

SECTION A

Q1 a) gases

- b) The combining capacity of an element is known as valency.
- c) Atoms of different elements having same mass no. and different atomic no. are called isobars.
- d) one unit (-)ve charge.
 -1.9×10^{-19} coulombs
- e) The total no. of neutrons & protons present in the nucleus of the atom are called mass no.
$$A = n + p$$
- f) Chadwick
- g) The solution whose pH does not change by adding small amount of acid/base, is called buffer solution.
- h) A homogeneous mixture of two or more substances is called solution.
solution = solute + solvent
- i) The water which does not form lather with soap is called hard water.
- j) The hardness due to the presence of chlorides and sulphates of calcium and magnesium in water is called permanent hardness.
It cannot be removed by boiling.

k) 0.204 g / 1000 mL MgSO_4 .

$$1 \text{ g} = 1000 \text{ mg}$$

$$1000 \text{ mL} = 1 \text{ L}$$

$$0.204 \times 1000 \frac{\text{mg}}{\text{L}} = 204 \text{ mg/L}$$

e) Mercury vapour lamp

m) The process of gaining of electrons is known as reduction.

n) Acids - H_2SO_4
Salts - $NaCl$.

o) The substances which do not allow electricity to pass through them are called insulators.

p) Carbon can form 4 covalent bonds. This property of carbon is known as tetravalency.

q) Aliphatic compounds having at least one carbon-carbon double bond ($C=C$) are called alkenes.

r) $>COOH$

SECTION B

Q2 i) CH_3CONH_2

C_2H_5ON

$$(2 \times 12) + (5 \times 1) + (1 \times 16) + (1 \times 14) \\ 24 + 5 + 16 + 14 \\ = 59$$

$$\% C = \frac{24}{59} \times 100 = 40.68\%$$

$$\% H = \frac{5}{59} \times 100 = 8.47\%$$

$$\% O = \frac{16}{59} \times 100 = 27.12\%$$

$$\% N = \frac{14}{59} \times 100 = 23.73\%$$

ii) <u>Compound</u>	<u>Mixture</u>
1) formed by chemical change	1) formed by physical change
2) The properties of compound are different from the properties of constituents.	2) The properties of mixture are sum total of properties of constituents.
3) Constituents are present in fixed ratio.	3) Constituents are present in any ratio.
4) Constituents can not be separated by simple method.	4) Constituents can be separated by simple method.

iii) a) ${}_{11}^{23}\text{Na}$ $A = 23, Z = 11, P = Z = 11$
 $e = P = 11$
 $n = A - Z = 23 - 11 = 12$

b) ${}_{19}^{39}\text{K}$ $A = 39, Z = 19, P = Z = 19, e = P = 19$
 $n = A - Z = 39 - 19 = 20$

iv) Metallic bond is the electrostatic attractive force between the delocalized electrons gathered in an electron sea and positively charged metal ions.

Dr Lorentz in 1923 proposed the electron sea model to explain metallic bond.

Various features of electron sea model are -

- i) The metal atom consists of 2 parts - valence electron, and the remaining part (the nucleus and inner shell) called kernels.
- ii) The kernels of metal atoms are positively charged. They occupy fixed positions.
- iii) The space between the kernels is occupied by valence electrons.

iv) Valence e^- can leave one kernel and enter into the influence of another kernel. These e^- are called delocalized e^- .

v) The strength of metal bond is directly proportional to the no. of valence e^- .

vi) Difference b/w sigma and pi bond.

Sigma bond

1) formed by axial overlap of atomic orbitals

2) The overlap is quite large and the Bond is quite strong.

3) S-orbitals can take part in the Sigma Bond formation.

4) The electron cloud of the molecular orbitals is symmetrical around the inter-nuclear Axis.

5) The Bond can be formed in the absence of π Bond.

pi bond

1) formed by lateral overlap of atomic orbitals

2) The overlap is less and the Bond is comparatively weak.

3) S-orbital do not take part in the π -Bond formation.

4) The electron cloud is unsymmetrical.

5) The Bond cannot be formed in the absence of π Bond.

vi)(a) ISOTOPE :-

Atoms of an element which contain the same atomic number but different Mass numbers are called isotopes.

