

# 1.HEAT

## 1 mark questions:

(1) Define specific heat? Mention its units.

Ans:- Specific heat of substance is the amount of heat required to raise the temperature of unit mass of the substance by one unit.

Units: C.G.S cal / g°C; M.K.S units – J / Kg – °k

(2) Why does ice float on water?

Ans:- The density of ice is less than that of water so ice floats on water.

(3) Convert 35°C into Kelvin scale?

Ans:- Temperature of Kelvin = 273 + Temperature in Celsius

... Temperature in kelvin scale = 273 + 35 = 308°C

(4) Why water is used as coolant?

Ans:- The specific heat capacity of water is large so, water requires large amount of heat for a given rise in temperature. Thus acting a very good coolant.

(5) State the principle of calorimeter or method of mixture?

Ans:- When two or more bodies at different temperature are brought into thermal contact, then net lost by hot bodies is equal to net heat gained by the cold bodies until they attain thermal equilibrium.

Net heat lost = Net heat gained

(6) Define melting and melting point?

Ans:- Melting:- The process in which solid phase changes to liquid phase at a constant temperature is called melting.

Melting point:- This constant temperature is called melting point.

(7) What is latent heat of vaporization?

Ans:- The heat energy required to change 1 gm of liquid to gas at constant temperature is called latent heat of vaporization. It is denoted by L.

(8) Define dew and fog?

Ans:- Dew:- The water droplets condensed on surface like windows, flowers and grass are known as dew

Fog:- Thick mist is called as fog

(9) Define Internal energy?

Ans:- Linear kinetic energy, rotational kinetic energy, vibrational energy and potential energy. The total energy of the system is called Internal energy.

(10) On which factors the rate of evaporation depends?

Ans:- The rate of evaporation depends on its surface area, temperature and amount of water, vapour already present in the surrounding air.

(11) A samosa appears to be cool out side but is hot when we eat. What is the application behind that?

Ans:- The curry inside the samosa contains in gradients with higher specific heats. Hence stay hot longer.

(12) Equal amounts of water are kept in a cup and in a dish which will evaporate faster? Why?

Ans:- The surface area of water in dish is more than the surface area of water in a cup. Evaporation increases with increase in surface area. So water in dish will evaporate faster.

### **2 marks questions**

(1) Write the differences between evaporation and boiling?

<u>Evaporation</u>	<u>Boiling</u>
1. The escaping of molecules from the free surface of a liquid is called Evaporation.	1. Boiling is a process in which the liquid phase changes to gaseous phase at a constant temperature at a given temp.
2. Evaporation is a surface phenomenon and a cooling process.	2. Boiling is a warming process.
3. It takes place at any temperature.	3. Boiling occurs at a definite temperature called boiling point.

(2) Explain why dogs pant during hot summer days?

Ans:- The dogs pant during hot summer days to reduce their internal temperature. When dogs pant, the water molecules present on the tongue and in mouth gets evaporated by absorbing some heat from their body. As a result the interior of dog's body gets cooled.

(3) If you are chilly outside the shower stall, why do you feel warm after the bath if you stay in the bathroom?

Ans:- (i) In the bathroom, the number of vapour molecules per unit volume is greater than the number of vapour molecules per unit volume out side the bath room.

(ii) When you try to dry ourselves with a towel, the vapour molecules surrounding us condense on our body.

(iii) The condensation process is a warming process. Hence we feel warm.

(4) What role does the specific heat play in keeping a water melon cool for a long time after removing it from fridge on a hot day?

Ans:- 1. Water melon contains large percentage of water.

2. Water has higher specific heat value.

3. Hence watermelon takes lot of time for cooling when compared to other fruits in a fridge.

(5) What happens to the water when wet clothes dry?

Ans:- 1. During drying water present in wet clothes changes to vapour state. This process is called evaporation

2. When wet clothes are kept in open place due to large area exposed to air the water molecules absorb heat from the surroundings and change its state there by leaving the clothes dry when wind blows.

(6) Why do we get dew on the surface of a cold soft drink bottle kept in open air?

Ans:- 1. When a cold soft drink bottle is kept in open air the water vapour present in the surrounding air condenses on the bottle

2. These water molecules are slowed down and stick to surface of the bottle as its surface is cold.

3. These water droplets are seen as dew on the surface of the bottle and this is a condensation process.

(7) Why do we sweat while doing work?

Ans:- When we do work we spend our energy mostly in the form of the skin becomes higher and the water in the sweat glands starts evaporating. This evaporation cools the body.

(8) Does the temperature of water rise continuously if heat is supplied continuously?

Ans:- Yes. If heat is supplied to water, its temperature rises continuously till it reaches  $100^{\circ}\text{C}$  no further rise in temperature because the heat is utilised to convert liquid state to gaseous state.

(9) What is heat energy required to rise 20 kg of water from  $25^{\circ}$  to  $75^{\circ}\text{C}$

Ans:- Mass of the water = 20kg = 20,000 gms

Initial temp  $t_1 = 25^{\circ}\text{C}$

Final temp  $t_2 = 75^{\circ}\text{C}$

Change in temp  $\Delta T = t_2 - t_1 = 75 - 25 = 50^{\circ}\text{C}$

specific heat of water =  $1 \text{ cal / gm}^{\circ}\text{C}$

Heat energy required  $Q = ?$

$$Q = ms\Delta T = 20,000 \times 1 \times 50 = 10,00,000 \text{ calories}$$

(10) Why it is easy to cook food in a pressure cooker?

Ans:- Pressure cooker works on the principle of “ Boiling point of liquid increases with external pressure.

The boiling point of water increases almost to  $110^{\circ}\text{C}$  -  $120^{\circ}\text{C}$  in a pressure cooker this increased temperature cooks food faster.

#### 4 mark question

(1) Explain the procedure of finding specific heat of solid experimentally.

Ans:- Aim:- To find the specific heat of given solid

Material required :- Calorimeter, thermometer stirrer, water, steam heater, wooden bon and lead shots.

Procedure:

1. Measure the mass of the calorimeter along with stirrer

$$\text{Mass of the calorimeter} = m_1 \text{ gms}$$

2. Now fill one third of volume of calorimeter with water. Measure its mass and its temperature.

$$\text{Mass of calorimeter + water} = m_2 \text{ gms}$$

$$\text{Mass of water} = (m_2 - m_1) \text{ gms}$$

3. Temperature of the water in calorimeter =  $T_1$

Here calorimeter and water are at same temperature.

4. Take a few lead shots and place them in hot water or steam heater. Heat them up to a temperature  $100^\circ\text{C}$

Let this temperature be  $T_2$

5. Transfer the hot lead shots quickly into the calorimeter

6. Measure the temperature  $T_3$  and mass of calorimeter along with water and lead shots

$$\text{Weight the calorimeter along with contents} = m_3 \text{ gms}$$

8. Let the specific heats of the calorimeter, lead shots and water be  $s_c$ ,  $s_l$  and  $s_w$  respectively

9. According to the method of mixture, we know

Heat lost by the solid = Heat gain by the calorimeter + Heat gain by the water.

$$(m_3 - m_2) s_l (T_2 - T_3) = m_1 s_c (T_3 - T_1) + (m_2 - m_1) s_w (T_3 - T_1)$$

$$s_l = \frac{m_1 s_c + (m_2 - m_1) s_w (T_3 - T_1)}{(m_3 - m_2) (T_2 - T_3)}$$

Knowing the specific heats of calorimeter and water we can calculate the specific heat of the solid.

(2) Define the following terms

(a) Heat (b) Temperature (c) Thermal equilibrium (d) Condensation (e) Humidity (f) Freezing

Ans:- (a) Heat:- Heat is form of energy that is flows from a hotter to a cooler body.

(b) Temperature :- Temperature is the measure of the degree of hotness or coldness.

(c) Thermal equilibrium:- Thermal equilibrium denotes a state of a body where it neither receives nor gives out heat energy.

(d) Condensation:- Condensation is the phase change from gas to liquid.

(e) Humidity :- The amount of vapour present in air is called humidity

(f) Freezing:- The process in which a substance in liquid phase changes to solid phase at constant temperature is called freezing.

(3) Collect information about working of geyser and prepare a report?

(4) Show that the rate of rise in temperature depends on the nature of substance?

(5) your friend is asked to differentiate between evaporation and boiling. What questions would you ask to know the difference between evaporation and boiling?

### **BITS**

1. Which of the following is warming process (b)

a) evaporation    b) condensation    c) boiling    d) all the above

2. Three bodies A, B and C are in thermal equilibrium. The temperature B is  $45^{\circ}\text{C}$  then the temperature of C is ----- (a)

a)  $45^{\circ}\text{C}$     b)  $50^{\circ}\text{C}$     c)  $40^{\circ}\text{C}$     d)  $55^{\circ}\text{C}$

3. When ice melts, its temperature ----- (a)

a) Remains constant    b) increases    c) decrease    d) can not say

(4) The value of latent heat of fusion of ice is (d)

a) 10 cal / gm    b) 450 cal/gm    c) 100 cal/gm    d) 80 cal/gm

5. Water droplets are observed on a cold soft drink bottle kept in open air are due to ( b )

a) Evaporation      b) condensation      c) sublimation      d) freezing

6. The average kinetic energy of the molecules is directly proportional to -----  
(absolute temperature)

7. The sultriness in summer days is due to ----- (Humidity)

8. 1 calorie = Joules (4.186)

9. The formula for specific heat  $S = \frac{Q}{m \cdot \Delta t}$

10. Latent heat of vaporization of water is ----- (540 cal/gm)

11. According to the principle of method of mixtures, the net heat lost by the hot bodies is equal to ----- by the cold bodies. ( Heat gained)

12. ----- is used as a coolant (water)

13. Impurities generally ----- the melting point of ice ( lowers)

14. ----- is the reverse process of evaporation ( condensation)

15. The temperature of steel rod is 330 K ----- is the temperature of that rod in terms of  $^{\circ}\text{C}$  (57 $^{\circ}\text{C}$ )

### MATCHING

#### Group – A

16. S.I units of specific heat

17. S.I units of latent heat

18. -40 $^{\circ}\text{C}$

19. 100 $^{\circ}\text{C}$

20. Conversion of solid into vapour directly [   ] e) 212 $^{\circ}\text{F}$

21. -173 $^{\circ}\text{C}$  [   ] f) 100 $^{\circ}\text{K}$

[   ] g) 212 $^{\circ}\text{K}$

#### Group - B

[   ] a) Sublimation

[   ] b)  $\text{J Kg}^{-10} \text{K}^{-1}$

[   ] c)  $\text{J kg}^{-1}$

[   ] d) -40 $^{\circ}\text{F}$

(16) – B    (17) - C    (18) – D    (19) – E    (20) – A    (21) - F

Group – AGroup – B

22. Melting [    ] a) 540 CAL/GM  
23. Boiling [    ] b) Increases volume  
24. Freezing [    ] c) 80 cal/gm  
25. Latent heat of vaporization of water [    ] d) liquid to gas  
26. Latent heat of fusion of ice [    ] e) solid to liquid
- (22) – E   (23) – D   (24) – B   (25) – A   (26) – C

**Additional questions**

(1) Support that 1 liter of water is heated for a certain time to rise and its temperature by 2°C. If 2l of water is heated for the same time, by how much will its temperature rise?

Ans:- Given  $m_1 = 1\text{ l}$  ;  $m_2 = 2\text{ l}$  ;  $s_1 = 1\text{ cal/g}^\circ\text{C}$      $s_2 = 1\text{ cal/g}^\circ\text{C}$

$$\Delta T_1 = 2^\circ\text{C} \quad \Delta T_2 = ?$$

If same quantity of heat is supplied for same time

$$Q_1 = Q_2$$

$$m_1 s_1 \Delta t_1 = m_2 s_2 \Delta t_2$$

$$1 \times 1 \times 2 = 2 \times 1 \times \Delta t_2$$

$$\Delta t_2 = 2/2 = 1^\circ\text{C}$$

(2) How do you appreciate the role of the higher specific heat of water in stabilizing atmospheric temperature during winter and summer seasons?

(3) What would be the final temperature of a mixture of 50 g of water at 20°C temperature and 50 g of water at 40°C temperature?

Ans:- Mass of hot water  $m_1 = 50\text{ gms}$

Temperature  $T_1 = 40^\circ\text{C}$

Mass of cold water  $m_2 = 50\text{ gms}$

Temperature  $T_2 = 20^\circ\text{C}$

Specific heat of water  $S = 1\text{ cal/gm}^\circ\text{C}$



According to thermal equilibrium

Heat lost = heat gained

$$T = \frac{m_1 T_1 + m_2 T_2}{m_1 + m_2} = \frac{50 \times 40 + 50 \times 20}{50 + 50}$$
$$= \frac{2000 + 1000}{100} = \frac{3000}{100} = 30^\circ\text{C}$$

## **2. CHEMICAL REACTIONS AND EQUATIONS**

1 mark questions and answers:

1.State one basic difference between a physical change and a chemical change.

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Ans:- In physical change, no new substance is formed. There is heat change in chemical change and a new substance is formed.

2. Why is photosynthesis considered an endothermic reaction?

Ans:- Photosynthesis is an endothermic reaction as it takes energy from sun.

3. Why should a magnesium ribbon cleaned before burning in air?

Ans:- Magnesium ribbon should be cleaned before burning in air, because it forms magnesium oxide by reacting with oxygen present in air. This oxide layer should be removed and we burn only pure magnesium metal.

4. Which two gases are evolved on heating ferrous sulphate?

Ans:-  $\text{SO}_2$  and  $\text{SO}_3$

5. A student has mixed the solutions of lead (I) nitrate and potassium iodide. State the colour of the precipitate formed.

Ans:- Yellow coloured precipitate.

6. Why are certain reagents like silver bromide stored in dark bottles?

Ans:- Reagents or chemicals like silver bromide decompose when exposed to light. Hence, these are stored in dark bottles.

7. Why potato chips manufacturers fill the packet of chips with nitrogen gas?

Ans:- To prevent potato chips from oxidation, manufacturers flush out oxygen with nitrogen.

8. Surface of some metals lose their brightness when kept in air for a long time. Why?

Ans:- Metals get corroded due to exposure to air and moisture and a rough oxide film is formed on the surface.

9. Why do we apply paint on iron articles?

Ans:- Paint acts as antioxidant and saves iron articles from damage due to corrosion. It acts as a buffer between iron article and moist air.

10. Which type of reaction involved when silver chloride is exposed to sunlight?

Ans:- Photo chemical reaction.

11. What are anti oxidants?

Ans:- The substances which prevent oxidation are called anti oxidants.

12. What is Galvanizing?

Ans:- Galvanizing is a method of protecting iron from rusting by coating them a thin layer of zinc.

13. What is the use of keeping food in air tight containers?

Ans:- Keeping food in air tight containers helps to slow down oxidation process. So that we can avoid spoiling of food.

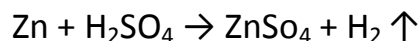
### **2 marks questions**

1. What is a chemical equation? Illustrate with an example?

Ans:- Describing a chemical reaction using least possible words or symbols is called a chemical equation. (or)

A chemical equation is an expression for given chemical change in terms of symbols or formulas of the reactants and products.

For example, the reaction of zinc with dilute sulphuric acid to produce zinc sulphate and hydrogen is given by the following chemical equation.



2. List four observations that help us to determine whether a chemical reaction has taken place.

Ans:- When a chemical reaction occurs, one or more of the following changes take place:

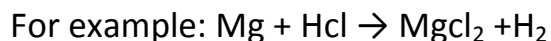
- (i) Change in state
- (ii) Change in colour
- (iii) Evolution of a gas.
- (iv) Evolution or absorption of heat (change in temperature).

3. Name and state the law which is kept in mind while we balance a chemical equation.

Ans:- Law of conservation of mass is applied here. Accordingly matter can neither be created nor destroyed. Thus during a chemical reaction the total mass of the reactants and products remains same. Therefore for a complete chemical equation, the number of atoms of various elements on both sides are made equal i.e. the equation is balanced.

4. What is meant by a skeletal chemical equation? Write a skeletal equation taking a chemical reaction.

Ans:- If the number of atoms of any element in a chemical equation is not equal on both sides, then it is a skeletal equation.

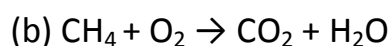
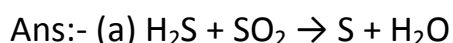


Here, the number of chlorine and hydrogen atoms are not equal on both sides.

5. Write the skeletal equation for the following reactions.

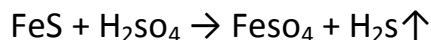
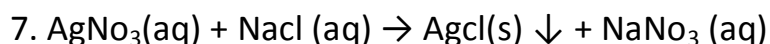
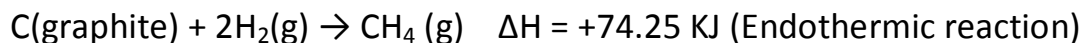
(a) Hydrogen sulphide reacts with sulphur dioxide to form sulphur and water.

(b) Methane on burning combines with oxygen to produce carbon dioxide and water.



6. What are thermo chemical equations? Give examples?

Ans:- The chemical reaction are accompanied by either evolution or absorption of heat are known as exothermic and endothermic reactions respectively. Such an equation in which information about heat change is included is called a thermo chemical equation.



Consider the above mentioned two chemical equations with two different kinds of arrows ( $\uparrow$  and  $\downarrow$ ) along with product. What do these different arrows indicate?

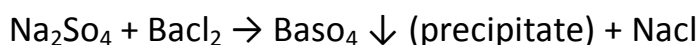
Ans:-  $\downarrow$  Indicates silver chloride is precipitated.

$\uparrow$  Indicates that  $H_2S$  is formed in gaseous form.

8. What do you mean by precipitation reaction? Give an example.

Ans:- The reaction in which an insoluble solid called precipitate is formed that separate from the solution is called a precipitate reaction.

Ex:- Sodium sulphate reacts with barium chloride to give white precipitate barium sulphate and sodium chloride.



9. Why does respiration considered as an exothermic reaction?

Ans:- The starch present in our food breaks down to form glucose. This glucose combines with oxygen in the cells of our body and releases energy. So it is considered as an exothermic reaction.

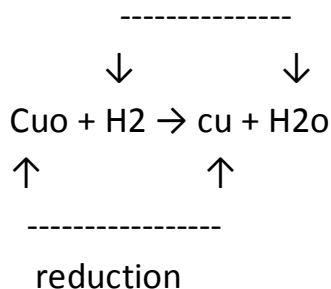


10. What is a redox reaction? Give an example.

Ans:- A chemical reaction in which one substance is oxidized and the other is reduced is called redox reaction. All oxidation – reduction reactions are redox reactions. If one reactant gets oxidized the other gets reduced.

Ex:-

oxidation



Here CuO is losing oxygen, is being reduced.

The hydrogen is gaining oxygen, is being oxidized.

4 marks questions and answers:

1. What is a balanced chemical equation? Describe the method of balancing a chemical equation taking an example.

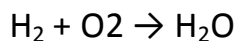
Ans:- A chemical equation is said to be balanced, when the number of atoms of each element on both sides of a chemical equation (reactants and products side) are equal.

Example:- Let us consider the formation of water from the combination of oxygen and hydrogen. The following sequential steps be taken to obtain a balanced chemical equation.

(i) First write 'word equation' of the chemical reaction.



(ii) Next write the skeletal equation to the word equation.



Caution:- Don't change formula of any constituent while balancing the equation.

(iii) The same total of charges should appear on the left and right side of the equation.

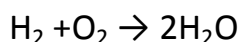
So compare atoms on both sides.

Element	No. of atoms	
	L H S	R H S
H	2	2
O	2	1

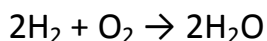
(iv) Make one of the atoms equal on both sides by multiplying a molecule or compounds with an integral number so that the desired element is balanced. It is

convenient to start with the molecule or compound that contains the maximum number of atoms.

Hence  $\text{H}_2\text{O}$  contains maximum number of atoms. It contains one short of oxygen atom and so it is multiplied by 2 as shown (2 as co-efficient of  $\text{H}_2\text{O}$ )



(v) Now the number of atoms of 'H' changes on both sides. Hydrogen on left is 2 less. So multiply  $\text{H}_2$  on the left by 2 (Co-efficient of  $\text{H}_2$ )



(vi) Further count the number of atoms of each type on both sides in the above equation.

Element	Right	left
H	4	4
O	2	2

So, the equation is balanced.

2. Using the chemical formulas write balanced chemical equation for the following reactions.

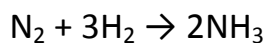
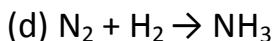
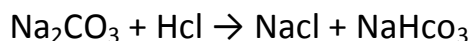
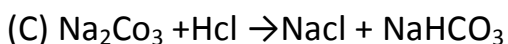
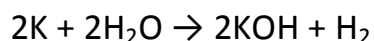
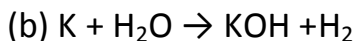
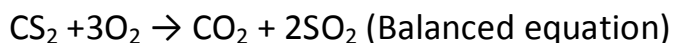
(a) Carbon disulphide burns in air give carbon dioxide and sulphur dioxide.

(b) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

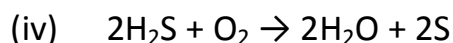
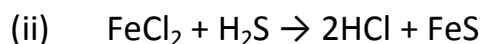
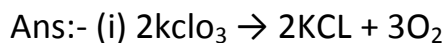
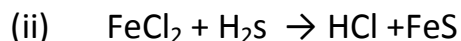
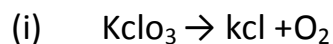
(c) Sodium carbonate on reaction with hydrochloric acid gives sodium chloride and sodium hydrogen carbonate.

(d) Nitrogen reacts with hydrogen under pressure to form ammonia.

Ans:- (a)  $\text{CS}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{SO}_2$  (Skeletal equation)



3. Balance the following skeletal equations:



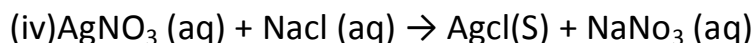
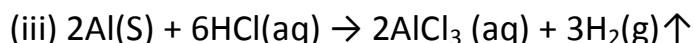
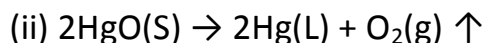
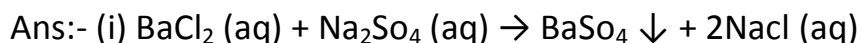
4. write a balanced equation with state symbols for the following reactions.

(i) Barium chloride solution is added to sodium sulphate.

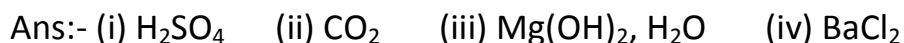
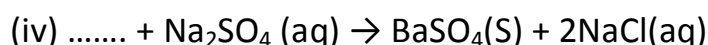
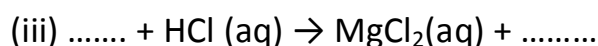
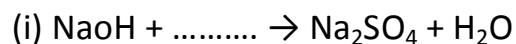
(ii) When solid mercury oxide is heated, liquid mercury and oxygen gas are produced.

(iii) When aluminum metal is dipped in a solution of hydro chloric acid in water, hydrogen gas is evolved with the formation of Aluminum chloride solution.

(vi) Solutions of silver nitrate and sodium chloride react to give insoluble silver chloride and the solution of sodium nitrate.



5. Complete and balance the following equations.



6. Write the balanced equations for the following and identify the type of reaction involved.

(i) Aluminum + Bromine  $\rightarrow$  Aluminum bromide

(ii) Calcium carbonate  $\rightarrow$  Calcium oxide + Carbon di oxide

(ii) Silver Chloride  $\rightarrow$  Silver + chloride

(iv) Lead nitrate + Potassium iodide  $\rightarrow$  lead iodide + Potassium nitrate

Ans:- (i)  $2\text{Al} + 2\text{Br}_2 \rightarrow 2\text{AlBr}_3$  (Combination Reaction)

(ii)  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$  (Decomposition Reaction)

(iii)  $2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$  (Decomposition Reaction)

(iv)  $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$  (Double displacement reaction)

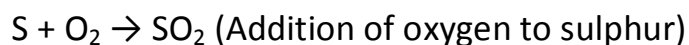
7. Explain the following terms with examples in each case.

(a) Oxidation

(b) Reaction

Ans:- (a) Oxidation:- It is a process (a) in which oxygen element is added up or (b) hydrogen is removed (addition of oxygen or removal of hydrogen)

Ex:- (i) Sulphur burns in air with a blue flame to form sulphur dioxide. Here oxygen is added up to sulphur.



(ii) Hydrogen sulphide combines with iodine to give hydrogen iodide and sulphur.



(b) Reduction:- It is a process in which (a) hydrogen element is added up or (b) oxygen element is removed.

Ex:- (i) Hydrogen reacts with chloride to form hydrogen chloride.



(ii) Copper oxide is reduced with hydrogen.





8. Explain the following terms with an example each.

(i) Corrosion

(ii) Rancidity.

