ionization energy than magnesium atoms. So sodium can lose electron easily that is why sodium is more reactive than magnesium.

vi. Name a metal which can be cut with knife?

Ans: Sodium is a metal that can be cut with knife.

vii. Name the best ductile and malleable metal?

Ans: <u>Most Malleable and Ductile Metals:</u>
The most malleable and ductile metals are gold and silver.

viii. Name the metal which is the poorest conductor of heat?

Ans: <u>Least conductor of heat:</u> The metal which is least conductor of heat is lead (Pb)

ix. What do you mean by malleable and ductile? **(2 times)(2018)**

Ans: <u>Malleable:</u> The property of metals that it can be converted into sheets is called as Malleability.
<u>Ductile:</u> The property of metals that it can be converted into wires is called as Ductility.

xi. What do you mean by metallic character?

Ans: <u>Electropositive Character of Metals:-</u>
Metals have the tendency to lose their valence electrons. This property of a metal is termed as electropositive character or metallic character.

xii. Why metallic character decreases along a period and increases in a group?

Ans: <u>Trend of electropositivity in periods and groups:</u>
<u>Trend of electropositivity in group:</u> Electropositive character increases down the group because size of atoms increases. For example, lithium metal is less electropositive than sodium which is in turm less electropositive tnan potassium.

Trend of electropositivity in periods: Electropositive character decreases across the period from left to right in periodic table because size of atom decreases due to increase of nuclear charge.

Test Yourself 8.2

i. Give the applications of silver?

Ans: Applications of silver:-
(i) It is excellent conductor of heat and electricity.
(ii) Alloys of silver with copper are widely used in making coins.
(iii) Compounds of silver are used in photographic films and dental preparations.
(iv) Silver is also used in mirror industry.

ii. Why is silver not used in pure form?

Ans: Silver is very soft that is why it is not used in pure form and is alloyed with copper.

iv. Why is gold used to make jewelry?

Ans: Gold is used to make jewelry due to following reasons:
i. Inertness in atmosphere.   ii. Lustrous nature.
iii. Most malleable and ductile.

v. Why is platinum used for making jewelry?

Ans: Use of Platinum in Jewelry:- Platinum is used to make jewelry items because of its unique characteristics like colour, beauty, strength, flexibility and resistance to tarnish. It provides a secure setting for diamonds and other gemstones, enhancing their brilliance.

vi. What is difference between steel and stainless steel? (4 times)

Ans:

Stainless Steel	Steel
It contain iron, nickel and chromium.	It contains iron and carbon.

Test Yourself 8.3

i. Why valency of chlorine is 1?

Ans: Valency of Chlorine:- Chlorine have 7 electrons in its valence shell and require 1 electron to complete its octet, So valency of chlorine is one. (6 times)

ii. Which factor controls the non-metallic character of the elements?

Ans: Factor controls the non-metallic character of the elements:
i. Electronegativity   ii. Electron affinity.
Greater the electronegativity and electron affinity of an element greater will eb the non metallic character.

iii. Why fluorine is more non-metallic than chlorine?

Ans: Reasons:
i. Small size of fluorine atom.
ii. High electron affinity of fluorine atom.
iii. High electronegativity of fluorine atom.

iv. Iodine exists in solid state, can it be beaten with hammer to form sheets?

Ans: Iodine is a non metal so it can not be hammered to form sheets because only metals have ability to be beaten with hammer to form sheets as they are malleable.

Can liquids and gases be brittle?
Ans: No, only solid non-metals are brittle.

Why the oxygen is called non-metal?
Ans: i. Oxygen is a gas.
ii. It has high electronegativity.

iii.   It form negative ion by gaining electrons.
          Due to these reasons oxygen is non metal.

vii. **Name two non-metals which are both brittle and non-ductile**

Ans: Graphite (Carbon) and iodine are both brittle and non-ductile.

viii. **Name the most abundant non-metal in the earth's crust**

Ans: Oxygen is the most abundant non-metal is earth's crust. (47%)

ix. **Give the non-metallic trend in halogens.**

Ans: <u>Non-metallic trends in Halogens:-</u> Non-metallic character of Halogens decreases down the group due to increase in atomic size.

x. **Why do the non-metals accept electrons readily?**

Ans: **Reasons:**

    i.   High electron affinity.
    ii.   High electronegativity.
    iii. Electron deficient.

xi. **Why non-metals do not react with dilute acids while metals do react?**

Ans: Non metals do not react with dilute acids because non metals are itself electron acceptors. Metals react with dilute acids because they can lose electrons readily.