(b) Causes of hardness of water :-

Hardness of water is due to the presence of the following dissolved salts in it :-

(a) Bicarbonates of Calcium and Magnesium
 $\text{Ca}(\text{HCO}_3)_2$, $\text{Mg}(\text{HCO}_3)_2$

(b) Chlorides of Calcium and Magnesium
 CaCl_2 , MgCl_2

(c) Sulphates of Calcium and Magnesium
 CaSO_4 , MgSO_4

vii.) Molarity :- Molarity of a solution may be defined as the number of moles of the solute dissolved per litre of the solution.

Normality :- Normality of a solution may be defined as the number of gram equivalents of the solute dissolved per litre of the solution.

ix.) Qualities of Drinking Water :-

- i. It should be transparent, tasteless, colourless and odourless.
- ii. It should be free from suspended impurities.
- iii. It should not contain germs, bacteria which cause diseases.
- iv. It should be reasonably soft.
- v. It should be good to taste.
- vi. It should be free from iron.
- vii. It should be free from objectionable gases and minerals.

viii) given $w = 3.0 \text{ g.}$
 $M = 250 \text{ g.} = \frac{250}{1000} \text{ kg.} = 0.25 \text{ kg.}$
 mo. mass = 60

$$\text{no. of moles} = \frac{3}{60} = 0.05$$

$$\text{molality (m)} = \frac{\text{moles of solute}}{\text{mass of solvent}}$$

$$= \frac{0.05}{0.25} = 0.2 \text{ m}$$

x) Caustic Embrittlement - Cracking of boiler material due to the presence of alkali substances in water is called caustic embrittlement.

Causes - 1) Presence of NaOH in water
 2) Presence of Na_2CO_3 in water

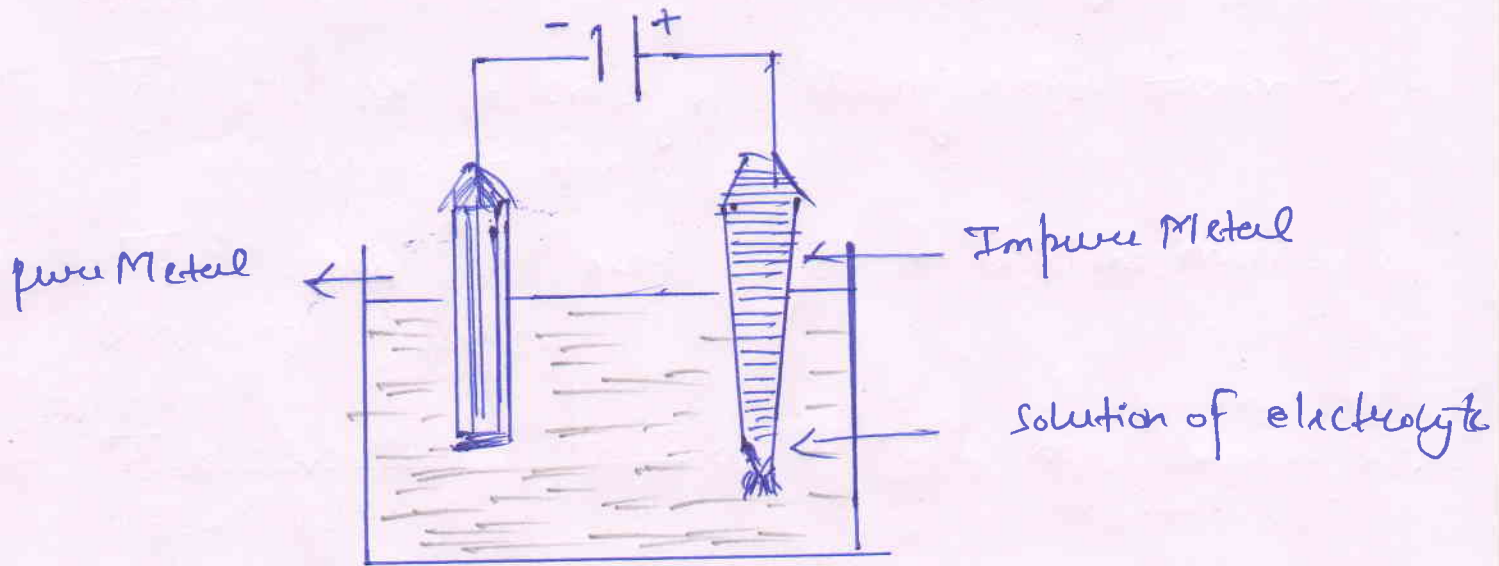
Disadvantages - 1) The life of the boiler decreases.
 2) The joints of boiler, pipes start leaking.
 3) The efficiency of boiler decreases.
 4) The cost of repair and maintenance increases.