Ans:- (i) Corrosion:- when some metals are exposed to moisture acids etc. They tarnish due to the formation of respective metal oxide on their surface. This process is called “Corrosion”.

Example:- Rusting of iron metal is the most common form of corrosion. When an iron object is left in damp air for a considerable time, it gets covered with a red – brown flaky substance called “rust”. This is called rusting of iron.

(ii) Rancidity:- Fats and oils food kept for a long time, they start giving unpleasant smell and taste are said to have become rancid. (sour or state)

Example:- When the fats and oils present in food materials oxidize by the oxygen of air, their oxidation products have unpleasant smell and taste.

9. How is corrosion and Rancidity prevented?

(a) Prevention of corrosion:-

(i) Corrosion can be prevented by shielding the metal surface from oxygen and moisture.

(ii) It can be prevented by painting, oiling, greasing, galvanizing, chrome plating or making alloys.

(b) Prevention of Rancidity:-

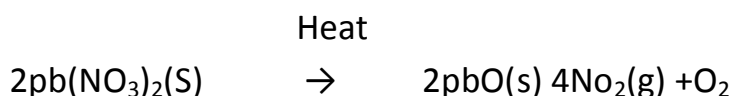
(i) Rancidity can be prevented by adding preservatives like vitamin C and Vitamin E.

(ii) Anti oxidants are added to foods containing fats and oils.

(iii) It can also be prevented by flushing out oxygen with an inert gas like Nitrogen.

10. Write an equation for decomposition reaction where energy is supplied in the form of heat light or electricity.

(i) On heating lead nitrate decomposed to lead oxide, oxygen and nitrogen dioxide.



(ii) Silver bromide decomposes to silver and bromine in sunlight. Yellow coloured silver bromide turns to grey due to sunlight.

Sunlight



(iii) On passing electricity water dissociates to hydrogen and oxygen.

Electricity



**Multiple choice questions (1/2 mark questions)**

1. Which of the statements about the reaction below are incorrect? (a)
- $$2\text{PbO}(\text{s}) + \text{C}(\text{s}) \rightarrow 2\text{Pb}(\text{s}) + \text{CO}_2(\text{g})$$
- (a) Lead is getting reduced (b) lead oxide is getting reduced  
(c) Carbon is getting oxidized (d) Lead oxide loses oxygen
2. Choose the combination reaction. (b)
- (a) Extraction of metal (b) Burning of metals  
(c) Addition of more active metal to a solution of less active metal compound.  
(d) Electrolysis.
3.  $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$ . It is an example of a ----- (d)
- (a) Combination reaction (b) Double displacement reaction  
(c) Decomposition reaction (d) displacement reaction.
4. Choose double displacement reaction. (d)
- (a)  $\text{X} + \text{YZ} \rightarrow \text{XY} + \text{Z}$  (b)  $\text{X} + \text{Y} \rightarrow \text{XY}$   
(c)  $\text{XYZ} \rightarrow \text{YZX}$  (d)  $\text{XY} + \text{AB} \rightarrow \text{XA} + \text{YB}$
5. Which one of the following change is not oxidation? (b)
- (a) combination (b) double displacement  
(c) corrosion (d) Rancidity
6. Identify the redox reaction from amongst the following reactions (c)
- (a)  $\text{PbCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + 2\text{HCl}$  (b)  $\text{AgNO}_3 + \text{HCl} \rightarrow \text{AgCl} + \text{HNO}_3$   
(c)  $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$  (d)  $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$ .
7. Which of the following process does not produce decomposition reaction? (b)
- (a) Electrolysis (b) Distillation (c) Exposure to light (d) Thermal.
8. On heating copper powder in air, the surface of copper becomes black. It is -- (a)
- (a) Combination reaction (b) decomposition  
(c) dissociation reaction (d) displacement reaction

9. What happens when dilute hydrochloric acid is added to iron filings? (a)

- (a) Hydrogen gas and Iron chloride are produced
- (b) Chlorine gas and iron hydroxide are produced
- (c) No reaction takes place
- (d) Iron salt and water are produced.

10. When copper vessels are kept over a period of time, these coated with a green surface. This is due to (d)

- (i) Oxidation of copper
  - (ii) Corrosion of copper
  - (iii) Reduction of copper
  - (iv) hydrolysis of copper
- (a) (i) and (iii)    (b) (ii) and (iii)    (c) (ii) and (iv)    (d) (i) and (ii)

**Fill in the blanks ( ½ marks questions)**

1. In an ionic equation, not only total number of atoms on both sides of equation should be ----- but also ----- on both sides should be equal. (equal, charge)

2.  $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$  is ----- reaction (displacement)

3. The balancing of chemical equation is in accordance with law of ----- of mass (conservation)

4. If a substance loses oxygen during a chemical change, it is said to be ----- (Reduced)

5. If a substance loses hydrogen during a chemical change, it is said to be ----- (Oxidized)

6. Decomposition reactions are the opposite of ----- reactions. ( combination)

7. The reaction between  $\text{H}_2$  and  $\text{O}_2$  to form  $\text{H}_2\text{O}$  is called ----- reaction (Combination)

8. ----- reactions are normally carried out in the presence of heat, light or electricity. (Decomposition)

9. It is called a ----- reaction when hydrogen is removed from a substance. (Oxidation)

10. It is called a ----- reaction when oxygen is removed from a substance (Reduction)

11. Electrons are lost and gained during ----- reactions (redox)

12. Anti oxidants are often added to packed foods to prevent ----- due to oxidation. (rancidity)

13. A solution made in water is known as an ----- solution and indicated by the symbol ----- (aqueous ; aq)

14. Formula of methane is ----- ( $\text{CH}_4$ )

15. The decomposition of vegetable into compost is an example of ----- reaction (oxidation or Fermentation)

16. Burning of candle wax is a ----- change (chemical)

Match the following ( ½ mark questions)

Group –A

Group –B

- |                                  |                                     |
|----------------------------------|-------------------------------------|
| 1. $A + BC \rightarrow AC + B$   | ( ) a) Combination reaction         |
| 2. $A + B \rightarrow C$         | ( ) b) Decomposition reaction       |
| 3. $X \rightarrow Y + Z$         | ( ) c) Displacement reaction        |
| 4. $PQ + RS \rightarrow PS + RQ$ | ( ) d) Double displacement reaction |
| 5. $2Mg + O_2 \rightarrow 2MgO$  | ( ) e) Reduction reaction           |
|                                  | f) Oxidation reaction               |
|                                  | g) Redox reaction                   |

Ans:- c, a, b, d, f.

Heat

- II 1. Double displacement reaction ( ) a)  $CaCO_3 \rightarrow CaO + CO_2$
2. Displacement reaction ( ) b)  $H_2 + Br_2 \rightarrow 2HBr$
3. Decomposition reaction ( ) c)  $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
4. Combination reaction ( ) d)  $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
5. Redox reaction ( ) e)  $2PbO_3 + 3C \rightarrow 2Pb + 3CO_2$

Ans:- d, c, a, b, e

- III 1. Galvanizing ( ) a) Vitamin C and E
2. Alloy ( ) b) Respiration
3. Anti oxidants ( ) c) Formation of NO from  $N_2$  and  $O_2$
4. Exothermic reaction ( ) d) Stainless steel
5. Endothermic reaction ( ) e) Prevention of corrosion

Ans:- e, d, a, b, c.

- IV 1. Exothermic reaction ( ) a)  $CaO$
2. Endothermic reaction ( ) b) Gas is evolved
3. Upward arrow ( $\uparrow$ ) ( ) c)  $C + O_2 \rightarrow CO_2 + Q$
4. Down ward arrow ( $\downarrow$ ) ( ) d)  $N_2 + O_2 \rightarrow 2NO - Q$
5. Quick lime ( ) e)  $Ca(OH)_2$
6. Slaked lime ( ) f) precipitate is formed

Ans:- c, d, b, f, a, e.

### Additional questions / Hot questions

1. You might have noted that when copper powder is heated in a china dish the surface of copper powder becomes coated with a black colour substance.
  - (i) How has this black coloured substance formed/
  - (ii) What is that black substance?
  - (iii) Write the chemical equation of the reaction that takes place.
2. What is meant by a skeletal equation? What does it represent? Using the equation for electrolytic decomposition of water differentiate between a skeletal chemical equation and a balanced chemical equation.
3. A solution of substance 'X' is used for white washing.
  - (i) Name the substance 'X' and write its formula.
  - (ii) Write the reaction of the substance 'X' named in (i) above with water.
4. A light sensitive compound 'X' of silver is used in black and white photography. On exposure to sunlight its colour changes to grey.
  - (a) Identify 'X'
  - (b) Write a chemical equation to express the above change.
  - (c) Identify the type of chemical reaction.
5.
  - (i) Give an example of a combination reaction which is also an exothermic reaction.
  - (ii) Complete the following chemical equation and balance it.  
$$\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow$$
6. Why is double the amount of gas collected in one of the test tubes in the electrolysis of water experiment? Name the gas.
7. All decomposition reactions are endothermic reactions. Explain why?
8. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?
9. Write balanced chemical equations for the reaction of dil. HCl with
  - (i) Zn metal    (ii)  $\text{Na}_2\text{CO}_3$     (iii) NaOH
10. State the chemical change that takes place when limestone is heated strongly.
11. A brown substance 'X' on heating in air forms a substance 'Y' when hydrogen gas passed over heated 'Y' it again changes back into 'X'.
  - (i) Name the substance 'X' and 'Y'
  - (ii) Name the type of chemical reactions occurring during both changes.
  - (iii) Write the chemical equations of the reactions.
12. A brown coloured metal 'X' is a good conductor of electricity and is mixed with gold to make ornaments. Metal 'Y' is also used for making Jewellery but turns black (Z) in air, Identify X, Y, Z. What type of reaction takes place between 'X' and a salt of 'Z'?

13. An alloy of 'M' is used for soldering. When a nitrate of 'M' is heated, it gives a yellowish brown coloured metal oxide together with a brown gas, 'G<sub>1</sub>' and a colourless gas 'G<sub>2</sub>'. Identify G<sub>1</sub> and G<sub>2</sub> and write the balanced chemical equation.
14. A grey colour metal 'Z' (At. Wt = 65) is used in making dry cell. It reacts with dil HCl to liberate a gas. What is the gas evolved?
- Calculate the minimum amount of 'Z' required to produce 100 liters of the gas at N.T.P.

### **3. REFLECTION OF LIGHT**

#### **1 mark questions**

1. How do you get a virtual image using a concave mirror?

Ans:- We get a virtual image using a concave mirror by keeping the object between the principal focus and pole of the mirror.

The image is virtual, erect and enlarged.

2. The magnification produced by a plane mirror is +1. What does this mean.

Ans:- Magnification +1 indicates the image is erect and size of the image is equal to size of the object.

3. What is Fermat principle.

Ans:- Light chooses the path which takes the least time travel. It is also applicable to reflection of light.

4. Mirror formula

Ans:-  $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

#### **2 marks questions**

1. State the laws of reflection of light.

Ans:- Laws of reflection

- (i) When light gets reflected from a surface, the angle of reflection is equal to the angle of incidence.
- (ii) The incident ray, the reflected ray and the normal (at the point of incident), all lie in the same plane.

2. Why do we prefer a convex mirror as a rear view mirror in the vehicles?

Ans:- (i) A convex mirror always forms an erect, virtual and diminished image of an object placed at any where in front of it.

(ii) A convex mirror has a wider field of view than a plane mirror of the same size.

(iii) Thus convex mirrors enable the driver to view much larger traffic behind him than would be possible with a plane mirror.

3. How do you appreciate the use of reflection of light by concave mirror in

making of TV antenna dishes?

Ans:- (i) T.V. antenna dishes contain concave surface to receive the signals from the distinct communication satellites.

(ii) The concave shape of a dish antenna helps to reflect the signal to the focal point of the dish.

(iii) A device known as feed horn is mounted at the focal point which gathers the signals and sends them to a processing unit.

(iv) Thus I appreciate the working process of T.V. antenna dishes.

4. Write the rules for sign convention.

Rules mentioned for sign convention in mirror equations:

Ans:- (i) All distances should be measured from the pole of mirror.

(ii) The distances measured in the direction of incident light to be taken positive and measured in the opposite direction of incident light to be taken negative.

(iii) Height of object ( $h_o$ ) and height of image ( $h_i$ ) are positive if measured upward from the principal axis and negative if measured downwards.

5. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm find the position and nature of image.

Ans:- Focal length  $f = 15\text{cm}$

Image distance  $v = ?$

$$1/f = 1/u + 1/v$$

$$1/v = 1/f + 1/u$$

$$1/v = 1/15 - [1/-10] = 1/15 + 1/10$$

$$1/v = (2+3)/30 = 5/30 = 1/6$$

∴

$$v = 6\text{cm}$$

∴

Image is formed behind 6cm from mirror.

Image is virtual, erect and diminished.

#### **4 marks questions**

1.State the difference between concave and convex mirrors.

Ans:- Concave mirror

Convex mirror

1.If the reflecting surface of a Spherical Mirror is concave it is called Concave mirror.

1. If the reflecting surface of a spherical mirror is convex, it is Called convex mirror.

2.Sometimes it forms enlarged images And sometimes smaller ones

2. Always forms a smaller image.

3.The size of the image varies according To the position of object in front of the Mirror.

3. Forms images of objects spread over a larger area.

4. Doctors use these mirrors to examine Eyes, ears, nose and throat.

4. Convex mirrors help the drivers Of motor vehicles to see the Traffic behind them.

2. We imagine that spherical mirrors are not known to human beings guess the consequences.



Ans:- (i) If the spherical mirrors are not known to human beings it would be difficult to make the light rays travel to long distances by the reflectors of car head lights and torches.

(ii) It would be difficult to focus the light on the decayed tooth and examined by a dentist.

(iii) The use of concave mirrors as shaving mirrors would not have become possible.

(iv) The use of convex mirrors by the driver of a vehicle to have a clear view of wide range of traffic behind him, if the convex mirror does not form a diminished virtual image of the traffic and if it is not used as rear view mirror.

3. By observing steel vessels and different images in them, surya a third class student asked some questions to his elder sister vidya. What may be those questions?

Ans:- (i) Dear sister, why is my face kept close to the steel pot with its bulging surface seem to be small

(ii) How these steel vessels form images.

(iii) Are these steel vessels mirrors.

(iv) The images are different in different vessels. Why?

(v) As we move the vessels the size and shape of the image changed. Why?

4. What do you know about the terms given below related to the spherical mirrors?

Ans:- (a) pole (b) centre of curvature (c) Focus (d) Radius of curvature

(e) Focal length (f) principal axis (g) object distance (h) image distance

(i) magnification

Ans:- (a) pole:- The point on the principal axis of spherical mirror with respect to which all the measurements are made usually it is the mid point of the curvature of mirror.

(b) Centre of curvature :- The centre of the sphere of which the curved surface of the mirror is a part.

(c) Focus :- The light rays coming from a source parallel to the principal axis converge at a point after reflection. This point is called focus.

(d) Radius of curvature:- The radius of the sphere of which the curved surface is a part is called radius of curvature.

(e) Focal length:- The distance between the pole of the mirror and focus is called focal length of mirror.

(g) Object distance :- The distance between the pole of the mirror and focal point is known as object distance

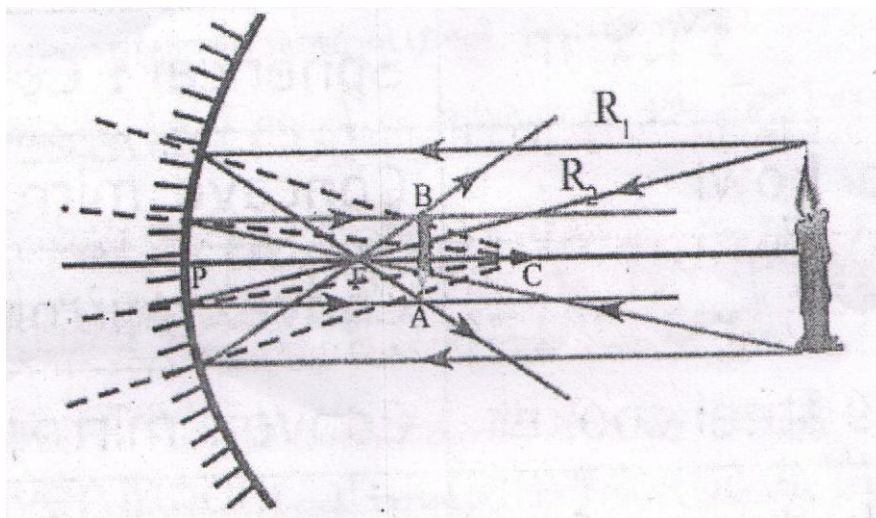
(h) Image distance:- The distance between the pole of the mirror and position of image is called image distance.

(i) magnification :- Magnification of a spherical mirror is the ratio between size of image to the size of object.

$$\text{Also } m = v/u$$

Show the formation of image with a ray diagram when an object is placed on the principal axis of a concave mirror away from the centre of curvature.

Ans:-



DAPA

Fill in the blanks

1. The centre of sphere to which a spherical mirror belongs is called .....
2. The line which passes through the centre of curvature and pole is.....
3. The distance between pole and centre of curvature is .....
4. Light selects the least time path to travel between two points. This principle was stated by .....
5. The relation between focal length and radius of curvature given by .....

6. .... mirrors are used by a Dentist.

7. If the magnification of a mirror is +2 then image is ..... and .....

## II Multiple choice questions

1.If an object is placed at c on the principal axis front of a concave mirror, the position of the image is ..... [   ]

a) at infinity   b) between 'F' and 'c'   c) at 'c'   d) beyond 'c'

2.We get a diminished image with a concave mirror when the object is placed ...

a) at F   b)between the pole and F   c) at C   d) beyond C [   ]

3. A ray which seems to be travelling through the focus of a convex mirror passes ----- after reflection. [   ]

a)parallel to the axis   b) along the same path in opposite direction

c) through F   d) through C

4. A ray of light is incident on a plane mirror making an angle of  $90^\circ$  with the mirror surface. The angle of reflection for this ray of light will be [   ]

a)  $45^\circ$    b)  $90^\circ$    c)  $0^\circ$    d)  $60^\circ$

5. The angle of incidence of a light ray is  $45^\circ$ . The angle of reflection is ..... [   ]

a)  $30^\circ$    b)  $45^\circ$    c)  $60^\circ$    d)  $90^\circ$

## Answers

I (1) Centre of curvature (2) principal axis (3) Radius of curvature

(4) Fermat (5)  $R = 2f$  (6) concave mirrors (7) virtual, erect.

(1) C   (2) B   (3) A   (4) C   (5) B

## 4.ACID, BASES AND SALTS

### 1 Mark Questions and answers:

1. Make distinction between metals and non- metals with respect to the nature of their oxides?

A: - Metals give basic oxides and non metals give acidic oxides.

2. Which gas is usually liberated when an acid reacts with a metal?

A: - Hydrogen ( $H_2$ ) gas.

3. Name the acids present in (i) Nettle sting (ii) Curd?

A: - (i) (Formic acid) Methanoic acid (ii) Lactic acid.

4. Write the chemical names of two salts belongs to sodium family?

A: -  $Na_2SO_4$ , NaCl,  $NaNO_3$ ,  $Na_2CO_3$ .

5. What is the source of common Salt?

A: - Sea water and Salt rocks.

6. Give reason: Tartaric acid is an ingredient of baking powder?

A: - Tartaric acid acts as preservation and also reacts with baking soda to give carbon dioxide

7. What are alkalis?

A: - Bases which are soluble in water are called alkalis.

8. What is  $P^H$  scale?

A: - A scale for measuring hydrogen ion concentration in a solution is called  $P^H$  scale. (or)  $P^H$  is negative logarithm of hydrogen ions  $[H^+]$ .

9. What type of reaction takes place in stomach when an antacid tablet is consumed?

A:- Neutralization reaction takes place in stomach when an antacid tablet is consumed.

10. Write the common name of Sodium hydrogen carbonate?

A:- Baking soda ( $NaHCO_3$ ).

11. Give the chemical names of acids present in.

(a) ants      (b) lemon      (c) milk      (d) tomato.

A:- Ants – Formic acid      Lemon – Citric acid.

Milk – Lactic acid      Tomato – Oxalic acid.

Tamarind – Tartaric acid      Vinegar – Acetic acid.

(Naturally occurring acids)

### **2 Marks Questions and answers.**

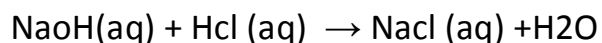
1. A Knife which is used to cut a fruit, was immediately dipped into water containing drops of blue litmus solution. If the colour of the solution is changed to red, what inference can be drawn about the nature of the fruit and why?

A:- The fruit is acidic because acid solutions change blue litmus solution to red.

2. What is a neutralization reaction? Give an example?

A:- When the effect of a base is nullified by an acid and vice versa, it is called neutralization reaction. In general a neutralization reaction is written as

Ex:-       $\text{Base} + \text{Acid} \rightarrow \text{Salt} + \text{Water}.$



3. What are olfactory indicators? Give an example?

A:- olfactory indicators are substances which have different odor in acid and base solutions.

Ex:- Vanilla essence has characteristic pleasant smell in acid solution and no smell in alkali solution.

4. What are antacids? Give an example?

A:- Antacids are mild alkaloids. These are used for getting relief from acidity and indigestion and some times even head ache. When take orally, it reach with hydrochloric acid present in the stomach and reduces its strength by consuming some of it.

Ex: - Milk of Magnesia is an antacid.

5. Plaster of Paris should be stored in moisture – proof container. Example why?

A: - Plaster of Paris should be stored in moisture – proof container. This is because the presence of moisture can cause slow setting of Plaster of Paris by bringing about its duration. This will make the plaster of Paris useless after some time.

6. Fresh milk has a  $P^H$  of 6. Explain the  $P^H$  changes as it turns into curd?

A: -  $P^H$  decreases as milk changes to curd. Lacto bacillus bacteria turns milk to curd by releasing Lactic acid. That means curd contain lactic acid. So its  $P^H$  decreases than 6 as curd is acidic in nature.

7. What will happen if the  $P^H$  value in your body increases?

A: - Our body works well with in a narrow  $P^H$  range of 7.0 to 7.8. If due to some reason this  $P^H$  range gets disturbed in the body of a person, then many ailments can occur.

8. Classify the following examples as acid, base(or)salt.

$Mg(OH)_2$ ,  $H_3PO_4$ ,  $KNO_2$ ,  $Ba(OH)_2$ ,  $KCl$ ,  $HBr$ ,  $NaCl$ ,  $HFO_4$ ,  $HCl$ ,  $Al(OH)_3$

A:- Acids :-  $H_3PO_4$ ,  $HBr$ ,  $HFO_4$ ,  $HCl$

Bases :-  $Mg(OH)_2$ ,  $Ba(OH)_2$ ,  $Al(OH)_3$

Salts :-  $KNO_2$ ,  $NaCl$ ,  $KCl$ .

9. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid.

A:- We should always added acid to water, other wise so much heat is produced during reaction that the container specially that of glass may break. The hot contents may also cause an explosion and spill on our clothes and body and result into serious acid burns.

10. Give reasons :

(a) Tap water conducts electricity where as distilled water does not.

(b) Solution of Sulphuric acid conducts electricity where as alcohol does not.

(c) Dry ammonia gas has no action on litmus paper but a solution of ammonia in water turns red litmus paper blue.

A:- (a) Tap water contains some impurities in the form of salts. Due to presence of salts, it conducts electricity. Distilled water is free from all kinds of salts and hence does not conduct electricity.

(b) Solution of Sulphuric acid has charged ions  $H^+$  and  $SO_4^{2-}$  which helps in conducting electricity where as alcohol does not give any ions in water.

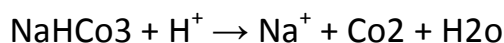
(c) Dry ammonia has no  $\text{H}^+$  or  $\text{OH}^-$  ions whereas ammonia in water gives  $\text{OH}^-$  ions which turns red litmus blue.

11. What is acid rain? How does it affect aquatic life?

A:- When the  $\text{p}^{\text{H}}$  of rain water is less than 5.6 it is called acid rain. When acid rain flows into the rivers, it lowers the  $\text{p}^{\text{H}}$  of the river water. Since our body works within a narrow  $\text{p}^{\text{H}}$  range close to 7 (7.0 – 7.8), the survival of aquatic life in river water mixed with rain water becomes difficult.

12. What is the baking powder? How does it make the cake soft and spongy?

A:- Baking powder is a mixture of baking soda and a mild, edible acid such as tartaric acid. When baking powder mixes with water then Sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide gas.



The  $\text{CO}_2$  gas produced gets trapped in the wet dough and bubbles out slowly making the cake to rise and become soft and spongy.

13. What is our tooth enamel made up of? "Sweet tooth" may lead to tooth decay. Explain why? What is the role of tooth paste in preventing Cavities?