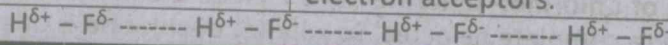**xii.** **How can we distinguish a metal from a non-metal by simple physical methods?**

Ans: **Physical Properties of Metals & Non-metals:-**   (23 times) (2019=4 times)

	Metals	Non-metals
1	Almost all metals are solid.	Solid non-metals are brittle.
2	They have high melting and boiling points.	They have low melting and boiling points.

xiii. **How we can distinguish a substance is metal or non-metal with the help of an acid?**

Ans:

Metals	Non-metals
Metals react with dilute acids because metals are itself electron donors.	Non-metals do not react with dilute acids because non-metals are itselft electron acceptors.

$$H^{\delta+} - F^{\delta-} \text{-------} H^{\delta+} - F^{\delta-} \text{-------} H^{\delta+} - F^{\delta-} \text{-------} H^{\delta+} - F^{\delta-}$$

Chapter No.8: Exercise (Short Question Answer)

1. **Why reactivity of metals increases down the group?** (16 times) (2019=3 times)

Ans: <u>Reactivity of Metals:</u> In group of periodic table generally reactivity increases from top to bottom due to the following reason:

(a) Atomic size increases down the group.
(b) Shielding effect increases down the group.
(c) Nuclear attraction on the valence electron decreases down the group.
(d) Ionization energy decreases down the group.
    Hence tendency of atoms to lose electrons increases.

**2.** **State the physical properties of metals?**   (19 times) (2019=1 times)

Ans: <u>Physical Properties of Metal:-</u>

(i) Almost all metals are solids (except mercury).
(ii) They have high melting and boiling points.
(iii) They posses metallic luster and can be polished.
(iv) They are malleable (can be hammered into sheets), ductile (can be drown into wires) and give off a tone when hit.
(v) They are good conductor of heat and electricity.
(vi) They have high density.

3. Why nitrogen forms compounds with alkaline earth metals directly?

**Ans:** Alkaline earth metals form stable nitrides when heated with nitrogen directly.

e.g $3Mg + N_2 \longrightarrow Mg_3N_2$
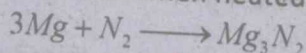
4. Why the second ionization energy of magnesium is higher than the first one?

(2 times) (2019=4 times)

Ans: Second ionization energy of magnesium is higher than the first:

The 1st ionization energy of magnesium is high but the 2nd ionization energy of magnesium is very high. It becomes very difficult to remove second electron from the Mg^+ ion as nuclear charge attracts the remaining electrons strongly. As a result of this attraction size of the ion decreases and ionization energy also increases.

5. How exygen reacts with group IIA meatals?

Ans: Reaction of alkaline earth metals with oxygen: They are less reactive towards oxygen and oxides are formed on heating.

$$2Mg + O_2 \longrightarrow 2MgO$$
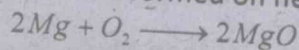
6- What is the relationship between electropositivity and ionization energy?

(2019=1 times)

Ans: Relationship between Electronepositivity and Ionization Energy:

Electropositive character of elements depends upon the ionization energy of their atoms. Atoms having high ionization energy are less electropositive or shows less metallic character, so small size atoms with high nuclear charge have high ionization energy and low electropositive characters.

7- Why elctropositivity decreases from left to right in periods? (2 times)

Ans: Elctropositivity decreases from left to right in periods:

Electropositive character decreases from left right in a period due to decrease in atomic size and increase in nuclear charge.

8- How electropositivity depends upon the size and nuclear charge of an atom?

Ans: Electropositivity depends on Nuclear Charge:

Electropositivity (electropositive character) depends upon ionization energy, which in turn depends on size and nuclear charge of the atom.

Small size atoms with high nuclear charge have high ionization energy, hence atoms having high ionization energy are less electropositive or less metallic.

9- Why ionization energy of alkaline earth metals is higher than alkali metals?

Ans: Comparison of ionization energy:

Ionization energy of alkaline earth metals is higher than alkali metals because atomic size of alklyne are smaller and they have greater nuclear charge than that of alkali metals.

10- Why are silver and gold least reactive?

Ans: Silver and gold are least reactive. There valence shell are completely filled and cannot take part in chemical reaction.

11- Can pure gold be used for making ornaments? If not why? (2019=1 times)

Ans: Use of Pure Gold in Ornaments: Gold is too soft. It is always alloyed with copper, silver or some other metal.

12- Why copper is used for making electrical wires?

Ans: Copper is used for making electrical wires:

Metals are malleable and ductile. Copper is a metal which is ductile and can conduct electricity easily. So copper is used for making electrical wires.

13. What is the trend of variation in densities of alkali metals?

Ans: Densities of alkali metals increase down the group in the periodic table due to increase in atomic masses.

14. Which metal is used for metal work?