A:- Tooth enamel is chemically calcium phosphate  $[\text{Ca}_3(\text{PO}_4)_2]$ . It starts corroding when  $\text{p}^{\text{H}}$  falls below 5.5. Food particles left in the mouth degrade to produce acid which lowers the  $\text{p}^{\text{H}}$  of the mouth. Doctors advise the use of paste etc. to prevent tooth decay because these are alkaline and neutralise the acid produced.

#### **4 Marks Questions and answers**

(1) Give the important uses of the following substances.

(a) Bleaching powder (b) Washing soda (c) Baking soda (d) Plaster of Paris

A:- (a) Bleaching powder :-  $(\text{CaOCl}_2)$

(i) It is used for bleaching purpose.

(ii) Used as an oxidising agent.

(iii) Used for disinfection of drinking water to make it free of germs.

(iv) Used as reagent in the preparation of chloroform.

(b) Washing soda :-  $(\text{Na}_2\text{CO}_3)$

(i) Sodium carbonate is used in glass, soap and paper industries.

(ii) It is used in the manufacture of Borax.

(iii) It can be used as a cleaning agent for domestic purposes.

(iv) It is used for permanent hardness of water.

(c) Baking soda :- (  $\text{NaHCO}_3$  )

(1) Baking soda causes bread or cake to rise, making them soft and spongy.

(2) It is also used in soda acid fire extinguishers.

(3) It acts as mild anti septic.

(4) It is an ingredient in antacids. Being alkaline it neutralizes excess acid in the stomach and provides relief.

(d) Plaster of Paris:- (  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$  )

(i) It is used in making chalks and fire proof materials.

(ii) Used for making patient plasters used in surgery and for plastering fractured parts of the body.

(iii) Mixed with alum, it is used as a cement in ornamental casting and for making moulds in pottery work.

(iv) Used for making toys, materials for decoration.

2. Compounds like alcohol and glucose which also contain hydrogen are not categorized as acids. Why? Describe an activity to justify your answer, draw the necessary diagram and label it.

Ans:- Alcohol and glucose contain hydrogen but they do not give hydrogen ions in water and are therefore not categorized as acids.

Activity:-

1. Take solution of glucose and alcohol.
2. Fix two iron nails on a rubber cork and place the cork and place the cork in a beaker as shown in the figure.
3. Connect the nails to the two terminals of a 6Vdt battery through a switch and a bulb.
4. Take glucose solution ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) in the beaker and switch on the current.

Draw  
Figure – 38  
Page No.76  
Of  
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5. The bulb does not glow. This shows that glucose solution does not conduct electricity.
6. Repeat this experiment by taking alcohol solution in the beaker, the bulb does not glow again. This shows that alcohol also does not conduct electricity.
7. Due to absence of ions, glucose and alcohol solutions do not conduct electricity.
8. Glucose, alcohol are not categorized as acids because they do not dissociate in water to produce  $H^+$  ions.
3. What is meant by 'water of crystallization' of a substance. Describe an activity to show the water of crystallization.

Ans:- Water of crystallization:- The water molecules which form part of the structure of a crystal are called water of crystallization. The salts which contain water of crystallization are called hydrated salts. Ex:-  $CaSO_4 \cdot 2H_2O$  ;  $CuSO_4 \cdot 5H_2O$  ;  $Na_2CO_3 \cdot 10H_2O$

Activity:-

1. Take some copper sulphate crystals in a dry boiling tube.
2. Heat the crystals strongly by keeping the boiling tube over the flame of a burner for some time.

Draw  
Fig -10 of  
Page No. 88 of  
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3. On heating the blue copper sulphate crystals turn white and a powdery substance is formed we can also see tiny droplets of water in the boiling tube.
4. Cool the boiling tube and add 2 or 3 drops of water on the white copper sulphate powder formed above.
5. The blue colour of copper sulphate crystals is restored they become blue again.
4. Demonstrate by an experiment that acid reacts with metal carbonate to liberate carbon dioxide gas.

Ans:- (i) Take two test tubes label them as A and B.

(ii) Take about 0.5gm of sodium carbonate ( $Na_2CO_3$ ) in test tube A.

(iii) Take about 0.5 gm of sodium hydrogen carbonate ( $NaHCO_3$ ) in test tube B.

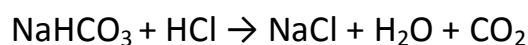
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(iv) Add about 2 ml of dil HCl to both the test tubes.

(v) Pass the gas produce in each case through lime water.

(vi) A milky white precipitation is formed. Hence the released gas is carbon dioxide.

(vii) From the above activity we conclude that when metal carbonate and bicarbonates reacts with acids they give a corresponding salt, CO<sub>2</sub> and H<sub>2</sub>O.



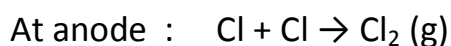
5. An Alkali is an important base used for the laboratory work. Name the base and state how it can be prepared from common salt? What is this process called.

Ans:- An important alkali commonly needed for laboratory work is "Sodium Hydroxide" (NaOH). It can be prepared from sodium chloride (NaCl) by the process of electrolysis. This is called . Chlor – alkali process.

Electrolysis of aqueous solution of sodium chloride (NaCl) :-

When electricity is passed through an aqueous solution of sodium chloride commonly called brine, it decomposes into ions chloride and sodium. Sodium is collected at the cathode where it reacts with water to form sodium hydroxide (NaOH). Chloride is formed at the anode and is collected as a gas.

Electrolysis

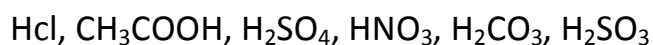


The overall reaction is

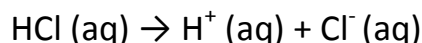
Electrolysis



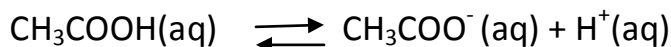
6. What is meant by strong acids and weak acids? Classify the following into strong acids and weak acids.



Ans:- Strong acids:- An acid which is completely ionized in water and thus produces a large amount of hydrogen ions is called strong acid.



Weak acids:- An acid which is partially ionized in water and thus produces a small amount of hydrogen ions is called a weak acid.



Strong acids : HCl, H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>; Weak acids : CH<sub>3</sub>COOH, H<sub>2</sub>CO<sub>3</sub>, H<sub>2</sub>SO<sub>3</sub>

7. what is meant by strong bases and weak bases?

Classify the following into strong bases, and weak bases.



Strong base:- A base which completely ionizes in water and thus produces a large amount of hydroxide ions (OH<sup>-</sup>) is called strong base.



Weak base:- A base which is partially ionized in water and thus produces a small amount of hydroxide ions is called a weak base.

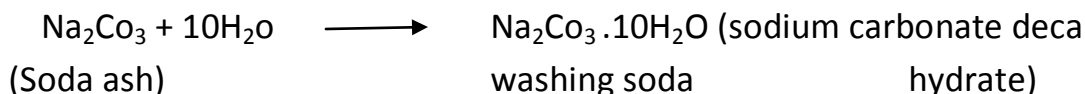


Strong bases :- NaOH, KOH      weak bases : NH<sub>4</sub>OH, Ca(OH)<sub>2</sub>, Mg (OH)<sub>2</sub>

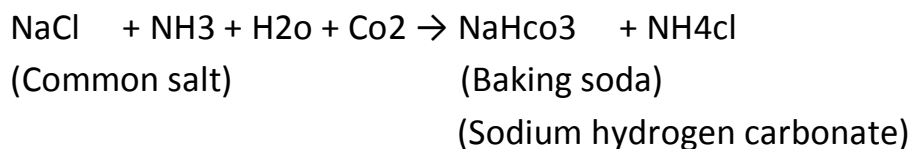
8. How are the following substances prepared? Write chemical equations involved in their preparation.

(a) Washing soda (b) Baking soda (c) Bleaching powder (d) Plaster of Paris

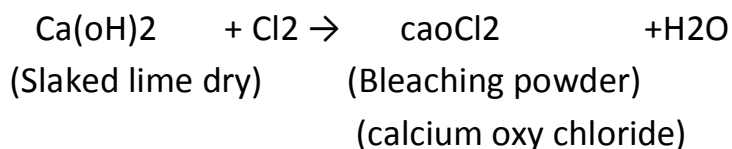
Ans:- (a) Washing soda:- Anhydrous sodium carbonate (soda ash) is dissolved 10 molecules of water of crystallization.



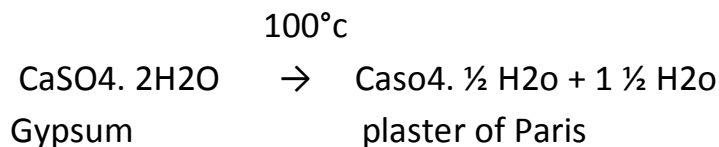
(b) Baking soda:- It is produced on a large scale by reacting a cold and concentrated solution of sodium chloride (Brine) with ammonia and carbon dioxide.



(c) Bleaching powder:- It is prepared by passing chlorine gas over dry slaked lime.



(d) Plaster of Paris:- Plaster of Paris is prepared from gypsum by heating to a temperature of  $100^\circ\text{C}$ .



### Multiple Choice questions

1. Which of the following indicators is not acid – base indicator? (b)

- (a) pheno phthalein    (b) Vanilla    (c) Litmus    (d) Methyl orange

2. Which of the following elements forms an acidic oxide? (c)

- (a) Mg    (b) Na    (c) P    (d) Al

3. The natural indicator among the following is ----- (d)

- (a) Phenolphthalein    (b) Methyl orange    (c) Methyl red    (d) Litmus.

4. An aqueous solution of sodium acetate will turn (d)

- (a) Methyl orange yellow    (b) Red litmus blue  
(c) Pheno phthalein solution pink    (d) all of these

5. A solution when added to crushed egg shells, a gas is evolved that turns lime water milky. The solution contains. (a)

- (a) HCl    (b)  $\text{NH}_4\text{Cl}$     (c) NaCl    (d) KCl

6. A few drops of methyl orange are added to a soap solution. The colour of the solution becomes (b)

- (a) Orange    (b) Yellow    (c) Pink    (d) Remains colourless.

7. A solution turns red litmus blue; its  $\text{p}^{\text{H}}$  is likely to be (d)

- (a) 1    (b) 4    (c) 5    (d) 10

8. Which of the following types of medicines is used for treating indigestion? (c)

(a) Anti biotic      b) Analgesic      c) Antacid      d) Anti septic

9. Many salts absorb water from atmosphere. This property is called ---- (a)

(a) Crystallization      b) Hydration      c) Deliquescence      d) Efflorescence

10. Which of the following substance has the lowest  $P^H$  value? (c)

(a) Sugar      b) Tomato juice      c) Vinegar      d) Washing soda

11. Which of the following substances is used as an anti chloral? (b)

(a)  $CaOCl_2$       b)  $Na_2S_2O_3$       c)  $Na_2SO_4$       d)  $CuSO_4$

12. Water soluble bases are known as ----- (d)

(a) Neutral      b) base      c) acid      d) alkali

13. The aqueous solution of ----- conducts electricity. (b)

(a) Ethyl alcohol      b) acetic acid      c) acetone      d) ether

14.  $H_2O + \text{-----} \rightarrow H_3O^+$  (a)

(a)  $H^+$       b)  $OH^-$       c)  $H_2O$       d)  $H_3O$

15. In neutralization reaction ----- is formed with water. (c)

(a) acid      b) base      c) salt      d) ice.

### Fill in the blanks

1. ----- gas is generally evolved when a metal is dropped into a dilute acid. ( $H_2$ )

2. ----- is evolved when metal carbonate reacts with acids. ( $CO_2$ )

3. All acids produce ----- ions in water. ( $H^+$  aq) or ( $H_3O^+$ ) or (Hydronium ions)

4. The strength of the base is measured by the number of ----- ions it produce in a solution. ( $OH^-$ ) or (Hydroxide ions)

5. All soluble hydroxides are ----- (alkalis)

6. Copper sulphate has ----- water molecules as water of crystallization (5)

7. Common salt is deliquescent because of the presence of ----- ( $MgCl_2$ )

8. The chemical name of table salt is ----- (NaCl ) (Sodium chloride)
9. During digestion stomach produces ----- (HCl)
10.  $P^H$  was introduced by ----- (Sorensen)
11. ----- oxides show properties for both acids and bases (Amphoteric)

**Match the following**

**Group –A**

**Group –B**

- |                     |        |                                    |
|---------------------|--------|------------------------------------|
| 1. Plaster of Paris | (    ) | a) $CaOCl_2$                       |
| 2. Gypsum           | (    ) | b) $NaHCO_3$                       |
| 3. Bleaching powder | (    ) | c) $Na_2CO_3$                      |
| 4. Baking soda      | (    ) | d) $CaSO_4 \cdot \frac{1}{2} H_2O$ |
| 5. Washing soda     | (    ) | e) $CaSO_4 \cdot \frac{1}{2} H_2O$ |

Ans:- d, e, a, b, c.

# DCEB-KADAPA

Group A

Group B

- |                                      |        |                 |
|--------------------------------------|--------|-----------------|
| (ii) 1. Metallic Oxide               | (    ) | a) Washing soda |
| 2. Non metallic oxide                | (    ) | b) Aqueous NaCl |
| 3. Brine solution                    | (    ) | c) MgO          |
| 4. Salt used in manufacture of Borax | (    ) | d) Baking soda  |
| 5. Acts as mild antiseptic           | (    ) | e) $CO_2$       |

Ans:- c, e, b, a, d.

Group A

Group B

- |                |        |                  |
|----------------|--------|------------------|
| (iii) 1. Ant's | (    ) | a) Tartaric acid |
| 2. Lemon       | (    ) | b) Oxalic acid   |
| 3. Milk        | (    ) | c) Lactic acid   |
| 4. Tomato      | (    ) | d) Citric acid   |
| 5. Tamarind    | (    ) | e) Formic acid   |

Ans:- e, d, c, b, a.

Group A	Group B
(iv) 1. $P^H$ range of acidic solution	(   ) a) 7.4
2. $P^H$ range of basic solutions	(   ) b) 0 – 7
3. $P^H$ range of neutral solutions	(   ) c) 7 – 14
4. $P^H$ range of body	(   ) d) 7
5. $P^H$ value of blood	(   ) e) 7 – 7.8

Ans:- b, c, d, e, a.

Group A	Group B
(iv) 1. Strong acid	(   ) a) $NH_4OH$
2. Weak acid	(   ) b) NaOH
3. Strong base	(   ) c) Distilled water ( $H_2O$ )
4. Weak base	(   ) d) $CH_3COOH$
5. Neutral solution	(   ) e) HCl

Ans:- e, d, b, a, c.

### Additional questions / HOT Questions

1. A yellow power 'A' gives a pungent smell when left in open. It is a good oxidizing agent and is used for bleaching cotton lines in textile industries. Identify 'A' and give its method of preparation. What is its commercial name?
2. Why does bleaching powder smell strongly chlorine?
3. What is meant by the term  $P^H$  of a solution? The  $P^H$  of rain water collected from two cities A and B was found to be 6 and 5 respectively. The water of which city is more acidic?
4. A student dropped a few pieces of marble in dilute HCl contained in a test tube. The evolved gas was passed through lime water
  - (i) What change would be observed in lime water?
  - (ii) Write balanced chemical equation for the above change?
5. A white coloured powder is used by the doctors for supporting fractured bones.
  - (a) write chemical name of the powder.

(b) Write its formula

(c) Write the chemical equation, when this white powder is mixed with water.

6. To a solution of sodium hydroxide in a test tube two drops of phenolphthalein are added.

(a) State the colour change observed.

(b) If dil HCl is added drop wise to the solution, what will be the colour change?

(c) On adding few drops of NaOH solution to the above mixture the colour of the solution reappears. Why?

7. (i) Name the compound which is obtained from baking soda and is used to remove permanent hardness of water.

(ii) Write its chemical formula.

(iii) What happens when it is recrystallized from its aqueous solution?

8. The products obtained on electrolysis of concentrated aqueous solution of a substance 'X' are NaOH,  $\text{Cl}_2$  and  $\text{H}_2$ .

(a) Name the substance 'X'.

(b) What is the special name of this process and why?

(c) Which gas is liberated at anode?

(d) List one commercial use of NaOH.

9. (a) A white powder is an active ingredient of antacids and is used in preparation of cakes. Name the compound and state how it is manufactured? Give chemical equation.

(b) Write an equation to show the effect of heat on this compound?

10. Draw the  $\text{p}^{\text{H}}$  scale

11. Describe the importance of  $\text{p}^{\text{H}}$  in our daily life.

12. When a drop of orange juice is added to pure water, how the  $\text{p}^{\text{H}}$  value will vary for water? If a drop of lemon juice is also added, will there be any more change in the  $\text{p}^{\text{H}}$  value?

13. Why should curd and sour substances not be kept in brass and copper vessels?

14. Mention names of two oxides each which on reaction with water give acids and bases respectively?

15. Mention important characteristics of acids and bases.



# 5. REFRACTION OF LIGHT AT PLANE SURFACE

## 1 Mark Questions

1. What is the reason for refraction?

(Or)

Why a light ray deviate at the interface of two media?

A. The incident light ray changes its direction (deviate) at the interface separating the two media due to change its speed.

2. What is Fermat's principle?

A. The light ray always travels in a path which needs shortest possible time to cover the distance between the two given points.

3. If refractive index of glass is  $\frac{3}{2}$ , then what is speed of light in glass?

A. Refractive index of glass (n) =  $\frac{3}{2}$

Velocity of light in vacuum (c) =  $3 \times 10^8$  m/s

Speed of light in glass v =  $\frac{c}{n} = \frac{3 \times 10^8}{\frac{3}{2}}$   
v =  $2 \times 10^8$  m/s

4. What are the factors that influence refractive index?

A. 1) Nature of material

2) Wave length of light

## 2 Mark questions

1. In what cases does a light ray not deviate at interface of two media?

(or)

Write the cases at which angle of incidence is equal to angle of refraction?

A. Case (1): When a light ray is incident perpendicular to the interface of surface of

two media.

Case (2): When the refractive index of two mediums are equal.

Case (3): When a light ray incident is more than critical angle, it does not undergo deviation but it reflects into the same medium.

2. Why do stars appear twinkling?

A. 1. The twinkling of a star is due to atmospheric refraction of star light.

2. The star light on entering the earth's atmosphere, undergoes refraction continuously before it reaches the earth.

3. The atmospheric refractions occurs in a medium of gradually changing refractive index.
4. Further the apparent position of a star is not stationary.
5. As the path of the rays of light coming from the stars goes on varying slightly, the apparent position of the star fluctuates and the amount of star light entering our eye flickers.
6. So, the star sometimes, appears brighter and sometimes fainter which is the twinkling effects.

3. Why does a diamond shine more than a glass piece cut to the some shape?

(or)

What is the reason behind the shining of a diamond?

- A.
1. The high refractive index (2.42) of diamond gives it a critical angle of  $24.4^\circ$  only. This is very less.
  2. The face of diamond are cut in such a way that most rays in the diamond undergo total internal reflection and emerge from the top face.
  3. Bit if we take a similarly cut glass piece, a large number of incident rays emerge on the other side of the glass.

4. Thus the diamond sparkles, in comparison, because the eyes receive much more light from the diamond than the glass?

Observe the figure given and calculate the refractive index of denser medium with respect to rarer medium.

(or)

Determine the refractive index of a medium of the critical angle is  $30^\circ$ .

A. Critical angle of a medium  $c = 30^\circ$

Refractive index of medium  $n = ?$

$$\begin{aligned}
 n &= \frac{1}{\sin c} \\
 &= \frac{1}{\sin 30} \\
 &= \frac{1}{1/2}
 \end{aligned}$$

Refractive index of medium  $(n) = 2$

#### 4 Mark Questions

1. Collect the information on working of optical fibres. Prepare a report about various uses of optical fibres in our daily life.

(or)

While doing heart operation Madhu observed that a thin pipe is passed to observe internal parts on a computer screen. He came to know that it was an optical fibre. How does the optical fibre work?

A. Optical Fibres:-

1. Total internal reflection is the basic principle behind working of optical fibre.
2. An optical fibre is very thin fibre made of glass or plastic having radius about a micro meter ( $10^{-6}\text{m}$ ).
3. A bunch of such thin fibres form a light pipe.

Working:-

1. Because of small radius of the fibre, light goes into it makes a nearly glancing incidence on the wall.
2. The angle of incidence is greater than the critical angle and hence total internal reflection takes place.
3. The light is thus transmitted along the fibre.

Uses:-

1. Optical fibre are used in endoscopy to see the internal organs of out body.
  2. Optical fibres are used in transmitting communication signals through lighth pipe.
  3. Optical fibres are used in international telephone cables laid under the sea, in large computer network etc.
2. Explain the refraction of light through a glass slab with a near ray diagram.

(Or)

How do you conduct an experiment to determine the position and nature of image formed by a glass slab?

- A. **Aim:-** To study the refraction of light through the glass slab (or) to determine the position and nature of image formed by a glass slab.

Material required: - Plank, chart, clamps, scale, pencil, thin glass slab, and pins.

Procedure:-

1. Place a piece of chart on a plank and clamp it. Place a glass slab in the middle of the chart.
2. Draw border line along the edges of the glass slab by using a pencil. Remove glass slab.
3. We will get a figure of a rectangle name the vertices as A,B,C and D.
4. Draw a perpendicular to the one of the larger side (AB) of the rectangle.
5. Now keep the glass slab such that it coincides with ABCD rectangle.

6. Take the two pins stick them on the other side of the slab in such a way all pins such that it reaches first edge (AB) we get a long straight line.
7. Remove glass slab, and pins. Draw a straight line by using the dots formed by the pins such that it reaches first edge (AB). We get a long straight line.
8. This means the light ray that falls perpendicular to one side of the glass surface comes out without any deviation.
9. Now take another piece of white chart on the plank follow the same procedure now we get another rectangle ABCD.
10. Draw a normal line to the longer side of AB Now draw a line, from the point of intersection. Where side AB of rectangle and perpendicular meet, in such a way that it makes  $30^\circ$  angle with normal.
11. This line represents the incident ray falling on the slab and the angle it makes with normal represents the angle of incidence.
12. Now place the glass slab on the paper in such a way fits in the rectangle drawn. Fix two pins on the line making  $30^\circ$  angle with equal lengths.
13. By looking at these two pins from the other side slab fix another two pins such that all pins appear to be along the straight line.
14. Remove slab and take out pins. Draw a straight line by joining the dots formed by the pins up to the edge of rectangle.
15. This represents emergent ray of light. Draw a normal line at the intersecting point of emergent ray with CD.
16. Measure the angle between emergent rays and normal this is called angle of emergence.
17. We notice that incident and emergent rays are parallel and the distance between these lines is called lateral shift.

### Extra Questions

1. Derive Snell's law (or)  
Prove  $n_1 \sin i = n_2 \sin r$

### 5 Mark Questions

1. Draw a neat ray diagram which shows the refraction of light through a glass slab.

## Multiple Choice Questions

- Which of the following is Snell's Law?  
A)  $n_1 \sin i = \sin \frac{r}{n_2}$                       B)  $n_1 / n_2 = \sin r / \sin i$   
C)  $n_2 / n_1 = \sin r / \sin i$                       D)  $n_2 \sin i = \text{constant}$
- Which one of the following is not an application of total internal reflection?  
A) Sparking diamond                      B) Optical fibre  
C) Mirage                      D) Blue colour of sky
- The angle of refraction for critical angle is  
A)  $60^\circ$                       B)  $90^\circ$                       C)  $120^\circ$                       D)  $48^\circ$
- Refractive index of water is  
A) 1.0003                      B) 1.31                      C) 1.33                      D) 4.44
- The relation between refractive index and optical density  
A) Inversely proportional                      B) directly proportional  
C) A and B                      D) none of these

## Fill in the blanks.

- The refractive index of glass with respect to air is 2. Then the critical angle of glass air interface is \_\_\_\_\_
- Speed of light in vacuum is nearly equal to \_\_\_\_\_
- The principle which states that the light ray always travels in a path which needs shortest possible time to cover the distance between two given points is \_\_\_\_\_
- If  $v_1 < v_2$  then the medium 2 is said to be \_\_\_\_\_ with respect to medium 1.
- If light ray enters from rarer medium to denser medium the angle of refraction is \_\_\_\_\_ than the angle of incidence.

## ANSWERS

- |                        |                     |                 |          |      |                |
|------------------------|---------------------|-----------------|----------|------|----------------|
| 1. B                   | 2. D                | 3. B            | 4. C     | 5. B | 6. $300^\circ$ |
| 7. $3 \times 10^8$ m/s | 8. Fermat Principle | 9. Rarer medium | 10. Less |      |                |

## **6. REFRACTION OF LIGHT AT CURVED SURFACES**

### **1 Mark Questions**

1. Can a virtual image be photographed by a camera?  
A. Yes, a virtual image can be photographed by a camera.  
Examples:
  1. We are able to photograph the virtual images formed by plane mirrors.
  2. Our eye works on the principle of camera with this we are able to see virtual images.
2. Find the focus by drawing a ray diagram using the position of source S and image  $S^1$  given in the below figure.  
A. DIAGRAM
3. Suppose you are inside the water in a swimming part near an edge. A friend standing on the edge. Do you find your friend taller or shorter than his usual height? Why?  
A. My friend appears to be taller.  
**Reason:-**  
The light rays of my friend travelling from rarer to denser medium. These rays bend towards normal line so apparent image of my friend which appears to be taller due to refraction.

### **2 Mark Questions**

1. A convex lens is made up of three different materials as shown in the figure. How many of images does it form?  
A. The lens made of three different materials of refractive indices say  $n_1$ ,  $n_2$  and  $n_3$  have three focal lengths. Thus for a given object it forms three images.
2. A man wants to get a picture of a zebra. He photographed a white donkey after fitting a glass, with black stripes, on to the lens of his camera. What photo will he get? Explain.  
A.
  1. Photographer will get a picture of white donkey only.
  2. Because every part of lens forms an image so if we cover lens with, stripes still it forms a complete image.
  3. However the intensity of the image will be reduced.
3. Collect the information about the lenses available in an optical shop. Find out how the focal length of a lens may be determined by the given 'power' of lens.

- A. 1. Optical shop has different types of lenses with different powers.  
 2. The relationship between power (p) and focal length (f) is  
 $\text{Power of lens (p)} = 1/\text{Focal length (f) [in meters]}$   
 3. The unit of power is diapters (D)  
 4. The value of power is positive for convex lens, negative for concave lens.  
 Eg:- If the power of lens is +4D the focal length is 25 cm [convex lens]
4. Complete the ray diagram to show the paths of the rays after refraction through the lenses shown in the following figures.

A. DIAGRAM

5. What is the focal length of double concave lens kept in air with two spherical surfaces of radii  $R_1=30\text{cm}$  and  $R_2=60\text{cm}$ . Take refractive index of lens as  $n = 1.5$ .

A. Solution:-

From the figure using sign convention we get

$$R_1 = 30\text{cm}$$

$$R_2 = 60\text{cm}$$

$$n = 1.5$$

Substituting these values in lens maker's formula

$$\frac{1}{f} = (n - 1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$$

$$= (1.5 - 1) \left( \frac{1}{-30} - \frac{1}{60} \right)$$

$$= (0.5) \left[ \frac{-2-1}{60} \right]$$

$$= \frac{5}{10} \times \frac{3}{60}$$

$$\frac{1}{f} = \frac{-5}{200} = \frac{-1}{40}$$

Focal length  $f = -40\text{ cm}$

6. The focal length of a converging lens is 20cm. An object is 60cm from the lens. Where will the image be formed and what kind of image is it?

A. Focal length of converging lens ( $f$ ) = 20cm

Object distance ( $u$ ) = -60 (in front of lens taken as -ve)

Image distance ( $v$ ) = ?

$U > 2f$  so image is real and diminished on the other side of lens.

From the formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{20} = \frac{1}{v} - \frac{1}{(-60)}$$

$$\frac{1}{20} = \frac{1}{v} + \frac{1}{60}$$

$$\frac{1}{v} = \frac{1}{30} - \frac{1}{60u}$$

$$\frac{3-1}{60} = \frac{1}{60}$$

Image distance ( $v$ ) = 30cm.

#### 4 Mark Questions

1. How do you find the focal length of a lens experimentally?  
(OR)

You have a lens suggest an experiment to find out the focal length of the lens.

- A. **Aim:-** To find focal length of given lens.

**Apparatus:-** Object (Candle), convex lens, v – stand, screen, scale.

**Procedure:-**

1. Take a v – stand and place it on a long table at the middle.
2. Place a convex lens on the v – stand
3. Light the candle and place it at a long distance along the principal axis.
4. Adjust the screen which is on the other side of lens to get an image on it.
5. Measure the distance of the image from the stand of the lens [v] and also measure the distance between the candle and the stand of lens [u]
6. Repeat the experiment for various object distances (u) like, 50cm, 40cm, 30cm and measure the distance of image (v) in all cases and not in the following table.

S.No	Object distance u (cm)	Image distance v (cm)	Focal length (f) $f = \frac{uv}{u+v}$

7. From the above table  $f = \frac{uv}{u+v}$  value is constant
8. In this way we can find the focal length of a given lens.

2. Collect the information about lenses used by Galileo in his telescope.

- A.
1. The original design Galileo Galilee came up with in 1609 is commonly called a Galilean telescope.
  2. It used a convergent (Plano – concave) eye piece lens.
  3. A Galilean telescope, because the design has no intermediary, focus, results in an non – inverted and upright image.
  4. Galileo’s best telescope magnified objects about 30 times.



5. Because of flaws in its design, such as the shape of the lens and the narrow field of view, the images were blurry and distorted.
  6. Despite these flaws, the telescope was still good enough for Galileo to explore the sky.
  7. The Galileo telescope could view the phases of Venus, and was able to see craters on the moon, and four moons orbiting Jupiter.
3. In the experiment “To find the focal length of the convex lens” you may get different  $u$ ,  $v$  values draw on the graphs of  $U$  vs  $V$  and  $\frac{1}{u}$  vs  $\frac{1}{v}$
- A. In that experiment I got  $u$ ,  $v$  and  $f$  values as follows.

Object distance (u) cm	Image distance (v) cm	Focal length (f) cm
60	60	60
50	75	60
40	120	30

Graph of  $u$ -  $v$  using the above data

The shape of this graph is rectangular hyperbola.

Graph of  $\frac{1}{u}$  -  $\frac{1}{v}$  using the above data.

Object distance $u$ (cm)	$\frac{1}{u}$	Image distance $v$ (cm)	$\frac{1}{v}$
60	$\frac{1}{60} = 0.016 = 0.16$ mm	60	$\frac{1}{60} = 0.016 = 0.16$ mm
50	$\frac{1}{50} = 0.02 = 0.2$ mm	75	$\frac{1}{75} = 0.013 = 0.13$ mm
40	$\frac{1}{40} = 0.025 = 0.25$ mm	120	$\frac{1}{120} = 0.0083 = 0.083$ mm

For this value the graph is straight line which touches the axis as shown in figure.

### 5 Mark Questions

1. Draw a ray diagram for the following positions and the nature and position of image.
  - (i) Object is placed at  $C_2$
  - (ii) Object is placed between  $F_2$  and optic centre p.

(OR)

Draw ray diagram of image formed by a convex lens at various distance.

Position of Object	Position of the image and Nature of image	Diagram
1. At infinity	At focal point Real & inverted image Highly diminished	
2. Beyond centre of curvature ( $C_2$ )	Between $F_1$ and $C_1$ Real & inverted Point size diminished	
3. At centre of curvature ( $C_2$ )	At $C_1$ Real & inverted Same size	
4. Between $C_2$ and $F_2$	Beyond $C_1$ Real & inverted Magnified	
5. At $F_2$	At infinity	
6. Between $F_2$ and p	Same side of lens Virtual & erect Magnified	

### Multiple choice questions

- Focal length of the Plano – convex lens is \_\_\_\_\_ when its radius of curvature is R and n is the refractive index of the lens  
A)  $f = R$                       B)  $f = R/2$                       C)  $f = R/(n-1)$                       D)  $f = (n-1)/R$
- Which of the following is the lens maker's formula?  
A)  $1/f = (n-1) (1/R_1 + 1/R_2)$                       B)  $1/f = (n+1) (1/R_1 - 1/R_2)$   
C)  $1/f = (n-1) (1/R_1 - 1/R_2)$                       D)  $1/f = (n+1) (1/R_1 + 1/R_2)$
- Power of a lens is -20 its focal length is  
A) 50cm                      B) 0.5 cm                      C) 2m                      D) 2cm
- The focal length of a lens has \_\_\_\_\_ in water  
A) Decreased                      B) Increased  
C) not charge                      D) either increase or decrease
- On what factors does the focal length of a lens depends  
A) Radius of curvature                      B) Material  
C) Surrounding medium                      D) all above

## II Fill in the blanks

6. The unit of power of lens is \_\_\_\_\_
7. \_\_\_\_\_ is also called as diverging lens
8. \_\_\_\_\_ lens has a negative power.
9. The lens which can form real and virtual images is \_\_\_\_\_
10. \_\_\_\_\_ is the plane perpendicular to principal axis at the focus.

### ANSWERS

1. C
2. C
3. A
4. B
5. D
6. Diaprtors (D)
7. Concave lens
8. Concave lens
9. Convex lens
10. Focal plane

## 7. HUMAN EYE AND COLORFUL WORLD

### 1 Mark Questions

1. What is the range of vision of a normal human eye?

A. 25cm to infinity.

2. Name the component of white light that deviates the least and the most while passing through a prism.

A. Least deviation: Red; most deviated: violet

3. What is scattering of light?

A. Atoms or molecules which are exposed to light absorb light energy and emit some part of the light energy in different directions is called scattering of light.

4. Define power of lens?

A. The Degree of convergence or divergence of light rays that can be achieved by a lens is expressed in terms of its power.

$$P=1/f$$

5. A rainbow viewed from an airplane may form a complete circle. Where will the shadow of airplane appear?

A. A rainbow viewed from an airplane may form a complete circle.

6. Doctor advised to use 2D lens. What is its focal length?

A. Given that power of lens  $P = 2D$

$$\text{Using } = 100/f \text{ (in cm); } 2 = 100/f$$

$$\text{Therefore, } f = 100/2 = 50\text{cm}$$

The lens has focal length  $f=50\text{cm}$

7. Define power of accommodation?

A. The ability of the property of the eye lens to adjust its focal length in order to be able to focus both near and distance objects is known as the power of accommodation.

### 2 Mark Questions

1. How do you correct the eye defect myopia?

A. (1) The eye lens can form clear image on the retina when an object is placed between far point and point of least distance of distinct vision.

(2) If we are able to bring the image of the object kept beyond far point, between the far point and point of least distance of distinct vision using a lens, this image acts as an object for the eye lens.

(3) This can be made possible only when a concave lens is used.

2. Explain correction of the eye defect Hypermetropia?

A. (1) Eye lens can form a clear image on the retina when an object is placed beyond near point.

(2) To correct the defect of Hypermetropia, we need to use a lens which forms an image of an object beyond near point when the object is between near point and least distance of distinct vision.

(3) This is possible only when a double convex lens is used.

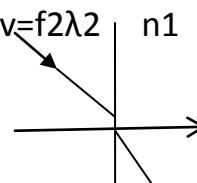
3. Light of wave length  $\lambda_1$  enters a medium with refractive index  $n_2$  from medium with refractive index  $n_1$ . What is the wave length of light in second medium.

A. Relative Refractive index

$$\Rightarrow n_{21} = n_2/n_1 = c/v \Rightarrow n_2 = f_1\lambda_1/f_2\lambda_2 = n_2/n_1 \Rightarrow c = f_1\lambda_1 = v = f_2\lambda_2$$

As the frequency remains constant  $f_1 = f_2$

$\lambda_1$



$$n_2/n_1 = \lambda_1/\lambda_2$$

 $\lambda_2$ 
 $n_2$ 

$$\lambda_2 = \lambda_1 n_1/n_2$$

**4.** A person is viewing distant object. If a converging lens is placed in front of his eye. Will he feel that the size of object has increased? Why?

**A.** Yes, if a converging lens is placed in front of his eye he will tell that the size of object has increased. Because converging lens is a magnifying lens.

**5.** If a white sheet of paper is stained with oil, the paper turns transparent. Why?

**A.** The refractive index of oil and refractive index of paper is same then light passes from oil to paper become transparent. The better the matching of refractive index, the more transparent the paper will be.

**6.** Why does the sky some times appear white?

**A. (1)** In a hot day due to rise in the temperature. Water vapour enters into atmosphere which leads to abundant presence of water molecules in the atmosphere.

**(2)** These water molecules scatter the colors of other frequencies (other than blue). **(3)** All such colors of their frequencies reaches your eye and white color is appeared.

4 Marks Questions

**1.** Explain the formation of rainbow.

**A. 1.** The rainbow is a spectrum of sun light in nature

2. The rainbow is formed due to the dispersion of sun light in nature

3. This phenomenon is due to the combination of the refraction of sun light through water droplets suspended in the atmosphere after rain fall.

4. Parallel beams of light coming from sun getting dispersed at different angles of deviation produce a cone of rays at the observer's eye.

5. The rainbow, therefore, appears as an arc of a circle for an observer on the earth.

**2.** How do you appreciate the role of molecules in the atmosphere for the blue colour of the sky?

**A.** 1. The sky appear blue due to atmospheric refraction and scattering of light through molecules.

2. Molecules are called scattering centres.

3. The reason to blue sky is due to the molecules  $N_2$  and  $O_2$ .

4. The sizes of these molecules are comparable to the wave length of blue light.

5. In the obsence of molecules there will be no scattering of sun light and the sky will appear dark.

6. We should appreciate the molecules which are scattering centre's.

**3.** How do you appreciate the working of ciliary muscles in the eye?

**A.** 1. The ciliary muscle to which eye lens is attached help the eye lens to change its local length changing radii of curvalure of eye lens.

2. when the eye is focused on a distant object the ciliary muscles are relaxed so that the focal length of eye lens has its maximum value which is eqalto its distance from the retina.

3. When the eye is focused on a closer object the ciliary muscles are strained and focal length of eye lens decreases, thus ciliary muscles adjust the focal length in a such a way that the image is formed on retina.

4. This process of adjusting focal length is called accommodation.

5. Ciliary muscles are useful to see distant, closer objects clearly.

**4.** A light ray falls on one of the faces of prism at an angle  $40^\circ$  so that it suffer angle of minimum deviation  $30^\circ$  find the angle of prism and angle of refraction at the given surface?

**A.** Incident angle  $i = 40^\circ$

Angle of minimum deviation  $D = 30^\circ$

$$A + D = 2i$$

$$A = 2i - D$$

$$= 2 \times 40 - 30 = 80 - 30 = 50^\circ$$

Angle of prism  $A = 50^\circ$

Angle of refraction  $r = A/2$

$$R = 50/2 = 25^\circ$$

5. The focal length of a lens suggested to a person with Hypermetropia is 100 cm. Find the distance of near point and power of the lens?

A. Focal length of a lens =  $f = 100 \text{ cm}$

$$P = 100/f$$

$$\text{Power of lens} = 100/100 = 1\text{D}$$

$$f = 25d/d - 25$$

$$100d - 25d = 2500$$

$$100 = 25d/d - 25$$

$$75d = 2500$$

$$100(d - 25) = 25d$$

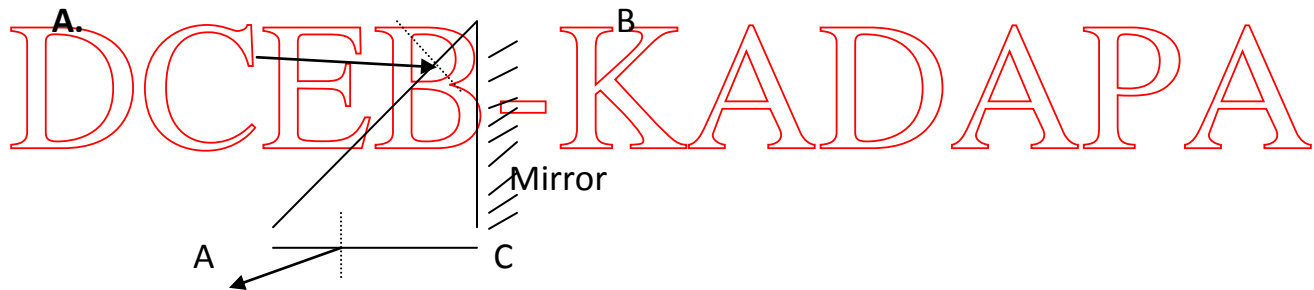
$$d = 2500/75 = 100/3 = 33.33\text{cm}$$

$$100d - 2500 = 25d$$

$f$  = focal length of lens

$d$  = distance of near point

6. Incident ray on one of the face (AB) of a prism and emergent ray from the face AC are given in below figure. Complete the ray diagram?



I Fill in the blanks

1. The value of least distance of distinct vision is about\_\_\_\_\_.
2. The distance between the eye lens and retina is about\_\_\_\_\_.
3. The maximum focus length of the eye lens is about\_\_\_\_\_.
4. Myopia can be corrected by using\_\_\_\_\_ lens.
5. Hypermetropia can corrected by using\_\_\_\_\_ lens.
6. The splitting of white light into different colors. (VIBGYOR)is called\_\_\_\_\_.

## II Multiple choice Questions:

1. The size of an object as perceived by an eye depends primarily on [ ]

- (A) actual size of the object      (B) distance of the object from the eye  
(C) Aperture of the pupil      (D) size of the image formed on the retina

2. When objects at different distances are seen by the eye which of the following remain constant? [ ]

- (A) Focal length of eye-lens      (B) object distance from eye-lens  
(C) The radii of curvature of eye-lens      (D) image distance from eye-lens

3. During refraction \_\_\_\_\_ will not change [ ]

- (A) Wave length      (B) frequency      (C) speed of light      (D) all the above

4. A ray of light falls on one of the lateral surface of an equilateral glass prism placed on the horizontal surface of a table. For minimum deviation of ray. Which of the following is true? [ ]

- (A) PQ is horizontal      (B) QR is horizontal  
(C) RS is horizontal      (D) either PQ or RS is horizontal

5. Far point a person is 5m. in order that he has normal vision what kind of spectacles should he use [ ]

- (A) Concave lens with focal length 5m      (B) Concave lens with focal length 10m  
(C) convex lens with focal length 5m      (D) convex lens with focal length 2.5m

6. The process of re-emission of absorbed light in all directions with different intensities by the atom or molecule is called..... [ ]

- (A) Scattering of light      (B) dispersion of light      (C) reflection of light      (D) refraction of light

### Answers

I      (1) 25cm      (2) 2.5cm      (3) 2.27cm      (4) Concave      (5) Convex      (6) dispersion

II      (1) B      (2) A      (3) B      (4) B      (5) A      (6) A



### III Match the following

- |                             |       |                               |
|-----------------------------|-------|-------------------------------|
| 1. Myopia                   | [   ] | A) Far sightedness            |
| 2. Hypermetropia            | [   ] | B) Near sightedness           |
| 3. Presbyopia               | [   ] | C) Reciprocal of focal length |
| 4. Power of lens            | [   ] | D) Dispersion                 |
| 5. Splitting of white light | [   ] | E) Vision defect with age     |

#### Answers:

(1) B      (2) A      (3) E      (4) C      (5) D

## 8.STRUCTURE OF ATOM

### 1 Mark Questions

1. How many  $ml$  values are possible for  $l = 3$   
A. The possible  $ml$  values for  $l = 3$  are 7 they are -3, -2, -1, 0, +1, +2, +3
2. What are degenerate orbital's?  
A. Orbital which have same energy are called degenerate orbital's
3. Which electronic shell is at higher energy level 'K' or 'L'?  
A. 'L' electronic shell lies at higher energy level than K shell.
4. Which rule is violated in electronic configuration  $1s^0 2s^2 2p^4$ ?  
A. The electronic configuration  $1s^0 2s^2 2p^4$  violates the Aufbau rule.
5. What is emission spectrum?  
A. The spectrum produced by the emitted radiation is known as emission spectrum.
6. We observe yellow light in street lamps. Which will produce yellow light?  
A. Sodium vapors produce yellow light in street lamps.
7. Define Hund's rule?  
A. The orbital's of equal energy are occupied with one electron each before pairing of electrons starts.

8. How many values can ' $l$ ' have for  $n = 4$ ?  
 A. Values of ' $l$ ' for  $n = 4$  are 0,1,2,3  
 The Maximum values of ' $l$ ' for  $n = 4$  is 3
9. Write the electronic configuration of ' $cr$ ' and ' $cu$ '?  
 A.  $cr = 24 \ 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$  (or)  $[Ar] 4s^1 3d^5$   
 $cu = 29 \ 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$  (or)  $[Ar] 4s^1 3d^{10}$

## 2 Mark Questions

1. Following orbital diagram shows electrons configuration of nitrogen atom which rule does not support this?  
 N ( $z = 7$ )
- A. i) The given electronic configuration does not support Hund's rule.  
 ii) Electrons do not pair in an degenerate orbital's until each available degenerate orbital in the given sub shell holds and least on electron.  
 iii) The correct representation of electronic configuration is
2. What information does principle quantum number give?  
 A. 1. The principle quantum number is related to the size and energy of the main shell.  
 2. By increasing the principle quantum, number the size and energy of the main shell also increases.
3. Write the four quantum numbers for the differentiating electron of sodium (Na) atom?
- A. 1. Electronic configuration of Na ( $z = 11$ )  $1s^2 2s^2 2p^6 3s^1$   
 2. The differentiating electron is in 3s orbital ( $3s^1$ )  
 3. Four quantum numbers for  $3s^1$

$n$	$l$	$m$	$s$
3	0	0	$+1/2$

4. An electron in an atom has the following set of quantum numbers to which orbital belong to

$n$	$l$	$ml$	$ms$
2	0	0	$+1/2$

- (ii) Write the four quantum numbers for  $1s^1$  electron?

- A. (i) The four quantum numbers belongs to  $2s^1$  orbital  
 (ii) The four quantum numbers for  $1s^1$  orbital

$n$	$l$	$ml$	$ms$
1	0	0	$+1/2$

5. Explain why electrons enter into 4s orbital but not 3d after filling up 3p?

- A. i) The  $(n+l)$  value of  $4s = 4 + 0 = 4$   
 ii) The  $(n+l)$  value of  $3d = 3 + 2 = 5$   
 iii) 3d orbital has more  $(n+l)$  value than 4s orbital.  
 iv) According to Aufbau principle electrons are enter into 4s orbital after filling the 3p orbital.

6. How many elliptical orbits are added by Somerfield in third Bohr's orbit what was the purpose of adding those elliptical orbits?

- A. i) Two elliptical orbits are added to Bohr's third orbit.  
 ii) The nucleus of the atom is one of the principle foci of these elliptical orbits.  
 iii) To explain the splitting of spectrum Somerfield added the elliptical orbits.

7. What is the  $nl^2$  method? How it is useful?

A.  $nl^2$  is the short hand notation of electronic configuration of an atom. In the  $nl^2$

$n$  = principal quantum number (or) principal energy level

$l$  = sub shell (or) angular momentum quantum member

$x$  = no of electrons in a sub shell.

This method is useful to amanging and understanding the electrons in the orbits, sub shell.

8. The wave length of a radio wave is 1.0m find its frequency?

A. Wave length = 1.0 m

$$c = 3 \times 10^8 \text{ m/s}$$

$$c = fs$$

$$3 \times 10^8 \text{ m/s} = 1 \text{ m} \times f$$

$$f = 3 \times 10^8 \text{ Hz}$$

9. Why are chromium and copper exceptions to electronics configuration?

- A. i) The half filled or fulfilled orbital's are in the outer most orbit is more stable.  
 ii) So, the electronic configuration of cr ( $z=24$ ) is  $[\text{Ar}] 4s^1 3d^5$  instead of cr (24) –  $[\text{Ar}] 4s^2 3d^4$   
 iii) In the same way the electronic configuration of LU ( $z=29$ ) is  $[\text{Ar}] 4s^1 3d^{10}$  instead of cu (29)  $4s^2 3d^9$ .  
 iv) Chromium and Copper redistribute one 4s electron to 3d they get half filled and fulfilled orbital's respectively both of them gets more stability.

#### 4 Mark Questions

1.
  - a) How many max no of electrons that can be accommodated in a principle energy shell?
  - b) How many max no of electrons that can be accommodated in an orbit?
  - c) How many sub shells present in a principle energy level?
  - d) How many spin orientation are possible in an orbital?
- A.
  - a)  $2n^2$  n = principle quantum number
  - b) 2
  - c) The number of sub shells present 2n principle energy shell is equal to 'n' where 'n' is the principle quantum number.
  - d) Two spin orientations are possible for an electron in an orbital. An electron can spin either in clock wise direction (spin value =  $+1/2$ ) or anti clock wise direction (spin value =  $-1/2$ )
2. In an atom the number of electrons in m shell is equal to the number of electrons in the K and L shell. Answer the following questions?
  - a) Which is the outer most shell?
  - b) How many electrons are there in their outer most orbit?
  - c) What is the atomic number of element?
  - d) Write the electronic configuration of the element?
- A.
  - a) N – shell is the outer most shell
  - b) There are 2 electrons in outer most orbit
  - c) The atomic number of element is 22
  - d)  $Ti = 22 - 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$
3. Explain the significance of three quantum numbers in predicting the position of an electron in an atom?
- A. The electron in the space around the nucleus is described by a set of quantum numbers  $n, l, ml$ .
  - i) Principal quantum number (n)
    - a) The principal quantum number was introduced by Bohr it is denoted by 'n'
    - b) The orbits with  $n = 1, 2, 3, 4, \dots$  are named as K, L, M, N..... respectively.
    - c) It indicates main energy level to which the electron belongs.
    - d) As 'n' increases size of the shell increases and the electrons in those shells are further from the nucleus.
  - ii) Angular movement quantum number
    - a) It was introduced by Somerfield and I denoted by ' $l$ '
    - b) Its values are from 0, 1, 2, 3.....

- c) It gives the information about position of electron in a sub shell present in the orbit
- d) Each ' $l$ ' values represents one sub shell

$l$	0	1	2	3
Name of sub shell	s	p	d	f

- iii) The magnetic quantum number ( $ml$ )
- a) It was introduced by Lande and is denoted by  $ml$
- b) If  $l = 0$  the possible  $ml = 1$  that is '0' indicates 's' orbital
- c) These values gives orientation of orbital's in space.

By using these three quantum numbers we can predict the position of an electron in an atom.

4. How can you appreciate Aufbau, Hund's and Pauli exclusion principle to help in the writing of electronic configuration of an atoms?
5. Draw the moeller graph of the filling order of atomic orbital's?
6. Draw the shapes of d – orbital's?

### Fill in the blanks

1. Maximum number of electrons that an m – shell contains are \_\_\_\_\_
2. \_\_\_\_\_ is an intrinsic property of an electron
3. If a sub – shell is denoted as 2p then its magnetic number values are \_\_\_\_\_
4. The value of ' $ms$ ' for an electron spinning in clock wise direction is \_\_\_\_\_ and for anti clock wise direction is \_\_\_\_\_
5. If  $n = 1$  then angular momentum quantum number  $l =$  \_\_\_\_\_
6. The value of Planck's constant  $h =$  \_\_\_\_\_ J.s
7. \_\_\_\_\_ Rule is violated in  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$  electronic configuration.
8. For  $ml$  the minimum value is \_\_\_\_\_ and the maximum value is \_\_\_\_\_

### Multiple Choice Questions

1. Velocity of light in vacuum [      ]  
 a)  $3 \times 10^8$  cm/s      b)  $3 \times 10^{1.8}$  cm/s      c)  $3 \times 10^3$  m/s      d)  $3 \times 10^8$  m/s
2. Elliptical orbits are introduced by [      ]  
 a) Neils Bohr      b) Heisen Berg      c) Sommer Field      d) Plank
3. The quantum number which explains the size and energy of the orbit is [      ]  
 a)  $n$       b)  $l$       c)  $ml$       d)  $ms$
4. If  $l = 1$  for an atom then the no of orbital's in its sub shell is  
 a) 1      b) 2      c) 3      d) 0

5. The maximum no of electrons that can be accommodated in the L shell of an atom  
 a) 2                      b) 4                      c) 8                      d) 16
6. Which quantum is related to shape of a sub shell [       ]  
 a)  $n$                       b)  $l$                       c)  $ml$                       d)  $ms$
7. Among the following which colour has the highest wave length  
 a) Red                      b) Violet                      c) Green                      d) Blue

### Matching

II

Group A		Group B	
1	Stationary Orbits	[       ]	A Schrodinger
2	Elliptical orbits	[       ]	B Max Planck
3	Dhal Nature of electron	[       ]	C Sommer Field
4	Wave equation	[       ]	D Lande
5	Quantum theory	[       ]	E Neils Bohr
			F De Bro glie

III

Group A		Group B	
1	Chromium	[       ]	A $[\text{Ar}] 4s^2 3d^{10}$
2	Carbon	[       ]	B $[\text{Ar}] 4s^1 3d^{10}$
3	Copper	[       ]	C $[\text{HC}] 2s^2 2p^2$
4	Zinc	[       ]	D $[\text{HC}] 2s^2 2p^3$
5	Nitrogen	[       ]	E $[\text{Ar}] 4s^1 3d^5$
			F $[\text{NC}] 3s^1$

### ANSWERS

1. 18              2. Spin              3. -1,0, +1              4. +1/2, -1/2              5. 0              6.  $6.626 \times 10^{-34}$  J.s  
 7. Aufbau              8.  $-l, +l$

### Multiple Choice Questions

1. D    2. C    3. A    4. C    5. C    6. B    7. A

### Matching

1. E    2. C    3. F    4. A    5. B  
 1. E    2. C    3. B    4. A    5. D

## **9.CLASSIFICATION OF ELEMENTS – THE PERIODIC TABLE**

### **1 mark questions**

1.Define element according to Boyle

Ans:- Robert Boyle defined an element as any substance that cannot be decomposed into further simple substance by a physical or chemical change.

2. What is a triad?

Ans:- A group of three elements in which atomic weight of middle element is the average of first and third elements.

3.Write Mendeleev's periodic law

Ans:- The properties of elements are the periodic functions of their atomic weights.

4. Write modern periodic law.

Ans:- The physical and chemical properties of elements are the periodic function of the electronic configurations of their atoms.

5. What is atomic number

Ans:- The number of positive particles or number of protons present in the atom of an element is known as atomic number of that element.

6. What is a chemical family?

Ans:- Group of elements is called a chemical family or element family.

7. Write the names of Alkaline earth metals?

Ans: Beryllium (Be), Magnesium (Mg), Calcium (Ca), Strontium (Sr), Barium (Ba) and Radium (Ra).

8. Why Zero group elements are inert towards any chemical reactions?

Ans:- Because of fully filled outer most orbital's zero group elements are inert towards chemical reactions.

9. What are transition elements!

Ans:- The metals from 3<sup>rd</sup> group to 12<sup>th</sup> group are called as d-block elements or transition elements.

10. Define valency.

Ans:- Valency of an element was defined as the combining power of an element with another element.

11. Define electron affinity.

Ans:- Electron affinity of an element is defined as energy liberated when an electron is added to its neutral gaseous atom.

12. Define electro negativity

Ans:- The electro negativity of an element is defined as the tendency of atoms to attract electrons towards itself when it is bounded to the atom of another element.

### **2 marks questions**

1.Elements in a group generally possess similar properties, but elements along a period have different properties. How do you explain this statement?

Ans:- 1.Physical and chemical properties of elements are related mainly to their outer shell configurations.

2. The elements in a group shows similar chemical properties because of their similar electronic configurations.

3. But in a period from left to right due to an increase in the atomic number by one unit elements possess different chemical properties.

4. We can observe a regular gradation in physical properties of both groups and periods.

2.State Dobereiner's law of triads with two examples?

Ans:- Dobereiner's law of triads:-

Dobereiner's stated that when elements with similar properties are taken three at a time and arranged in the ascending order of their atomic weights, the atomic weight of the middle element is the average of the atomic weight of the first and third elements.

Ex:- 1. Lithium, sodium, potassium

2. calcium, strontium, Barium.



3. State Newland's law of octaves. Write two limitations of this law?

Ans:- New land's law of octaves :- The law of octaves states that when elements are arranged in the ascending order of their atomic weights, they fall into a pattern in which their properties repeat at regular intervals. Every 8<sup>th</sup> element starting from a given element resembles in its properties to that of the starting element.

Limitations: 1. Certain elements totally dissimilar in their properties were fitted into the same group.

2. There are instances of two elements fitted into the same slot.

Ex: Co and Ni.

4. How does metallic character change when we move

(i) Down a group!                      (ii) Across a period!

Ans:- (i) Down a group:- Metallic character increases when we move down the group.

(ii) Across a period :- Metallic nature decreases when we move along a period.

5. An element X belongs to 3<sup>rd</sup> period and group 2 of the periodic table.

State (a) the no. of valence electrons (b) the valency (c) whether it is metal or a non metal.

Ans:- 1. The element 'X' belongs to 3<sup>rd</sup> period and group 2 is Mg.

2. The number of valence electrons is 2.

3. So valency must be 2.

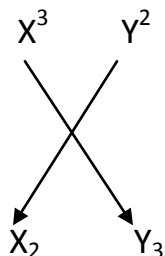
4. It is a metal.

6. Using the periodic table, predict the formula of compound formed between and element X of group 13 and another element Y of group 16.

Ans:- 1. The valency of an element X group 13 is 3.

2. The valency of an element Y in group 16 is 2.

3. Hence the formula of compound formed by X and Y is  $X_2O_3$ .



7. Second ionization energy of an elements higher than its first Ionization energy why?

Ans:- 1. The energy required to remove an electron from any positive ion is called 2<sup>nd</sup> ionization energy.

2. The attraction between outer most electron and nucleus in neutral atom is less than the attraction between outermost electron and nucleus in an ion.

3. Since number of protons is more in an ions nucleus.

4. So second ionization energy is more than first Ionization energy.

#### **4 Marks questions**

1.What are the limitations of Mende leeff's periodic table? How could the modern periodic table overcome the limitations of mende leeff's table?

Ans:- Limitations of Mnde leeff's table:-

1.The position of Hydron in the table is not certain.

2. Certain elements of higher atomic weights precede those with lower atomic weight .

Ex:- Tellurium precedes Iodine

3. Elements with dissimilar properties were placed in same group as sub group A and sub group B.

4. Elements with similar properties were separated.

Rectification of demerits of mendeleeff's periodic table by modern periodic table

1.Mosley proposed a periodic table based on atomic numbers. This arrangement eliminated the problem of anomalous series.

2. Hydrogen is place in IA group according to its atomic number. But it is not included in that group.

3. Dissimilar elements are placed in different groups.

4. Metals and non metals are separated.

2.Define the modern periodic law discuss the construction of the long form of the periodic table.

Ans:- Modern periodic law:-

The physical and chemical properties of elements are the periodic function of the

electronic configuration of their atoms.

### Construction process of modern periodic table:-

1. Based on modern periodic law, the modern periodic table is constructed.
2. The modern periodic table contains 18 vertical columns and 7 horizontal rows.
3. Vertical columns are named as group which included subgroups A and B and denoted by Roman numerals I to VIII.
4. Horizontal rows are named as periods and indicated by Arabic numerals 1 to 7.
5. The number of main shells present in the atoms of a particular element decides to which period it belongs.
6. Every period starts with alkali metal and ends with inert gas.
7. First period consist of 2 elements  $2^{\text{nd}}$  and  $3^{\text{rd}}$  periods consist of 8 elements each,  $4^{\text{th}}$  and  $5^{\text{th}}$  periods contains 18 elements each  $6^{\text{th}}$  period contains 32 elements and  $7^{\text{th}}$  period is in complete.
8. Elements with atomic numbers 58 to 71 are called lanthanides and elements with atomic numbers 90 to 103 are called actinides.
9. These are shown separately at the bottom of the periodic table.

3. Explain how the elements are classified into S, P, d and F – block elements in the periodic table and give the advantage of this kind of classification.

Ans:- Depending upon the valency shell electronic configuration elements are classified into 4 blocks ie S, P, d, and f blocks.

1. S-block elements:- The elements with valence shell electronic configuration  $ns^1$  and  $ns^2$  are called s – block elements. The elements of group IA and IIA belong to s-block. Except hydrogen all the s-block elements are metals.
2. P-block elements :- The elements with valence shell electronic configuration from  $ns^2 np^1$  to  $ns^2 np^6$  are called p block elements. The elements of group IIIA to VIIIA belong to p-block. The only p-block element in which the differentiating electron does not enter in to p-orbital is He.
3. d- block elements:- The elements with valence electronic configuration  $ns^2 np^6 (n-1)d$  to  $ns^2 np^6 (n-1) d$  are called d- block elements or transition elements. The elements of group IB to VIIIB belong to d-orbital. All the d-block elements are metals.
4. f-block elements:- The elements in which 'f' orbital's are being filled in their

atoms are called f-block elements. Lanthanides and actinides which are also known as inner transition elements belong to f- block.

Advantages:-

1. The division of elements into blocks made easy to divide elements in to groups.
2. We can easily predict the physical and chemical properties of elements by this classification.

4. Write down the characteristics of the elements having atomic number 17.

Electronic configuration -----

Period number -----

Group number -----

Element family -----

No. of valence electrons -----

Valency -----

Metal or non metal.

Ans:- 1. Atomic number of given element is 17.

2. Electronic configuration:  $1s^2 2s^2 2p^6 3s^2 3p^5$

3. Period number :3

4. Group number:17

5. Element family : Halogen family VIIA or 17<sup>th</sup> group.

6. No. of valence electrons :  $2+5 = 7$

7. Valency : 1

8. Metal or non metal : Non metal

9. So the given element is chlorine.

5. What is a periodic property? How do the following change in a group and period? Explain.

(a) Atomic radius

(b) Ionization energy

(c) Electron affinity

(d) Electro negativity.

Ans:- Periodic property:- The physical and chemical properties of elements are related to their electronic configuration particularly the outer shell configurations. The electronic configuration of valence shell of any two elements in a given period is not same Due to this reason elements along a period possess different chemical properties

with regular gradation in their physical properties from left to right. This is called periodic property.

#### Changes of periodic properties in a group and period

Periodic property	Groups from top to bottom	Periods from left to right
1. Atomic radius	Increases	Decreases
2. Ionization energy	Decreases	Increases
3. Electron affinity	Decrease	Increases
4. Electro negativity	Decrease	increases

6. Name two elements that you would expect to have chemical properties similar to Mg. What is the basis of your choice?

Ans:- 1. The two elements that have chemical properties similar to Mg are Be and Ca.

2. The outer most shell of these three atoms consists of 2 electrons.

3. We know that physical and chemical properties of elements are related to their electronic configuration particularly the outer shell configuration.

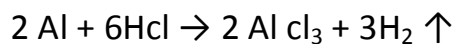
4. These three elements Be, Mg, Ca have the outer shell configuration as  $2s^2$ ,  $3s^2$ ,  $4s^2$ .

5. Hence we expect that Be and Ca have similar properties with magnesium.

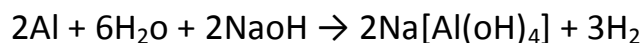
7. Aluminum does not react with water at room temperature but reacts with both dil HCl and NaOH solution. Verify these statements experimentally. Write your observations with chemical equations. From these observations can we conclude that Al is a metalloid?

Ans:- 1. Aluminium is a silvery white metal. The surface of Al metal is covered with a thin layer of oxide, that protects the metal from attack by air. If the metal oxide layer is damaged then Al is exposed to attack even by water.

2. Aluminium reacts with dil HCl. HCl dissolves Al and gives H<sub>2</sub> gas.



3. Aluminium reacts with NaOH and liberates H<sub>2</sub> gas.



4. The above two reactions say that Aluminum is Amphoteric.

Conclusion:- From these observations we can conclude that Aluminum is a metal and not a metalloid.

8. Without knowing the electronic configurations of the atoms of elements, Mendeleev still could arrange the elements nearly close to the arrangements in the modern periodic table. How can you explain this.

Ans:- 1. Mendeleev arranged all the known elements in the increasing order of their atomic weights.

2. He divided his table into groups and periods respectively which resembles mostly the modern periodic table.

3. The elements of the same group show similar properties due to the same common valency. The modern periodic table also proposed the same thing.

4. If we compare the long form periodic table with Mendeleev's table, we find many elements with their places unchanged.

5. He left some gaps predicting the properties of some elements which were not available at that time. This accurate prediction made his classification of elements famous.

6. Mendeleev's vision must be appreciable. It made a scientific base for the study of chemistry.

7. In his honour, the 101st element was named as 'mendelevium'.

#### Multiple choice questions

1. Number of elements present in 1<sup>st</sup> period of modern periodic table --- [ a ]

a) 2              b) 8              c) 18              d) 32

2. Which of the following is the most active element? [ a ]

a) lithium    b) sodium    c) potassium    d) rubidium

3. The element with electronic configuration 2, 8, 8, 3 belongs to --- block [ c ]

a) s                      b) p                      c) d                      d) d

4. The incompletely filled period is ----- [ b ]

a) 5                      b) 7                      c) 4                      d) 6

5. Mendeleeff's eka – aluminum is --- [ c ]

a) Scandium                      b) Zinc                      c) Gallium                      d) Germanium

6. s and p- block elements are called ----- [ a ]

a) Representative elements                      b) Transition elements

c) Inner transition elements                      d) Zero group elements

7. Elements with electronic configuration  $ns^2 np^6$  are called ----- [ d ]

a) Representative elements                      b) Transition elements

c) Inner transition elements                      d) Zero group elements

8. Name given to IV group element family is ----- [ b ]

a)  $ns^2$                       b)  $ns^2 np^2$                       c)  $ns^2 np^4$                       d)  $ns^1$

9. Most electro negative element is ----- [ c ]

a) chlorine                      b) Nitrogen                      c) Fluorine                      d) oxygen

10. Units for Ionization energy ---- [ c ]

a) Ergs                      b) KJ                      c)  $KJ\ mole^{-1}$                       d) Moles

Answers:-

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

#### Fill in the blanks

1. The first attempt for classification of elements was made by -----

2. Law of triads was proposed by -----

3. The number of elements present in 6<sup>th</sup> period is -----

4. Elements from 58<sup>ce</sup> to 71<sup>Lu</sup> are known as -----

5. Elements from 90<sup>th</sup> to 103th are called as -----
6. Modern periodic table is based on -----
7. Father of periodic table -----
8. The element with highest electro positive character is -----
9. The most reactive halogen is -----
10. The highest metal in the periodic table is -----
11. The highest element in the periodic table is -----
12. Alkali metals are strong ----- agents.
13. Halogens are strong ----- agents
14. ----- is the heaviest naturally occurring element.
15. Electron affinity of inert gases is -----

Answers:-

- (1) Dobereiner (2) Dobereiner (3) 32 (4) Lanthanides  
 (5) Actinides (6) Atomic number (7) Mendeleef (8) cesium  
 (9) Fluorine (10) Lithium (11) Hydrogen (12) Reducing  
 (13) Oxidizing (14) Uranium (15) Zero

**Match the following**

I Group – A

Group –B

1. law of triads ( ) a) Mendeleeff
2. Law of octaves ( ) b) Dobereiner
3. Atomic weight ( ) c) Newlands
4. Atomic number ( ) d) Pauling
5. Electro negativity ( ) e) Mosely.



- | II                  | Group A | Group –B                     |
|---------------------|---------|------------------------------|
| 1.s-block elements  | ( )     | a) zero group elements       |
| 2. p-block elements | ( )     | b) Transition elements       |
| 3. d-block elements | ( )     | c) Inner transition elements |
| 4. f-block elements | ( )     | d) IA , IIA                  |
| 5. Noble gases      | ( )     | e) IIIA to VIIA              |

Answers:-

- I (1) B (2) C (3) A (4) E (5) D
- II (1) D (2) E (3) B (4) C (5) A

## 10.CHEMICAL BONDING

### 1 Mark Questions

1. Explain the difference between the valence electron and the covalency of an element?

A. 1. Valency is the number of electrons loss or gain by an atom in the formation of ionic bond.

2. Covalency is the number of electrons sharing by an atom with other atom in the formation of covalent bond.

2. Are there elements which exist as atoms?

A. Inert elements exist as atoms.

3. Why do some elements exist as molecules and some as atoms?

A. Due to their electronic configuration in their valence shell.

4. Why do some elements and compounds react vigorously while others are inert?

A. Elements which do not have a stable configuration in their valence shell react vigorously with other elements and which have an octet in their valence shell are chemically inert in nature.

5. Why do atoms of elements try to combine and form molecules?

A. To get a stable electronic configuration in their valence shell.

6. What do you understand from bond lengths and bond energies?
- A. Bonds formed between two atoms indifferent molecules have different bond lengths and bond energies.
  
7. Define co – ordination number?
- A. The number of oppositely charged ions covered a given ion of given charge is known as co – ordination number.
  
8. Draw simple diagrams to show how electrons are arranged in calcium oxide (cao)
- A.
  
9. Draw simple diagrams to show how electrons are arranged water (H<sub>2</sub>O) molecules
- A.
  
10. Represent the molecule H<sub>2</sub>O using Lewis notation.
- A.
  
11. Represent calcium atom using Lewis notation?
- A. Calcium belongs to 2<sup>nd</sup> group, hence it has two valence electrons. Lewis representation  $x\text{Ca } x$  (or)  $\text{Ca} \begin{smallmatrix} x \\ x \end{smallmatrix}$
  
12. Represent Co<sub>2</sub> molecules using Lewis notation
- A.
  
13. Draw the shape of water molecule
- A.
  
14. Draw the shape of Ammonia (NH<sub>3</sub>) molecule
- A.
  
15. How many valency electrons does element 'y' have? What is the valency of element 'y'?
- A.
  
16. What is the bond angle in a molecule?
- A. It is the angle subtended by two imaginary lines that pass from the nucle of two atoms which from the covalent bonds with the central atom through the nucleus of the central atom at the central atom.
  
17. What is octet rule?
- A. Octet rule: The atom of element tend to undergo chemical changes that help to leave their atoms with eight outer shell electrons/

## 2 Mark Questions

1. List the factors that determine the type of bond that will be formed between two atoms?

A.

A	B	Type of Bond
Electro Positive	Electro Negative	Ionic Bond
Electro Negative	Electro Negative	Covalent Bond
Electro Positive	Electro Positive	Metallic Bond
Electro Negativity Difference between two atoms		Type of Bond
$\geq 1.9$		Ionic Bond
$<$		Covalent Bond

2. Why do only valence electrons involve in bond formation? Why not electron of inner shell? Explain?

- A.
1. Formation of bond between two atoms takes place by losing or gaining or sharing of electrons.
  2. Valency electrons are loosely bounded by the nucleus, hence it is easy to lose or share.
  3. Where as the bond formation is not effective with inner shell electrons.

3. Represent each of the following molecules using Lewis Notation?

a) Bromine gas ( $\text{Br}_2$ ),      b) Calcium Chloride ( $\text{CaCl}_2$ )

- A. Bromine gas ( $\text{Br}_2$ ) Bromine belongs to 7<sup>th</sup> group hence it has 7 valence electrons.  
Calcium Chloride ( $\text{CaCl}_2$ )

4. Define Electro positivity & Electro negativity?

- A. Electro positivity: Electron loosing tendency is called Electro positivity  
Electro Negativity: Electron gaining tendency (or) the phenomenor of attracting electron pair towards of one of the atom in a molecule is electronegativity.

5. Predict the compounds, which are directional and non directional in nature.

a) KCl      b)  $\text{H}_2\text{O}$       c)  $\text{NH}_3$       d) NaCl      e)  $\text{CH}_4$

- A. Ionic compounds are non directional in nature, because ionic bond is just an electro static force of attraction between oppositely charged ions.

Hence KCl, NaCl are non directional in nature

2. Covalent compounds are directional in nature. Hence  $\text{H}_2\text{O}$ ,  $\text{NH}_3$        $\text{CH}_4$  are directional in nature

6. What could be the reason for the less reactivity of noble gases?
- A. All the noble gases have eight electrons in the outer most shell, except Helium (He). Thus they have no valency electrons and are less or not at all reactive.

7. Write the difference between 'Sigma' bond and 'pi' bond?

A.

**Sigma Bond**

1. It results due to direct overlapping (or) end – end (or) head on overlapping
2. It is stronger
3. It is independent

**Pi bond**

1. It results due to indirect or lateral or partial overlapping
2. It is weaker
3. It is dependent

8. Predict the reasons for low melting point for covalent compounds when compared with ionic compounds?

A. 1. In ionic compounds the ions are bounded by strong electrostatic force of attractions, therefore they are strong solids with high melting points and boiling points.

2. In covalent compounds the atoms are bounded by weak forces, therefore covalent compounds are gases and liquids at room temperature and have low M.P and B.P.S.

9. A,B and C are three elements with atomic number 6, 11 and 17 respectively?

i) Which of these cannot form ionic bond? Why?

ii) Which of these cannot form covalent bond?

iii) Which of these can form as well as covalent bonds?

A. 1. 'A' cannot form ionic bond, because it has high ionisation enthalpy. It cannot

lose or gain electron.

2. 'B' and 'C' cannot form covalent bond rather they can easily form ionic bond. Because 'B' has low ionisation enthalpy, hence it can easily lose its one electron and form cation and 'C' can easily form anion because of high electron affinity.

3. 'C' can form ionic as well as covalent bonds.

10. Define Hybridisation?

A. Intermixing of atomic orbitals of two or more atoms to form equivalent number of equal energy and some shape of new set orbitals is called Hybridisation.

11. Why do some atoms combine while others do not?
- A. Elements which do not have octet configuration in their valence shell combined with other elements and which have octet in their valence shell chemically inert in nature.
12. How bond energies and bond lengths of molecule helps us in predicting their chemical properties?
- A. Bond Length:- Bond length or bond distance is the equilibrium distance between the nuclei of two atoms which form a covalent bond.
- Bond energy:- It is the energy needed to break a covalent bond between two atoms of a diatomic covalent compound in its gaseous state.
13. Why the bond angle reduced in water molecule?
- A. 1. In water molecule, the central atom oxygen has two lone pair and two bond pair of electrons.
2. Due to lone pair Lone pair electron repulsions bond angle reduced to minimize the repulsion forces.

14. Write the draw backs of electronic theory of Valency Theory (or) Octet Rule?
- A. 1. It cannot explain the shapes of molecules.
2. It cannot explain the bond angles of molecules.
3. It explains the reactivity of inert gas elements.

#### 4 Mark Questions

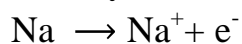
1. Explain the formation of Sodium Chloride on the basis of the concept of electron transfer from one atom to another atom?

A. Formation of Sodium Chloride

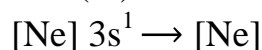
Sodium Chloride is formed from the elements Sodium and Chlorine. It can be explained as follows.

##### **Cation formation:**

Sodium atom by losing one electron gets stable octet configuration in its valency shell, like neon (Ne) atom.

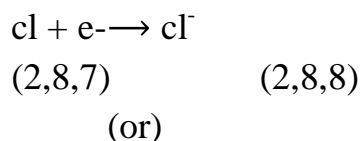


(or)



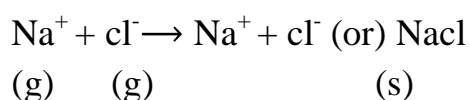
### Anion Formation:

Chlorine atom has shortage of one electron to get octet in its valency shell. So it gains an electron that was lost by 'Na' to form anion and gets electronic configuration that of 'Ar'



### Formation of compound NaCl:

The oppositely charged ions formed in the above process attracted towards each other due to electrostatic force and form the compound Sodium Chloride (NaCl)



2. How Lewis dot structure helps in understanding bond formation between atoms?
- A.
1. In Lewis dot representation, every atom is represented with symbol.
  2. Symbol represents nucleus and inner shell electrons.
  3. Valency electrons are shown around the symbol in different manners.  
Eg:
  4. Each valence electron can form a single bond  
Eg:
  5. Two valence electrons can form a double bond  
Eg:
  6. Three valence electrons can form a triple bond.  
Eg:

3. Explain the formation of the following molecules using valence bond theory.

a)  $\text{N}_2$  molecules      b)  $\text{O}_2$  molecules

a)  $\text{N}_2$  molecules

1. The electronic configuration of Nitrogen atom is 2,5 and to have octet configuration in the valence shell, it requires 3 more electrons.
2. When two Nitrogen atoms approach each other, each atom distributes 3 electrons.
3. They are shared between both Nitrogen atoms in the form of three pairs.
4. Therefore there is a triple bond between two nitrogen atoms in  $\text{N}_2$  molecules.

### $\text{O}_2$ Molecule:

1. Electronic configuration of oxygen atom is 2,6
2. Oxygen atom has six electrons in its valence shell. It requires two more electrons to get in its valence shell.

3. Therefore Oxygen atoms come close and each oxygen atom contributes two electrons for bonding.
4. Thus, there exist two covalent bonds between two oxygen atoms in  $O_2$  molecule as there are two pairs of electrons shared between them.
5. So, a double bond is formed between two oxygen atoms in  $O_2$  molecule and both the oxygen atoms have octet the valence shell.

4. What is hybridisation? Explain the formation of following molecules using hybridisation :  $BeCl_2$ ?

A. **Hybridisation:-**

The inter mixing of orbitals of nearly equal energies of an atom to give the same number of identical orbitals is known as hybridisation.

Types of hybridisation : (1)  $Sp^3$  hybridisation (2)  $Sp^2$  hybridisation (3)  $Sp$  hybridisation

**Formation of  $BeCl_2$  molecule using hybridisation:**

In the formation of  $BeCl_2$  the central 'Be' atom undergoes ' $Sp$ ' hybridisation to form two half filled ' $sp$ ' hybrid orbit which are oriented themselves in linear manner using the Be orbitals 'Be' forms two bonds with two Cl atoms but overlapping with these half filled  $p_z$  orbitals.

Hence the molecule is linear with bond angles of  $180^\circ$ .

Bond angle is  $180^\circ$ .

5. Write the postulates of valence shell electrons pair repulsion (VSEPR) theory.
- A. It was proposed by 'Sidewick' and 'Powell', later it was further improved by 'Gillespie' and 'Nyholm'

Postulates:

1. Every central atom in a molecule may possess two types of electron pairs bond pair and lone pair of electrons. Lone pair of electrons may or may not present in a molecules.
2. There are repulsive forces among these pair of electrons. This is follows  
Lone pair – Lone pair > Lone pair – bond pair > bond pair – bond pair
3. The presence of lone pairs of electrons on central atom causes slight distortion of bond angles.
4. Hence the molecules deviate from their original shape, to reduce the repulsive forces.
5. A multiple bond is treated as if it is a single electron pair and the two or three electron pairs of a multiple bond are treated as a single super pair.

6. Write the properties of Ionic and Covalent compounds?

**A. Ionic Compounds:**

1. Ionic compounds are solids in state.
2. They have high MP and BP's due to strong electrostatic of attractions.
3. They soluble in polar solvents.
4. Their chemical reactivity is mole because of no bond making and bond breaking.

**Covalent compounds:**

1. They are liquid and gases at room temperature
2. They have low MP and BP's due to weak force of attraction.
3. They soluble in both polar as well as non polar solvents.
4. They are less or moderate reactive because of bond making and bond breaking involved in chemical reactions.

**5 Marks Questions**

1. Draw a simple diagram to show how electrons are arranged in the following covalent molecule.

A) Methane ( $\text{CH}_4$ ) B) Ammonia ( $\text{NH}_3$ )

2. Draw  $\text{O}_2$  molecule structure

3. Draw  $\text{N}_2$  molecule structure

4. Draw Boran trichloride molecule structure ( $\text{BF}_3$ )

**Choose the correct answers**

1. Which of the following elements is electro negative [     ]  
a) Sodium   b) Oxygen   c) Magnesium   d) Calcium
2. An element  $\text{X}^{23}$  forms an ionic compound with another element 'y'. Then the charge on the ion formed by X is [     ]  
a) +1        b) +2        c) -1        d) -2
3. A element 'A' forms a chloride  $\text{Acl}_4$ . The number electrons in the valence shell of 'A' [     ]  
a) 1        b) 2        c) 3        d) 4
4. Except this all the Noble gases have eight electrons in their outer most shell [     ]  
a) Helium   b) Argon   c) Neon        d) Radon
5. Covalent bonds in Methane molecule [     ]  
a) 1        b) 2        c) 3        d) 4
6. Hybridisation of atomic orbitals was proposed by [     ]  
a) Linus pavling   b) Moseley   c) Mendaleeff        d) Cosal
7. Bond angle between  $\text{Becl}_2$  atoms [     ]  
a)  $180^\circ$         b)  $120^\circ$         c)  $110^\circ$         d)  $104, 31^\circ$



8. The chemical formula of common salt is [      ]  
a)  $\text{Na}_2\text{Cl}$                       b)  $\text{NaCl}$                       c)  $\text{NaCl}_2$                       d)  $\text{Na}_2\text{Cl}_2$
9. These elements exist as atoms but not molecules [      ]  
a) Halogens                      b) Metals                      c) Inert gases                      d) Alkaline earth metals
10. These are responsible for the formation of bonds between atoms [      ]  
a) Lone electrons                      b) All electrons                      c) Valence electrons                      d) No electrons
11. These ions lose electrons to form stable positive ions [      ]  
a) Anions                      b) Cations                      c) Both A & B                      d) None
12. The valency of chlorine is [      ]  
a) 1                      b) 2                      c) 3                      d) 4
13. Nitrogen forms a \_\_\_\_\_ covalent bond [      ]  
a) Single                      b) Double                      c) Triple                      d) None
14. The formula of Methane [      ]  
a)  $\text{C}_2\text{H}_2$                       b)  $\text{CH}_4$                       c)  $\text{C}_4\text{H}_4$                       d)  $\text{C}_2\text{H}_5$
15. The bond angle between  $\text{H}_2\text{O}$  atoms [      ]  
a)  $10^{-7}$  Meter                      b)  $10^{-8}$  Meter                      c)  $10^{-9}$  Meter                      d)  $10^{-10}$  Meter

### Fill in the blanks

1. Electrons in \_\_\_\_\_ shell are called valence electrons
2. Covalency of elements explains about number of \_\_\_\_\_ formed by the atom.
3. Valence bond theory was proposed by \_\_\_\_\_
4. In \_\_\_\_\_ bonding the valence electrons are shared among all atoms of the metallic elements.
5. The ionic formation for  $\text{NaCl}$  is \_\_\_\_\_
6. The electronic configuration of sodium \_\_\_\_\_
7. Chloride ion is a \_\_\_\_\_
8.  $\text{NaCl}$  is said to possess face centred \_\_\_\_\_ crystal structure.
9. \_\_\_\_\_ proposed that atoms of some elements could achieve an octet form
10. Fluorine, Chlorine etc form \_\_\_\_\_ bonds
11. An angstrom  $\text{\AA}$  is a unit of length equal to \_\_\_\_\_
12. In VSEPR the letter 'E' stands for \_\_\_\_\_
13. The bond angle of Methane molecule \_\_\_\_\_
14. The shape of  $\text{NH}_3$  molecule is \_\_\_\_\_
15. VSEPR theory mainly fails in explaining the \_\_\_\_\_ of the bonds
16. Linus Pauling proposed the quantum mechanical model called \_\_\_\_\_
17. \_\_\_\_\_ is a phenomenon of inter mixing of atomic orbitals of almost equal energy.
18. The boiling point of sodium chloride common salt is \_\_\_\_\_

## ANSWERS

1. B 2. A 3. D 4. A 5. D 6. A 7. A 8. B 9. C 10. C  
11. B 12. A 13. C 14. B 15. D 16. C

- II**
1. Valence
  2. Bonds
  3. Linus pauling
  4. Metallic
  5.  $\text{Na}^+\text{Cl}^-$
  6.  $1s^2 2s^2 2p^6 3s^1$
  7. Anion
  8. Cubic lattice
  9. G.N.Lew's
  10. Covalent
  11.  $10^{-10}$  metre
  12. Electron
  13.  $109^{0.281}$
  14. trigonal pyramid
  15. A strength
  16. Valence bond theory
  17. Hybridisation
  18.  $1413^0\text{c}$

## 11.ELECTRIC CURRENT

### 1 Mark questions

1. Define electric current?
- A. Electric current is defined as the amount of charge crossing any cross section of the conductor in one second.

It is denoted with the letter I its SI unit is Ampere.

It can be mathematically written as  $I = \frac{Q}{t}$

- DCEB-KADAPA**
2. Define Ampere?

If one coulomb of charge crosses any cross section of the conductor in one second, then the electric current flown through that conductor is "1 Ampere".

It is denoted with the letter A

Mathematically 1 Ampere =  $\frac{1 \text{ coulomb}}{1 \text{ second}}$

3. What is electric potential difference?
- A. Electric potential difference between two points in an electric circuit is the work done to move a unit positive charge from one point to another it is also called as 'Voltage'

It is denoted with the letter 'V'

Its SI unit is 'Volt'

Mathematically voltage (v) =  $\frac{\text{work done}}{\text{charge}} = \frac{W}{Q}$

4. Define volt?
- A. If 1 Joule work is done to move 1 coulomb of positive charge from one point to another, then the electric potential difference between those two points is '1 volt'

Mathematically 1 volt =  $\frac{1 \text{ Joule}}{1 \text{ coulomb}}$

5. Define electric resistance?

A. The electric resistance of a conductor is as the obstruction to the motion of electrons in its conductor. It is denoted by the letter 'R'. Its unit is 'ohm' ( $\Omega$ )

6. Define ohm?

A. If 1 Ampere of electric current passes between two points of potential differences 1 volt, then the resistance between them said to be 1 ohm.

$$\text{Mathematically } 1 \text{ ohm} = \frac{1 \text{ volt}}{1 \text{ Ampere}}$$

7. What is multi meter?

A. A multi meter is an electronic measuring instrument that combines several measurement functions like electric current, electric voltage, electric resistance in one unit.

8. Define resistivity (or) specific resistance of a material?

A. It is the resistance per unit length of a unit cross section of the material. It is denoted with the letter 'P'

Its SI unit is 'Ohm meter' ( $\Omega m$ )

9. Define electric power?

A. Electric power is the product of potential difference (v) and the electric current (I). It is denoted with the letter 'P'.

Its SI unit is watt 'W'

Mathematically power (p) = Voltage x current.

10. Define electric energy?

A. Electric energy is the product of power and time SI unit of electrical energy is 'ws' (or) KWH.

11. Define Ohm's Law?

A. At constant temperature, the electric current through a conductor is directly proportional to the potential difference applied between its ends.

Mathematically  $V \propto I$

$$\frac{V}{I} = \text{constant.}$$

12. Convert the value of 1 KWH into Joules?

A.  $1 \text{ KWH} = 1 \text{ Kilo} \times \text{Watt} \times 1 \text{ hour}$   
 $= 1000 \times \frac{1 \text{ Joule}}{\text{sec}} \times 3600 \text{ sec}$   
 $= 3600000 \text{ Joules}$   
 $= 36 \times 10^5 \text{ Joules}$

13. Even though silver is better conductor of electricity than copper, why do we use copper wire for conductor of electricity?

A. Though silver is better conductor of electricity than copper, copper wire is preferred for conduction of electricity because of its cost effectiveness.

Copper is more cheap than silver.

14. Why do we use Tungsten as a suitable material for making the filament of a bulb?

A. Tungsten has high melting point and has high resistance too. Tungsten gets heated up and emits light when electric current is passed through it, without being melted. Hence, Tungsten is the suitable material for making the filament of a bulb.

15. Why don't we use series arrangement of electrical appliances like bulb, television fan and other in our domestic circuits?

A. If all the electrical appliances at home are connected in series same amount of electric current passes through them. All the appliances start working all the time. We cannot operate them individually. If one of appliances is damaged, all the appliances are stopped working. Hence we don't connect them in series.

16. Why do we use fuses in house hold circuits?

A. To prevent damages due to over loading and high power supply, we connect an electric fuse to the house hold circuits.

17. Are head lights of a vehicle connected in series or parallel? Why?

A. Vehicle head lights are connected in parallel. If one head lamp fuses The other still works, in parallel connection the electric current is divided between two head lamps. Hence if one goes out, the other still works.

18. Define electric motive force (emf)?

A. emf is defined as the work done by the chemical force to move a unit positive charge from negative terminal to positive terminal of the battery.

## 2 Marks questions

1. Define Kirchhoff's Law?

A. There are two Kirchhoff's Laws 1. The Junction law 2. The Loop law

**1. The Junction law:-** At any function point in a circuit where the current can divide, the sum of the currents into the junction must equal the sum of the currents leaving the junction.

**2. The Loop law:-** The algebraic sum of increments and decrements in potential differences across various components of a closed circuit loop must be zero.

2. What do you mean by electric shock? Explain how it takes place?
- A. If we touch a line wire of 240v, 0.0024A current flows through our body. Due to this functioning of organs inside our body get disturbed. This disturbance inside our body is felt as electric shock.

This can be experienced if there is a potential difference between one part of the body and another part.

The electric shock is a combined effect of potential difference, electric current and resistance of the human body.

3. Explain over loading of household circuits?
- A. The values that we notice on the domestic electric meters are (voltage)

Potential difference = 240v

Electric current = 5A – 20A

This mean that the minimum and maximum limit of current that can be drawn from the mains is 5A to 20A. If the current drawn from the mains is more than 20A then over heating may occur and causes fire. This is called over loading.

4. Two bulbs have rating 100w, 220v and 60w, 220v which one has the greater resistance?

A.

Power of the first bulb (p) = 100w

Voltage of the 1<sup>st</sup> bulb (v) = 200v

Resistance of the 1<sup>st</sup> bulb (R) = ?

The relationship of PV & R is  $P = \frac{V^2}{R}$

$$R = \frac{V^2}{P}$$

=

$$\frac{220 \times 220}{100}$$

$$484\Omega$$

Power of 2<sup>nd</sup> bulb (p) = 60w

Voltage of the 2<sup>nd</sup> bulb (v) = 200v

Resistance of the 2<sup>nd</sup> bulb (R) = ?

We know  $P = \frac{V^2}{R}$

$$R = \frac{V^2}{P}$$

$$= \frac{220 \times 220}{60}$$

$$= 806.66 \Omega$$

5. A wire of length 1m and radius 0.1mm has a resistance of 100  $\Omega$ . Find the resistivity of the material?

A. Length of wire (l) = 1m

Radius of wire (r) = 0.1mm =  $1 \times 10^{-4}$ m

Cross sectional area of the wire (A) =  $\pi r^2$

$$= \frac{22}{7} \times (1 \times 10^{-4}\text{m})^2$$

$$5.14 \times 10^{-9} \text{ m}^2$$

Resistance of the wire (R) = 100  $\Omega$

Resistivity of the wire (P) = ?

From the relation  $R = \frac{\rho l}{A}$

$$\begin{aligned}\rho &= \frac{RA}{l} \\ &= \frac{100 \Omega \times 3.14 \times 10^{-8} \text{ m}^2}{1 \text{ m}} \\ &= 3.14 \times 10^{-6} \text{ m}\end{aligned}$$

6. Draw V.I graphs for a metallic conductor and for an LED.

A. GRAPH

7. Define  $R = \frac{\rho l}{A}$

- A. At constant temperature and cross section of the resistance (R) of a conductor is directly proportional to its length.

$$R \propto l \dots\dots\dots (1)$$

At constant temperature and length, the resistance (R) of a conductor is inversely proportional to its cross sectional area (A)

$$R \propto \frac{l}{A} \dots\dots\dots (2)$$

From 1 and 2

$$R \propto \frac{l}{A}$$

$$R = \frac{\rho l}{A}$$

Where P is the specific resistance of the material of the conductor can also be called as resistivity of the conductor.

8. Draw a circuit diagram for a circuit in which two resistance A and B are connected in series with a battery and a voltmeter is connected to measure the potential difference across the resistor A.

A. DIAGRAM

9. In the given figure find the potential at A, where the potential at B is '0'?

- A. Total voltage (V) = Voltage of battery ( $V_1$ ) + Voltage across resistance ( $V_2$ )

$$V = 2V + (1 \text{ amp} \times 5\Omega) \quad (V=IR)$$

$$V = 2V + 5V$$

$$V = 7V$$

Again total voltage =  $V_A + V_B$

$$7V = V_A + 0 [V_B = 0]$$

$$V_A = 7V$$

10. If the resistance of your body is  $100000\ \Omega$ , what would be the current that flows in your body when you touch the terminals of a 12v battery?

A. The voltage of the battery (V) = 2V

The resistance of the body (R) =  $100000\ \Omega = 10^5\ \Omega$

Amount of flow of current (I) = ?

From ohm's law  $V = IR$

By rearranging  $I = \frac{V}{R}$

$$= \frac{12v}{105\Omega}$$

$$= 1.2 \times 10^{-6} \text{ amp}$$

11. A uniform wire of resistance  $100\Omega$  is melted and recast into wire of length doubled that of the original what would be the resistance of the new wire formed?

A. Given  $R_1 = 100\ \Omega$

$$l_1 = l \text{ m}$$

$$l_1 = 2l \text{ m}$$

$A_1$  = Area of cross section of uniform wire

$A_2$  = Area of cross section of recast wire

$R_2 = ?$

Resistance in both cases

By substituting values we get

$$V = A_1 l_1 = A_2 l_2$$

$$\frac{A_1}{A_2} = \frac{l_2}{l_1}$$

$$= \frac{2l}{l} \quad [l_1 = l, \quad l_2 = 2l]$$

$$\frac{A_1}{A_2} = 2, \quad \frac{l_2}{l_1} = 2$$

$$2$$

$$R_1 = \frac{\rho l_1}{A_1}, \quad R_2 = \frac{\rho l_2}{A_2}$$

$$\frac{R_1}{R_2} = \frac{\rho l_1 / A_1}{\rho l_2 / A_2}$$

$$\frac{R_1}{R_2} = \frac{l_1}{A_1} \times \frac{A_2}{l_2}$$

$$= \frac{l_1}{l_2} \times \frac{A_2}{A_1}$$

$$\frac{R_1}{R_2} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$R_2 = 4R_1$$

$$R_2 = 4 \times 100\Omega$$

$$R_2 = 400\ \Omega$$

Resistant of the new wire  $R_2 = 400\ \Omega$ .

#### 4 Mark Questions

1. Write the difference between potential differences and emf electro motive?

##### Potential differences

1. Work done by the electric force on unit positive charge to move it from one point to another is called the potential difference between these two points.

##### Emf electro motive

1. Work done by the chemical force to move positive charge from negative terminal to positive terminal of the battery is called the emf.

2. It is denoted by the letter 'V'      2. It is denoted by the letter E.

$$V = \frac{W}{q} = \frac{fel}{q}$$

$$E = \frac{W}{q} = \frac{fed}{q}$$

3. The SI unit of voltage is volt.      3. The SI unit of emf is volt.

$$1 \text{ volt} = \frac{1 \text{ Joule}}{1 \text{ coulomb}}$$

$$1 \text{ volt} = \frac{1 \text{ Joule}}{1 \text{ coulomb}}$$

4. It is equal to the emf of cell when cell is not in use and less than the emf when cell is in use.      4. It is equal to terminal voltage when cell is not in use and greater than the terminal voltage when cell is in use.

5. Potential difference is directly proportional to the resistance between the two points of the circuit.      5. Emf doesn't depend on the resistance in the circuit.

2. Deduce the expression for the equivalent resistance of three resistances connected in series?

- A. In series connection of resistors there is only one path for the flow of current in the circuit. Let the voltage across the three resistors  $R_1, R_2, R_3$  be  $V_1, V_2, V_3$  respectively. Let the voltage across the circuit be  $V$ .

Then ' $V$ ' divides as  $V_1, V_2, V_3$  and hence

$$V = V_1 + V_2 + V_3 \dots\dots\dots (1)$$

According to Ohm's Law  $V = I R_{eq} \dots\dots\dots (2)$

$$V_1 = I R_1 \dots\dots\dots (3)$$

$$V_2 = I R_2 \dots\dots\dots (4)$$

$$V_3 = I R_3 \dots\dots\dots (5)$$

I – Electric current

$R_{eq}$  = equivalent resistance.

Substituting 2,3,4,5 in 1

We get  $I R_{eq} = I R_1 + I R_2 + I R_3$

$$R_{eq} = R_1 + R_2 + R_3$$

From above equation we can conclude that the sum of individual resistances is equal to their equivalent resistance when the resistors are connected in series.

3. Deduce the expression for the equivalent resistance of three resistors connected in parallel?

- A. The cell connected across 3 resistors maintain same potential difference ( $V$ ) across each resistors. The current  $I$  gets divided into 3 parts  $I_1, I_2, I_3$  and flow through  $R_1, R_2, R_3$  respectively.

$$I = I_1 + I_2 + I_3 \dots\dots\dots (1)$$



If we replace combination of resistors by equivalent resistance  $R_{eq}$  then according to Ohm's law.

$$I = \frac{V}{R_{eq}} \dots\dots\dots (2)$$

$$I_1 = \frac{V}{R_1} \dots\dots\dots (3)$$

$$I_2 = \frac{V}{R_2} \dots\dots\dots (4)$$

$$I_3 = \frac{V}{R_3} \dots\dots\dots (5)$$

Substituting 2,3,4,5 in 1 we get

$$\frac{V}{R_{eq}} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

From the above equation we can conclude that reciprocal of the equivalent resistance is equal to sum of the reciprocals of the individual resistances.

4. State Ohm's law suggests an experiment to verify it and explain the procedure?
- A. Ohm's Law: - At constant temperature the electric current through a conductor is directly proportional to the potential difference applied between its ends.

$$V \propto I$$

And hence  $\frac{V}{I}$  is a constant for a conductor.

Experiment: -

Aim: - To show that  $\frac{V}{I}$  is a constant for a conductor at constant temperature.

Materials required: - 5 dry cells of 1.5 each, conducting wires, an Ammeter (A) a volt meter (V), iron spook of length 10cm key.

Arrangement of materials:

Procedure:- Connect the circuit as shown in figure and close key. Note the reading of current (I) from ammeter and potential difference (V) from voltmeter in the table below.

S.no	No of Batteries	Potential Difference (V)	Current (I)	$\frac{V}{I}$

Now connect two cells in series instead of 1 cell in the circuit and note the readings of V and I in the table repeat the same for 3 cells. 4 cells and 5 cells and record the readings in the table. Find  $\frac{V}{I}$  for each set of values. We notice that  $\frac{V}{I}$  is constant.

Hence we can write mathematically as  $V \propto I$

If we plot a graph taking V on X axis and I on y – axis we will get a straight line graph passing through the origin.

5. A house has 3 bulbs, 2 fans and a television each bulb draws 40w fan draws 60w and the television draws 60w on the average all the bulbs are kept on for five hours, two fans for 12 hours and the television for shows everyday find the cost of electricity energy used in 30days at the rate of 3.00 per KWH with 10% surcharge more?

A.

S.no	Appliance	No	Voltage (w)	No of hours / day	Consumption for 1 day WH
1	Bulbs	3	40	5	$3 \times 40 \times 5 = 600$
2	Fans	2	80	12	$2 \times 80 \times 12 = 1920$
3	Television	1	60	5	$1 \times 60 \times 5 = 300$

Total consumption for one day =  $600 + 1920 + 300$

= 2820 wt

Total consumption for 30 days =  $2820 \text{ WH} \times 30$

= 84600 WH

= 84.6 KWH

Total cost at the rate 3/KWH =  $84.6 \times 3$

= 7253.8

Surcharge at 10% =  $253.8 \times \frac{10}{100}$

= 225.38

Total amount to be paid =  $7253.80 + 25.38$

= 279.18

6. Find electric current drawn from the battery of emf 12V in the figure given below.

A. Let  $I = I_1 + I_2$  be the current drawn from emf 12v from the figure using the Loop Law

For Loop DABCD

$$- 3(I_1 + I_2) = 12 - 2I_1 - 5 = 0$$

$$- 3I_1 - 3I_2 + 12 - 2I_1 - 5 = 0$$

$$- 5I_1 - 3I_2 + 7 = 0 \dots\dots\dots (1)$$

For Loop DABCD

$$- 3(I_1 + I_2) = 12 - 4I_1 = 0$$

Solving equations 1 and 2

$$- 3(-5I_1 - 3I_2 + 7) = 0$$

$$- 5(-3I_1 - 7I_2 + 12) = 0$$

$$-15I_1 + 9I_2 - 21 = 0$$

$$-15I_1 + 35I_2 - 60 = 0$$

$$-26I_2 + 39 = 0$$

$$-26I_2 = -39$$

$$26I_2 = 39$$

$$I_2 = \frac{39}{26} = 1.5A$$

Substituting  $I_2 = 1.5A$  in

$$- 3I_1 - 7I_2 + 12 = 0 \text{ we get}$$

$$- 3I_1 - (7 \times 1.5A) + 12 = 0$$

$$- 3I_1 - 10.5 A + 12 = 0$$

$$- 3I_1 + 1.5A = 0$$

$$3I_1 = 1.5A$$

$$I_1 = \frac{1.5A}{3}$$

$$I_1 = 0.5A$$

The total current drawn  $I = I_1 + I_2$

$$= 0.5A + 1.5A$$

$$= 2A \text{ Ampere.}$$

DCEB-KADAPA

Fill in the blanks

1. The kilo watt hour (KWH) is the unit of \_\_\_\_\_
2. A thick wire has a \_\_\_\_\_ resistance than a thin wire
3. An unknown circuit draws a current of 2A from 12V battery its equivalent resistance is \_\_\_\_\_
4. The SI unit of potential difference is \_\_\_\_\_
5. The SI unit of current is \_\_\_\_\_
6. Three resistors of values  $2\Omega, 4\Omega, 6\Omega$  are connected in series, the equivalent resistance of combination of resistors is \_\_\_\_\_
7. Three resistors of values  $2\Omega, 4\Omega, 6\Omega$  are connected in parallel the equivalent resistance of combination of resistors is \_\_\_\_\_
8. The power delivered by a battery of emf 10V is low. Then the current delivered by the battery in \_\_\_\_\_
9. Ammeter is always connected in \_\_\_\_\_ on electric circuit.
10. Voltmeter is always connected in \_\_\_\_\_ on electric circuit.
11. The reciprocal of resistivity is called \_\_\_\_\_
12. Junction law is based on \_\_\_\_\_
13. Loop Law is based on \_\_\_\_\_

14. The rate of electric work is called \_\_\_\_\_
15. The resistance of human body generally varies from \_\_\_\_\_ to \_\_\_\_\_

### ANSWERS

1. Electric energy   2. Low   3.  $6\Omega$    4. Volt   5. Ampere  
 6.  $12\Omega$    7.  $1.09\Omega$    8. 1 Ampere   9. Series   10. Parallel  
 11. Conductivity   12. Law of conservation of charge  
 12. Law of conservation of charge   13. Law of conservation of energy  
 14. Electric power   15.  $100\Omega$ ,  $500000\Omega$ .

### Multiple Choice questions

1. A uniform wire of resistance  $50\Omega$  is cut into 5 equal parts. These parts are now connected in parallel. Then the equivalent resistance of the combination is [   ]  
 a)  $2\Omega$    b)  $12\Omega$    c)  $250\Omega$    d)  $6250\Omega$
2. A charge is moved from point A to point B. the work done to move unit charge during this process is called [   ]  
 a) Potential at A   b) potential B  
 c) Potential difference between A and B   d) Current from A to B
3. Joule, Coulomb is same as [   ]  
 a) Watt   b) 1 volt   c) 1 ampere   d) 1 Ohm
4. The current in the wire depends [   ]  
 a) Only on the potential difference applied  
 b) Only on the resistance of the wire  
 c) On both of them  
 d) None of them
5. Consider the following statements [   ]  
 A: In series connection the same current flows through each element  
 B: In parallel connection the same potential difference gets applied across each element  
 a) Both A & B are correct   b) A is correct but B is wrong  
 c) A is wrong but B is correct   d) both A and B are wrong
6. The electric potential of the earth is [   ]  
 a) -ve   b) +ve   c) 0   d)  $\infty$  infinite

### ANSWERS

1. A   2. C   3. B   4. C   5. A   6. C   7. C

## MATCHINGS

### Group A

- |   |                     |        |               |
|---|---------------------|--------|---------------|
| 1 | Electric charge     | (    ) | A             |
| 2 | Electric power      | [    ] | B Volt ampere |
| 3 | Specific resistance | [    ] | C coulomb     |
| 4 | Conductance         | [    ] | D Ohm – meter |
| 5 | Electric current    | [    ] | E Ampere      |

### Group B

**ANSWERS**      1.C    2.B    3.D    4.A    5.E

### Group A

- |   |                                    |        |   |   |
|---|------------------------------------|--------|---|---|
| 1 | Electric power                     | [    ] | A | $RA / I$  |
| 2 | Specific resistance (P)            | [    ] | B | $W / V$   |
| 3 | Voltage (v)                        | [    ] | C | $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ |
| 4 | Parallel combination of resistance | [    ] | D | $R = R_1 + R_2 + R_3$   |
| 5 | Series combination of resistance   | [    ] | E | $V \propto I$   |

### Group B

**ANSWERS**      1.E    2.A    3.B    4.C    5.D

## 12.ELECTRONICS

### 1 Mark questions

- Define magnetic flux density?  
A. Magnetic flux density (B) is defined as the ratio of flux passing through a plane perpendicular to field and the area of the plane.

$$B = \frac{\phi}{A} \text{ (}\phi \text{ Magnetic flux, A area)}$$

- Define Faraday's Law?  
A. The induced EMF generated in a closed loop is equal to the rate of change of magnetic flux passing through it.

$$\varepsilon = \frac{\Delta\phi}{\Delta t} \text{ (}\Delta\phi \text{ - change in magnetic flux, } \Delta t \text{ change in time)}$$

3. Define Lenz's law?
- A. The induced current set up in the coil is in such a direction that it opposes the changes in the flux.
4. What is motional EMF?
- A. When a conductor of length ' $l$ ' moves perpendicular to field  $B$  with a speed ' $V$ ' then the potential difference (Voltage) developed between the ends of conductor is " $Blv$ ". This EMF is called motional EMF.
5. Write the main difference between electric motor and generator?
- A.

#### **Electric motor**

In electric motor, electrical energy is converted into mechanical energy.

#### **Generator**

In generator, mechanical energy is converted into electrical energy.

6. What is the main difference between AC and DC?
- A.

#### **Alternating current (AC)**

Alternating current (AC) reverses its direction periodically.

#### **Direct Current (DC)**

Direct current (DC) always flows in one direction.

7. What is right hand thumb rule?
- A. If you hold the current carrying wire with your right hand in such a way that the thumb is in the direction of current, then the curled fingers show the direction of magnetic field produced around the wire.
8. State Fleming's right hand rule?
- A. If the fore finger points towards the direction of velocity of charge or current ( $I$ ) middle finger points to the direction of field ( $B$ ) then the thumb gives the direction of force when the three fingers are stretched in such a way that they are perpendicular to each other.
9. In the given figure magnetic lines are shown. What is the direction of current flowing through the wire?
- A. In the figure, the magnetic field lines are anti clock wise: Hence the current flows vertically upward from the page.
10. The direction of current flowing in a coil is shown in figure what type of magnetic pole is formed at the face?
- A. As the current in the coil is in anti clock wise direction, North magnetic pole is formed at the face. If we place compass at the face, its south pole points towards the face of the coil.

11. Why does picture appear distorted when a bar magnet is brought close to the screen of a television?
- A. We know that electron beams produce picture on the screen of television if we trying far magnet close to the TV screen, the electron beams affected by the magnetic field of the bar magnet. The magnetic field exerts force on the electrons making the picture distorted.

## 2 Marks questions

1. A charged particle 'q' is moving with a speed 'v' perpendicular to the magnetic field of induction B. Find the radius of the path and time period of the particle?
- A. The force experiment by the charged particle 'q' which is moving with speed 'v' in the magnetic field of induction 'B' is given by

$$F = q v B \dots\dots\dots (1)$$

As the force is always perpendicular to velocity the particle moves along a circular path and the above force acts like a centripetal force. If 'r' be the radius and 'm' be the mass of the particle, the centripetal force,

$$F = \frac{mv^2}{r} \dots\dots\dots (2)$$

Equating 1 and 2 we get

$$q v B = \frac{mv^2}{r}$$

$$\text{Radius } r = \frac{mv}{qB}$$

$$\text{Time period of the particle } T = \frac{2\pi r}{v}$$

$$T = \frac{2\pi(\frac{mv}{qB})}{v}$$

$$T = \frac{2\pi m}{qB}$$

2. The magnetic flux inside a coil of 400 turns changes for each single turn with time as shown in graph. Determine the maximum induced emf generated in the coil. Is there any change in induced EMF  $t = 0.1$  sate 0.3 sec?
- A. From the graph the increase in magnetic flux through one turn of coil in 0.1 sec  $(\Delta\phi) = 0.001$  wb

According to Faraday's law, the maximum induced emf generated in the coil is given by

$$\varepsilon = N \frac{\Delta\phi}{\Delta t} \text{ (N = No of turns of coil)}$$

$$\varepsilon = 400 \left( \frac{0.001 \text{ wb}}{0.1 \text{ s}} \right)$$

$$\varepsilon = 4 \text{ v}$$

There is no change in magnetic flux ( $\phi$ ) through coil from  $t = 0.1$ s to 0.3s and hence no emf is generated.

3. Find the length of the conductor which is moving with a speed of 10 m/s in the direction perpendicular to the direction of magnetic field of inductor 0.8T, if it induces an emf of 8V between the ends of the conductor?

A. Given that  $B = 0.8\text{T}$ ,  $V = 10\text{m/s}$   $\varepsilon = 8\text{v}$   $l = ?$

Substituting above values in  $\varepsilon = Blv$

$$8 = 0.8 \times l \times 10$$

$$8l = 8$$

$$l = 8/8 = 1\text{m}$$

The length of the conductor is ( $l$ ) = 1m

4. The value of magnetic field induction which is uniform is 2T. What is the flux passing through a surface area  $1.5\text{m}^2$  perpendicular to the field?

A. Value of uniform magnetic field induction ( $B$ ) = 2T

$$\text{Surface area (A)} = 1.5\text{m}^2$$

$$\text{Magnetic flux } (\phi) = ?$$

$$\text{From } B = \frac{\phi}{A}$$

$$\phi = B.A$$

$$= 2\text{T} \times 1.5\text{m}^2$$

$$= 3 \text{ wb.}$$

5. An 8N force acts on a rectangular conductor 20cm long placed perpendicular to a magnetic field. Determine the magnetic field induction if the current in the conductor is 40A?

A. Force acting on the conductor ( $F$ ) = 8N

$$\text{Length of the conductor (l)} = 20\text{cm} = 0.2\text{m}$$

$$\text{Current in the conductor (I)} = 40\text{A}$$

$$\text{Magnetic field induction (B)} = ?$$

$$\text{From } F = I l B$$

$$B = \frac{F}{Il}$$

$$B = \frac{8\text{N}}{40\text{A} \times 0.2\text{m}}$$

$$B = \frac{8}{8} = 1 \text{ tesla.}$$

6. Give a few applications of Faraday's law of induction in daily life?

- A.
- 1) Gadgets and scanners used for security check at airports, railway stations etc Work on the principle of electromagnetic induction.
  - 2) Transformers, electrical generators work on the principle of electromagnetic induction.
  - 3) The tape recorder which we use to listen to songs (or) record voices works on the principle of electromagnetic induction.



- 4) ATM cards, swiping machines are also the applications of Faraday's law of electromagnetic induction.
  - 5) Induction stove works on the principle of electromagnetic induction.
7. A bar magnetic with North Pole facing towards coil moves as shown in figure. What happens to the magnetic flux passing through the coil?
- A.
- 1) Moving the bar magnet towards the coil with its north pole facing the coil produces an induced current 'I' such that the forward motion of north pole is opposed.
  - 2) The force of the coil opposite to North Pole will act as North Pole.
  - 3) Induced current due to the change of magnetic flux per unit time will be in the anti clock wise direction.

### 1 Mark questions

1. Explain the working of electric motor with a neat diagram?
- A.
1. Electric motor converts electrical energy into mechanical energy.
  2. It works on the principle that when a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on the coil which rotates it continuously.
  3. When electric current is passed through rectangular coil ABCD, it produces a magnetic field around the coil.
  4. The magnetic field of horse shoe magnet interferes with the magnetic field of the coil and causes the coil to rotate continuously.
  5. If ABCD in horizontal position, current from battery enters the coil through brush B, and commutator half ring  $C_1$ . The current flows in the direction of ABCD and leaves via ring  $C_2$  and brush  $B_2$ .
  6. When the direction of current is from A to B the force on side AB will be in the downward direction. At the same time the force on the side CD will be in upward direction as the direction of current is from C to D. So ABCD coil rotates in anti clock wise direction.
  7. When the coil reaches vertical position, the brushes  $B_1$ ,  $B_2$  touch the gap between the commutator rings and current to the coil is cut off. But the coil does not stop rotating as it has already gained momentum.
  8. The coil CD comes to left side and AB goes to right side. The brushes again come into contact with the rings and the current direction is reversed.
  9. The reversing current in the coil is repeated after every half rotation due to which the coil continues to rotate as long as current from battery passed through it. The rotating shaft of electric motor can drive a large number of machines which are connected to it.

2. Find the magnetic force on a current carrying wire which is placed (i) along a magnetic field (ii) perpendicular to magnetic field (iii) Making an angle ' $\theta$ ' with the magnetic field?

A. (i) First let us find the magnetic force on a straight wire carrying current which is kept perpendicular to a uniform magnetic field ' $B$ '. This ' $B$ ' is directed in to the page. It is represented by ' $X$ ' in the figure.

Both ends of the wire is connected to a battery only a part ' $L$ ' of the wire is in the magnetic field.

We know that the electric current means charges in motion and charges move with a certain velocity called drift velocity ' $v$ '.

The magnetic force on a single charge ( $q$ ) is given by

$$F_0 = q v B$$

If the total charge inside the magnetic field is ' $Q$ ' then the magnetic force on the current carrying wire is given by

$$F = Q v B \dots\dots\dots (1)$$

The time taken to cross the field by the charge ' $Q$ ' be

$$t = \frac{L}{v} \rightarrow v = \frac{L}{vt} \dots\dots\dots (2)$$

Substituting 2 in 1 we get

$$F = Q \frac{L}{t} B \dots\dots\dots (3)$$

But we know that  $\frac{Q}{t} = I$  (electric current)

$$F = ILB \dots\dots\dots (4)$$

(ii) If the conducting wire makes an angle ' $\theta$ ' with the magnetic field, then the magnetic force on it is given by

$$F = ILB \sin \theta \dots\dots\dots (5)$$

(iii) If the conducting wire is along the magnetic field, the magnetic force on it can be obtained by substituting  $\theta = 0^\circ$

In the above equation

$$F = ILB \sin 0^\circ$$

$$F = ILB \times 0$$

$$F = 0$$

It will not experience any force.

3. Derive Faraday's Law of induction from law of conservation of energy?

A. Arrange two far parallel conductors in a uniform magnetic field ( $B$ ) with space between them is ' $l$ ' connect them to a galvanometer as shown in figure. Place a cross conductor on the parallel conductors. If we move the conductor to the left, the needle of the galvanometer will deflect in one direction. If we move the cross conductor (cross wire) to the right, the needle will deflect in the opposite direction.

Suppose that the cross wire is moved to the left to a distance of 'S' meters in a time of ' $\Delta t$ ' then the reading of the galvano meter gives us the amount of current that flows in the circuit. A current will be set up in circuit only when there is an EMF in the circuit let this EMF be 'E'.

The principle of conservation of energy tells us that the electrical energy must come from the work we have done in moving the cross wire.

If we ignore friction, the work done  $W = FS$  ..... (1)

There is a current  $I$  amperes flowing through the length ' $l$ ' of the cross wire.

The force applied on cross wire by the field  $B$  is given by

$$F = IlB \text{ ..... (2)}$$

Substituting 2 in 1 we get

$$W = IBS \text{ ..... (3)}$$

As we move cross wire to the left, the area of the loop decreases and the flux through the loop also decreases. The decrease in flux given by

$$\Delta\phi = BIS \text{ ..... (4)}$$

Substituting 4 in 3 we get

$$W = I (\Delta\phi) \text{ ..... (5)}$$

Dividing 5 by  $\Delta t$  we get

$$\frac{W}{\Delta t} = I \left( \frac{\Delta\phi}{\Delta t} \right) \text{ ..... (6)}$$

$$\text{Electric power } P = I \left( \frac{\Delta\phi}{\Delta t} \right) \text{ ..... (6)} \quad \left( \frac{W}{\Delta t} = P \right)$$

$$\text{But we know electric power } P = \varepsilon \times I \text{ ..... (7)}$$

$$\text{Comparing 6, 7 we get } \left( \frac{\Delta\phi}{\Delta t} = \varepsilon \right)$$

This is the expression for Faraday's Law.

Dividing 3 by  $\Delta t$  we get,

$$\frac{W}{\Delta t} = \frac{IlBs}{\Delta t}$$

$$P = IlBV \text{ ..... (8)} \quad \left( \frac{s}{\Delta t} = v \right)$$

Substituting 7 in 8 we get

$$\varepsilon I = IlBV$$

$$\varepsilon = BIV \text{ ..... (9)}$$

This is called motional EMF

4. Explain the working of AC electric generator with a neat diagram?

- A. 1. When the coil is at rest in vertical position with side 'A' of the coil at the top and side 'B' at bottom position, no current will be induced in it.
2. When coil is rotated in clock wise direction, current will be induced in it and it flows from A to B. During the first quarter of the rotation, the current increases from zero to a maximum and reaches peak value when the coil is in horizontal position.

3. If we continue the rotation of coil, current decreases during the second quarter of the rotation and once again becomes zero when coil comes to vertical position with side B at the top and A at bottom. During the second part of the rotation, current generated follows the same pattern as that in the first half except that the direction of current reversed.
4. The current obtained by this process changes its direction alternatively for each half cycle. This current is called alternating current (AC) in which direction of charge flow reverse periodically. So AC possesses certain frequency.
5. Explain the working of DC generator with a neat diagram?
  - A. 1. Unlike in AC electric generator, if two half slip rings are connected to ends of the coil as shown in figure, the AC generator works as DC generator to produce DC current.
  2. When the coil is in the vertical position the induced current generated during the first half rotation rises from zero to maximum and then falls zero again.
  3. As the coil moves further from this position, the ends of the coil go to other slip rings. Hence during the second half rotation, the current is reversed in the coil itself.
  4. The current generated in the second half rotation of coil identical with that during the first half of direct current for one complete revolution.

#### DIAGRAM

6. Which of the various methods of current generations protects nature well? Give examples to support your answer?
    - A. Various methods of power generations which protect nature well are
      - 1) Hydro power generation
      - 2) Wind power generation
      - 3) Solar power generation etc.
- 1) Hydro power generation:-** Power is generated by using flowing of water to rotate a turbine.
- Advantages:** - 1) No environmental pollution  
 2) The construction of dams for this purpose controls floods and helps in irrigation too.
- 2) Wind power generation:** - Power is generated when the wind rotates the wind mill, which in turn rotates a turbine.
- Advantages:** - 1) No environmental pollution  
 2) It will never get exhausted  
 3) Cost effective as wind energy is free.

**3) Solar power generation etc:** - Solar panels, absorb solar energy from the sun and generates the power.

**Advantages:** - 1) No environmental pollution

2) It will never get exhausted

3) If the best alternative source of electric power if the solar panels are made cheaper.

### 5 Marks Diagrams

1. Draw a neat diagram of electric motor. Name the parts?
2. Draw a neat diagram of AC generator. Name the parts?
3. Draw a neat diagram of DC generator. Name the parts?

### Fill in the blanks

1. The SI unit of magnetic field induction is \_\_\_\_\_
2. Magnetic flux is the product of magnetic field induction and \_\_\_\_\_
3. The charge is moving along the direction of magnetic field. Then force acting on it is \_\_\_\_\_
4. A current carrying wire of length 'l' is placed perpendicular to a uniform magnetic field B. then the force acting on the wire with current I is \_\_\_\_\_
5. Faraday's law of induction is the consequence of \_\_\_\_\_

### Multiple choice questions

1. Which of the following converts electrical energy into mechanical energy [ ]  
a) Motor    b) battery    c) generator    d) switch
2. Which of the following converts mechanical energy into electrical energy [ ]  
a) Motor    b) battery    c) generator    d) switch
3. The magnetic force on a current carrying wire placed in uniform magnetic field if the wire is oriented perpendicular to magnetic field is [ ]  
a) 0    b)  $ILB$     c)  $2ILB$     d)  $ILB/2$

### Answers

- 1) Tesla    2) Area    3) zero    4)  $ILB$   
5) Law of conservation of charge  
1. a    2.c    3.b

## Matching

### Group A

### Group B

- |   |                            |         |   |  |
|---|----------------------------|---------|---|--|
| 1 | Magnetic field             | [     ] | A | Electromagnetic induction                |
| 2 | Magnetic flux density      | [     ] | B | $\epsilon = Blv$                         |
| 3 | Faraday's law of induction | [     ] | C | Weber (Wb)                               |
| 4 | Motional EMF               | [     ] | D | Telsa (T)                                |
| 5 | ATM card                   | [     ] | E | $\epsilon = \frac{\Delta\phi}{\Delta t}$ |

## Answers

1. C   2.D   3.E   4.B   5.A

# 13.PRINCIPLES OF METALLUGY

## 1 Mark questions

1. What is an ore? Give one example?

A. Ore:- A mineral from which a metal can be profitably extracted is called an 'ore'.

Ex:- Aluminium ore is "Bauxite" ( $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ )

2. What are the metals present in the Braze Alloy?

A. Copper and Tin ( $\text{Cu} + \text{Su}$ )

3. State the terms gangue and slag?

A. **Gangue:** - The impurities like clay, sand present in the ore is called a Gangue.

**Slag:** - A flux is a chemical substance added to convert gangue into fusible mass. This fusible mass is called 'slag'

4. What is flux? Give an example?

A. **Flux:** - The new substance added to ore for remove gangue is called a flux.

Ex: -  $\text{SiO}_2$  (Acidified flux),  $\text{CaO}$  (Base flux)

5. Write the name of any two ores of iron?

A. Hematite ( $\text{Fe}_2\text{O}_3$ ), magnetite ( $\text{Fe}_3\text{O}_4$ )

6. What is the use of a Bisphenol?

A. Bisphenol is a chemical used for prevention of corrosion of metals.

7. Write a chemical name of rusting of iron and mention its formula?

A. The rusting of Iron is a Iron Oxide. Its formula is  $\text{Fe}_2\text{O}_3$ .

8. What is a poling?

A. **Poling:** - the molten metal is stirred with poles of green wood. The impurities are removed either as gases or they get oxidized and form slag over the surface of the molten metal the process is called a 'poling'.

9. What is a stainless steel?

A. Stainless steel is an alloy of Iron, Nickel and Chromium.

10. What are the cathode and Anode used for electrolytic refining process?

A. In the electrolytic refining process the impure metal used as a Anode and a pure metal used as a cathode.

### 2 marks questions

1. What is termite process? Mention its applications in daily life?

A. Termite process:

1. When highly reactive metals such as Na, Ca, Al are used as reducing agents they displace metals of lower reactivity from their compounds.
2. These displacement reactions are highly exothermic. The amount of heat evolved is so large that the metals produced in molten state.
3. The reaction of Iron Oxide ( $\text{Fe}_2\text{O}_3$ ) with aluminium is used to join reaction is known as the termite reaction.

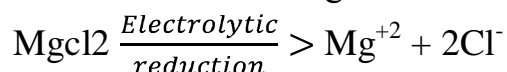


Applications: - 1. Terminate process used for join railing of railway tracks

2. It is used to join cracked machine parts.

2. Magnesium is an active metal if it occurs as a chloride in nature. Which method of reduction is suitable for its extraction?

A. Magnesium is an active metal it is occurs as a chloride in nature in the form of Carmelite ( $\text{KCl}$ ,  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ ). So electrolytic reduction is suitable for extraction of magnesium from its chloride ore in this 'Mg' liberated at cathode.



At cathode:  $\text{Mg}^{+2} + 2\text{e}^- \rightarrow \text{Mg}$

At anode  $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

### Additional questions

1. Write the high reactivity metals medium reactivity metals and low reactivity metals?

2. Draw the diagram for showing froth floatation and mention its parts?

3. Draw the diagram for showing magnetic separation for concentration the ore and mention its parts?

### 4 Marks questions

1. What is activity series? How it helps in the extraction of metals?

A. **Activity series:** - The arrangement of metals in decreasing order of their reactivity is called "activity series" of metals.



The method used for a particular metal for the reduction of its ore to the metal depends mainly as the position of the metal in the activity series.

Ex: - 1) Electrolysis of fused compounds is the method used for extraction of metals at the top of the activity series.

2) For the extraction of metals in the middle of the activity series, different reducing methods like roasting, auto reduction and termite process etc., are used.

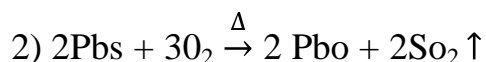
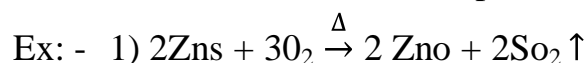
3) For the extraction of metals at the bottom of the activity series, reduction by heating and displacement from their aqua solution methods are used.

2. Write short notes on the following?

1) Roasting                      2) Calcinations

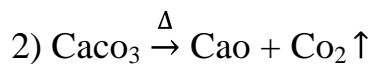
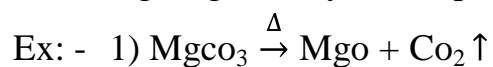
A. **1) Roasting:** - Roasting is a pyro chemical process in which the ore is heated in the presence of oxygen (Air) below its melting point.

The sulphide ores are converted into oxides by roasting. In this sulphur impurities removed in the form of sulphur dioxide.



**2) Calcinations:** - Calcinations is a pyro chemical process in which the ore is heated in the absence of oxygen (Air) through this process carbonate ores are purified.

The ore gets generally decomposed in the process.



3. Write short note on the following?

A. 1) Smelting                      2) Froth floatation

**1) Smelting:** - 1) Smelting is a pyro chemical process in which the ore is mixed with flux and fuel then it is strongly heated.

2) The ore with impurities is finally powdered and kept in a water, containing pine oil taken in a floatation cell.

3) Air under pressure is blown to produce froth in water.

4) Froth is separated and washed to get ore particles.

**Figure Page no 290 in academy text book**

### **Additional questions**

1. Suggest an experiment to prove that the presence of air and water are essential for corrosion. Explain the process?



## 5 Marks questions

1. Draw a neat diagram of Blast furnace and label its parts?
2. Draw a neat diagram of River boretory furnace and label its parts?

Page No 298 in Academy text book

## I Multiple choice questions

1. Which of the following is a carbonate ore? [     ]  
a) Magnesite     b) Baurite     c) Gypsum     d) Galena
2. Froth floatation il method used for the purification of \_\_\_\_\_ ore [     ]  
a) Carbonateb) oxide     c) Sulphide     d) Nitrate
3. The reducing agent in termite process is \_\_\_\_\_ [     ]  
a) Mg     b) Al     c) Fe     d) Si
4. Galena is an ore of [     ]  
a) Zn     b) Pb     c) Hg     d) Al
5. The most abundant metal in the earth's crust is [     ]  
a) Iron     b) Aluminium     c) Zinc     d)

Silver

6. Which of the following is the Gypsum [     ]  
a)  $\text{CuSO}_4 \cdot 2\text{H}_2\text{O}$      b)  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$      c)  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$      d)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
7. The ore from which mercury is obtained [     ]  
a) Carnalite     b) Harne silver     c) Hacmalited) Cinnabar
8. The oil used in the froth floatation process is [     ]  
a) Kerosene oil     b) Olive oil     c) Pine oil     d) Coconut oil
9. In the word chalcogen, "chalco" means [     ]  
a) Ore     b) gens     c) produce     d) none
10. The metal that occurs in the native form is \_\_\_\_\_ [     ]  
a) Pb     b) Fe     c) Hg     d) An

## II Fill in the blanks

1. The method suitable for purification of low boiling metals is \_\_\_\_\_
2. Alloys of mercury are called \_\_\_\_\_
3. The chemical process in which the ore is heated in the absence of air is called \_\_\_\_\_
4. Blister copper is purified by \_\_\_\_\_ method
5. The chemical formula of the rusting of iron is \_\_\_\_\_
6. The chemical name of the lime stone is \_\_\_\_\_
7. Smelling is carried out in \_\_\_\_\_ furnace.

### III Matching

	<u>Group A</u>		<u>Group B</u>
1	Bauxite	[    ]	A $\text{Fe}_2\text{O}_3$
2	Zincite	[    ]	B Pbs
3	Galena	[    ]	C $\text{MgCO}_3$
4	Hacmalite	[    ]	D $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
5	Magnesite	[    ]	E Zno

### ANSWERS

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

II     1. Distillation                      2. Amalgams                      3. Calcinations                      4.  
Poling  
      5.  $\text{Fe}_2\text{O}_3$                       6. Calcium carbonate                      7. Blast

III    1. D   2.E   3.B   4.A   5.C

## 14. CARBON AND ITS COMPOUNDS

### 1 Mark questions

- Define allotropy? Give an example?  
A. The property of an element to exist in two or more physical forms having similar chemical properties but different physical properties is called allotropy.  
Ex: - Carbon has three allotropy forms are the Diamond, Graphite  $\text{F}_{60}$ .
- What is a catenation?  
A. If any element forms bands between its own atoms to give a giant molecule are call that property as catenation.  
Ex: - Carbon possesses huge catenation property.
- What is Vinegar? Give its uses?  
A. 5 – 8% solution of acetic acid in water is called Vinegar. It is used to preserve pickle for long time.
- Define Homologous series? Give examples?  
A. The series of carbon compounds in which two successive compounds differ by –  $\text{CH}_2$  unit is called Homologous series.  
Ex: - Alkanes, Alkenes, Alkynes etc.
- Name the isomers of a compound having molecular formula  $\text{C}_2\text{H}_6\text{O}$ ?

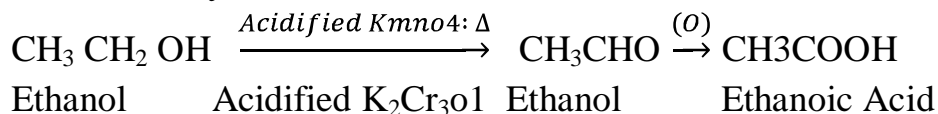
- A. The isomers of  $C_2H_6O$  are 1. Ethyl Alcohol 2. Dimethyl Ether  
 $C_2H_6O \rightarrow CH_3 - CH_2 - OH$  (Alcohol)  
 $C_2H_6O \rightarrow CH_3 - O - CH_3$  (Ether)
6. What is Saponification?  
 A. Alkaline hydrolysis of ester producing soaps is called Saponification.
7. Name the product other than water formed on burning of ethanol in air?  
 A.  $CO_2$  [ $C_2H_5OH + 3O_2 \xrightarrow{\Delta} 2CO_2 + 3H_2O + \text{energy}$ ]
8. What is meant by paraffin's? Give an example?  
 A. The saturated Hydro Carbons with least reactivity by are called "paraffin's"  
 Ex: - Alkanes
9. What is micelle?  
 A. A spherical aggregate of soap molecules in water is called "Micelle"
10. What is a Denatured Alcohol?  
 A. An alcohol contains impurities like methanol or pyridine are called Denatured alcohol.
11. Name the simplest ketone and write its molecular formula?  
 A. Acetone or propanone its molecular formula is  $CH_3 - CO - CH_3$
12. Give the names of functional groups 1)  $-CHO$  2)  $>C=O$   
 A. 1)  $-CHO$  is aldehyde 2)  $>C=O$  is a ketone
13. Write the IUPAC name of the next homologous of  $CH_3OH$   $CH_3CH_2OH$ ?  
 A. The IUPAC name is 2-Butanol and formula is  $CH_3CH_2CH_2CH_2OH$
14. Draw the electronic dot structure of ethane molecule?  
 A. Molecular formula of ethane is  $C_2H_6$  and structure is
15. What is soap? Write its general formula?  
 A. Soap is a sodium or potassium salt of a higher fatty acids like stearic acid, palmitic acid etc.  
 The general formula of a soap is  $RCOONa$  (or)  $RCOOK$  (where  $R = C_{17}H_{35}$ ) etc
16. Write the functional group of amine ester?  
 A. The functional group of amine is " $-NH_2$ "  
 The functional group of ester is " $-COOR$ "
17. Give the IUPAC names of formaldehyde, chloroform?  
 A. The IUPAC name of formaldehyde is "Methanal" ( $HCHO$ )  
 The IUPAC name of formal chloroform is "trichloro methane" ( $CHCl_3$ )
18. Write the IUPAC names of the following?

### Additional Questions

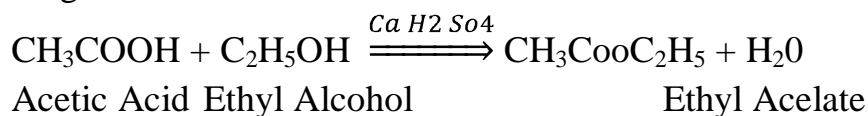
1. Define Isomerism?
2. What is a functional group?
3. State the terms combustion, catalyst, hydrocarbons?
4. What is Esterification?
5. What is meant by pKa?

## 2 marks questions

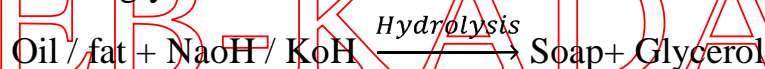
1. Name the product obtained when ethanol is oxidized by either chromic anhydride or Acidified potassium permanganate and write its equation?
- A. When Ethyl alcohol undergoes oxidation in the presence of either chromic anhydride or Acidified potassium permanganate to form the product “Acetaldehyde” and finally “Acetic Acid” the reaction is as follows.



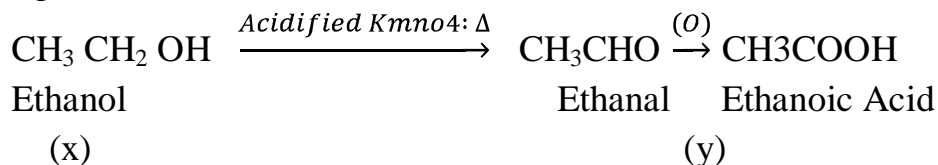
2. Distinguish between esterification and saponification reactions of organic compounds?
- A. **Esterification:** - Esterification is the reaction in which a carboxylic acid combines with an alcohol in the presence of ca.  $\text{H}_2\text{SO}_4$  to form an ester. These esters are pleasant smelling.



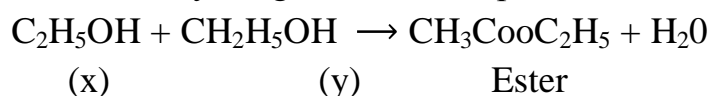
**Saponification:** - saponification is defined as the hydrolysis of an oil under the basic conditions ( $\text{NaOH}$  /  $\text{KOH}$ ) leading to the formation of sodium salt of carboxylic acid and glycerol.



3. An organic compound 'x' with molecular formula  $\text{C}_2\text{H}_6\text{O}$  undergoes oxidation with Acidified  $\text{KMnO}_4$  and forms the compound 'y' that has molecular formula  $\text{C}_2\text{H}_4\text{O}_4$  (a) Identify 'x' and 'y' (b) write your observation regarding the product when the compound 'x' is made to react with 'y' which is used as a preservative for pickles?
- A. Here 'x'  $\text{C}_2\text{H}_6\text{O}$  is “Ethanol” ‘y’  $\text{C}_2\text{H}_4\text{O}_4$  is “Ethanoic Acid” because when Ethyl Alcohol undergoes oxidation to form the

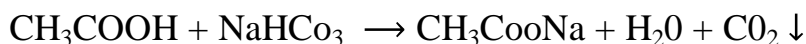


(b) When 'x' react with 'y' to give Ester as a product.



4. Suggest a chemical test to distinguish between ethanol and ethanoic acid and explain the procedure?
- A. Ethanol and Ethanoic Acid can be distinguished by test with  $\text{NaHCO}_3$  (Sodium bicarbonate)

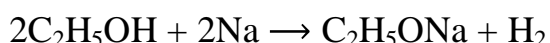
In this Ethanol do not react with  $\text{NaHCO}_3$ , where as Ethanoic Acid reacts with  $\text{NaHCO}_3$  forming sodium acetate with the liberation of  $\text{CO}_2$  gas.



5. Suggest a test to find the hardness of water and explain the procedure?
- A. **Hard water:** - Water which does not give good lather with soap is called hard water.

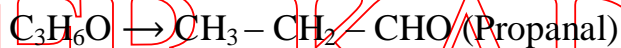
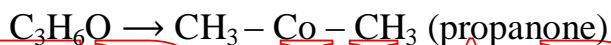
To find the hardness of water add same soap solution to it, and stir it. If lather is formed easily it is soft water. If it gives a white precipitation it is hard water.

6. What happens when a small piece of sodium is dropped into Ethanol?
- A. When sodium metal piece is dropped in ethanol, liberate hydrogen with a 'pop' sound and form sodium ethoxide.



Ethane Sodium Sodium ethoxide

7. What are the various possible structural formula of a compound having molecular formula  $\text{C}_3\text{H}_6\text{O}$ ? Give the IUPAC names of it?
- A. The compound of  $\text{C}_3\text{H}_6\text{O}$  exhibits the following Isomers.



8. A mixture of oxygen and ethyne is burnt for welding can you tell why a mixture of ethane and air is not used?
- A. When ethyne is burned with oxygen it provides a clear flame, along with temperature  $3000^\circ\text{C}$  as a result of complete burning this Coly Acetylene flame is utilized for welding.

But Ethyne is burnt in air it provides a sooty flame. It is because of incomplete combustion due to limited available of air it is not suitable for welding process.

## 2 Marks (Additional Questions)

- Write any four differences between Alkanes and Alkenes?
- Explain the saturated and unsaturated Hydrocarbons with an examples?
- What is a Hydrogenation of oils? Write any uses of it?
- Define homologous series of carbon compounds? Mention any two characteristics of homologous series?
- Two carbon compounds A and B have molecular formula  $\text{C}_3\text{H}_8$  and  $\text{C}_3\text{H}_6$  respectively. Which one of the two is most likely to show addition justify your answer?

6. Is graphite good conductor of electricity? Explain?
7. Graphite is used as a lubricant. Why? Explain?
8. What are the Hydrophobic and Hydrophilic nature? What is the role in soap?
9. Draw the diagram of soap molecule?
10. The bond Angle of Methane is  $109^{\circ}28'$  explain?
11. Write a suitable chemical equation of ethanol which is obtained from ethane?
12. What are the important characteristics of a "Graphene"?

#### 4 Marks questions

1. An organic compound with molecular formula  $C_2H_4O_2$  produces brick effervescence as addition of sodium carbonate/bicarbonate answer the following questions?
  - a) Identify the organic compound      b) Name the gas evolved
  - c) How will you test the gas evolved
  - d) Write the chemical equation for the above reaction
  - e) List any two important uses of compounds?
- A.
  - a) This is Ethanoic Acid ( $C_2H_4O_2$  (or)  $CH_3COOH$ )
  - b) Carbon dioxide ( $CO_2$ )
  - c) When the evolved gas ( $CO_2$ ) is allowed to pass through lime water. It turns to milky white.
  - d)  $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 \downarrow + H_2O$
  - e) Uses: - 1) Ethanoic Acid is used as vinegar for preservative in pickles  
2) It is used in manufacture of Acetone, esters in perfumes, dyes and plastics.
2. Explain the cleaning action of soap?
- A. Process of cleaning action of soap: -
  1. Soap and detergent makes oil and dirt present on the cloth come out into water, thereby making the cloth clean.
  2. Every soap molecule has two parts namely hydrocarbon and (non polar) and carboxyl end (polar)
  3. Hydrocarbon end is known as hydrophobic and carboxylend is known as hydrophilic end.
  4. When a dirty cloth is inserted in the solution then the hydrocarbon end (Hydrophobic) sticks to the dirt or oil and second part of Hydrophilic end directed toward the water side.
  5. The molecule of soap surround the dirt particles at the centre of the cluster and form a spherical structure called miscall.
  6. With little agitation the dirt particles get entrapped by the soap miscalls and get dispersed in water.
  7. Due to which the soap water gets dirty and cloth gets cleaned.

3. Explain the structure of graphite in terms of bonding and give a property based on this structure?

A. Structure of Graphite: -

1. Graphite forms a two dimensional layer structure with c - o bond within the layers.
2. The c - c bonds relatively weak between the layers.
3. In the layer structure each carbon undergoes  $Sp^2$  hybridization interaction between  $Sp^2$  orbital's leads to the formation of c - c bonds.
4. Each carbon atom is with an unhybridized 'P' orbital's laterally overlap and forms ' $\pi$ ' bonds are delocalized over the layer.
5. In a layer structure, the carbon atoms are in a trigonal planar environment.
6. The interaction forces or van der Waals forces between the layers which are separated by a distance of  $3.35\text{\AA}$  are weakened by the presence of water molecules so that it is easy to leave graphite.
7. For this reason graphite is used as lubricant and as the lead in pencils.

4. Explain the formation of Acetylene ( $C_2H_2$ ) molecule?

(or)

Explain  $sp$  hybridization with an example?

A.  $Sp$  Hybridization: By intermixing one s - orbital (2s) and one p - orbital (2p) and reshuffling to form two  $sp$  orbital's in hybridization is called  $sp$  hybridization.

Ex: Acetylene ( $C_2H_2$ )

Formation of Acetylene molecule:

- 1) The electronic configuration of carbon in excited state is  
 $1s^2 2s^1 2p_x^1 2p_y^1 2p_z^1$   
 $\boxed{\uparrow\downarrow} \quad \boxed{\uparrow} \quad \boxed{\uparrow\uparrow\uparrow}$
- 2) In excited state each carbon atom undergoes  $sp$  hybridization in Acetylene ( $C_2H_2$ ) by mixing its one 's' orbital and one 'p' orbital and reshuffling to form two identical  $sp$  - orbital's.
- 3) Each carbon atom has two unhybridized 'p' orbital's ( $2p_x, 2p_z$ )
- 4) One  $Sp$  - orbital's of a carbon overlaps the  $sp$  orbital of other carbon to give  $sp - sp$  sigma ( $\sigma$   $sp - sp$ ) bond.
- 5) The other  $sp$  orbital of each carbon atom overlaps 's' orbital of a hydrogen atom to form a  $s - sp$  sigma ( $\sigma$   $sp - s$ ) bond.
- 6) The unhybridized p orbital's of one carbon atom laterally overlap the unhybridized 'p' orbital's of other carbon atom to give two ' $\pi$ ' bonds between two carbon atoms.
- 7) Thus Ethyne molecule has three ' $\sigma$ ' bonds and two ' $\pi$ ' bonds this shown as figure

DIAGRAM



#### 4 Marks Additional question

1. State the hybridization and explain the  $sp$ ,  $sp^2$ ,  $sp^3$  hybridization with an example?
2. Explain the formation of structure of methane?
3. "Carbon has tetra valency informing covalent bonds" explain it?
4. Write a short notes as the following
  - a) Substitutional reactions
  - b) Additional reactions
5. 1 ml glacial acetic acid and 1ml of ethane are mixed together in a test tube in the presence of  $H_2SO_4$  based as this reactions  
Answer the following questions.
  - a) Write a chemical equation of the above reactions?
  - b) What term is given to such a reactions?
  - c) What are the special characteristics of the compound formed?
6. How do you cardamom the use of alcohols as a social practice?
7. Explain how the police detect whether suspected drivers have consumed alcohol or not?

#### 5 Marks questions

1. Draw the diagram showing  $Sp^2$  hybridization in "Ethene"?  
A. Page No 307 (Text book)
2. Draw the diagram showing  $sp$  hybridization in "Ethene"?  
A. Page No 308 (Text book)
3. Draw a neat diagram of Diamond and Graphite?  
A. Page No 309 (Text book)
4. Draw the diagram showing  $sp^3$  hybridization in "Methane"?  
A. Page No 306 (Text book)

#### I Multiple Choice Questions

1. Which of the following solution of Acetic acid in water can be used as preservative
  - a) 5 – 10%
  - b) 10 – 15%
  - c) 15 – 20%
  - d) 100%
2. Which are of the following hydrocarbon can shown isomerism [      ]
  - a)  $C_2H_4$
  - b)  $C_2H_6$
  - c)  $C_3H_8$
  - d)  $C_4H_{10}$
3. A fens drops of ethanoic acid were added to solid sodium carbonate the possible results of the reactions are [      ]
  - a) A hissing sound was evolved
  - b) Broun's fames evolved
  - c) Brisk effervescence occurred
  - d) A pungent smelling gas evolved.



4. The suffix used for naming an aldehyde is [      ]  
 a) -ol              b) -al                      c) -One                      d) -ene
5. When acetic acid reacts with ethyl alcohol, we add  $\text{Co}_4 \text{H}_2\text{So}_4$  it acts as \_\_\_\_\_ and the process is called [      ]  
 a) Oxidizing agent, sapanification              b) Dehydrating agent, esterification  
 c) Reducing agent, esterification              d) Acid, esterification
6. The general formula of a alkane is [      ]  
 a)  $\text{C}_n\text{H}_{2n+2}$               b)  $\text{C}_n\text{H}_{2n-2}$     c)  $\text{C}_n\text{H}_{2n}$                       d)  $\text{C}_n\text{H}_{2n+1}$
7. Marsh gas of the following [      ]  
 a) Methanal              b) Methanol    c) Methanoic Acid    d) Methane
8. The amorphous allotrope of carbon is [      ]  
 a) Diamond              b) Graphite    c) Coal                      d) Buck Minster fullerene
9. The bond angle in Acetylene molecules is [      ]  
 a)  $109^\circ.281$               b)  $180^\circ$                       c)  $120^\circ$                       d)  $90^\circ$
10. The first organic compound synthesized in the laboratory is [      ]  
 a) Ammonia              b) Alcohol    c) Urea                      d) Acetic Acid

## II Fill in the Blanks

1. A compound which is basic constituent of many cough syrups \_\_\_\_\_
2. Type of reactions shown by alkanes is \_\_\_\_\_ reactions.
3. Very dilute solution of ethanoic acid is \_\_\_\_\_
4. The hydrogenation of oils using \_\_\_\_\_ as catalyst.
5. Ester contain the functional group \_\_\_\_\_
6. Molecular formula of stearic acid is \_\_\_\_\_
7. A spherical aggregate of soap molecule in water is called \_\_\_\_\_
8. Nanotubed was discovered by \_\_\_\_\_
9. Alkaline  $\text{KMnO}_4$  is known as \_\_\_\_\_ reagent.
10. IUPAC name of alkene containing 3 carbon atoms is \_\_\_\_\_

## III Matching

### Group A

- 1 Aldehyde
- 2 Ether
- 3 Amine
- 4 Ketane
- 5 Alcohol

### Group B

- |          |   |                                   |
|----------|---|-----------------------------------|
| [      ] | A | $\text{C}_3\text{H}_2\text{NH}_2$ |
| [      ] | B | $\text{CH}_3\text{COCH}_3$        |
| [      ] | C | $\text{CH}_3\text{CH}_2\text{OH}$ |
| [      ] | D | $\text{CH}_3\text{CHO}$           |
| [      ] | E | $\text{CH}_3\text{OCH}_3$         |

**Group A**

- 1 Ethane
- 2 Hexane
- 3 Pentane
- 4 Hexane
- 5 Acetelen

**Group B**

- |         |   |             |
|---------|---|-------------|
| [     ] | A | $C_6H_{14}$ |
| [     ] | B | $C_6H_{12}$ |
| [     ] | C | $C_5H_{10}$ |
| [     ] | D | $C_2H_2$    |
| [     ] | E | $C_2H_6$    |

**ANSWERS**

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

- II    1. Ehtanol   2. Substitution                    3. Vinegar   4. Nickel (Ni)  
      5. -Coor    6.  $C_{17}H_{35}COOH$    7. Miscelle   8. Sumioli Jima  
      9. Bayer's reagent                                10. 1 – Propene

- III    1. D   2.E   3.A   4.B   5.C  
      1.E   2.A   3.C   4.B   5.D

DCEB-KADAPA

DCEB-KADAPA

DCEB-KADAPA