Prevention - 1) water should be free from oil, suspended impurities.

2) It should be free from alkali substances.
 3) water should be replaced from time to time.

xii) Electro - Refining :

The process of removal of impurities from an impure metal by electrolysis is called electro-refining. Metals like copper, silver, gold, tin etc.

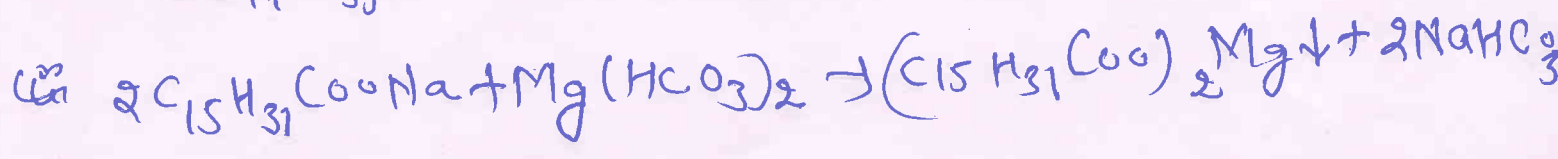
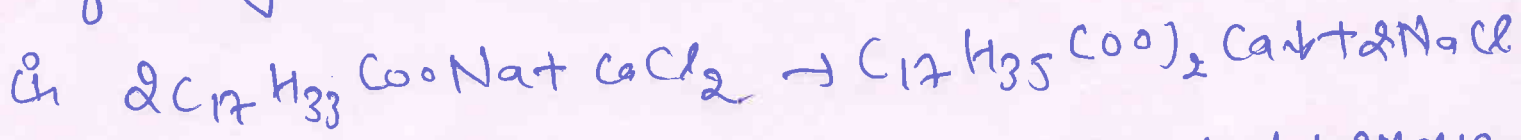


The impure metal is made the anode in an electrolytic bath containing the solution of suitable salt of metal. The cathode is made of a thin plate of pure metal. On passing electric current, pure metal from the electrolyte deposit on the cathode and an equivalent amount dissolves from the anode. The impurities present generally fall at the bottom as 'Anode Mud'.

xiii) Action of Soap on hard water :-

Soap reacts with soluble salt of calcium and magnesium present in hard water to form insoluble curdy precipitates according to the

following equation.



Thus, the hard water insoluble precipitates with soap and hence prevents the formation of lather.

~~xiv~~ xiv) Aliphatic Compounds - The compounds which contain an open chain of carbon atoms in their molecule are called Aliphatic Compounds.

eg. Methane - CH_4

Ethane - C_2H_6 .

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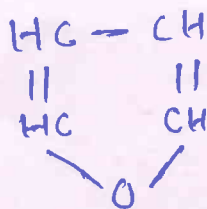
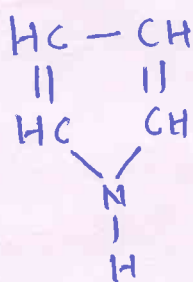
xiii) Faraday's II law of Electrolysis :-

According to this law, when the same quantity of electricity is passed through the solution of different electrolytes connected in series, the masses of the substances produced at the electrodes are directly proportional to their equivalent masses.

formula, $\frac{W_1}{W_2} = \frac{E_1}{E_2}$

xv) Heterocyclic Compound :-

The cyclic compound in which the ring consists of atoms of more than one kind are called heterocyclic compounds. In addition to the carbon atom, the rings have one or more atoms of N, O, or S. examples of heterocyclic -



~~xiv) Aliphatic Compound :-~~

~~According to the IUPAC system, the name of compound consists of three parts. These are :-~~

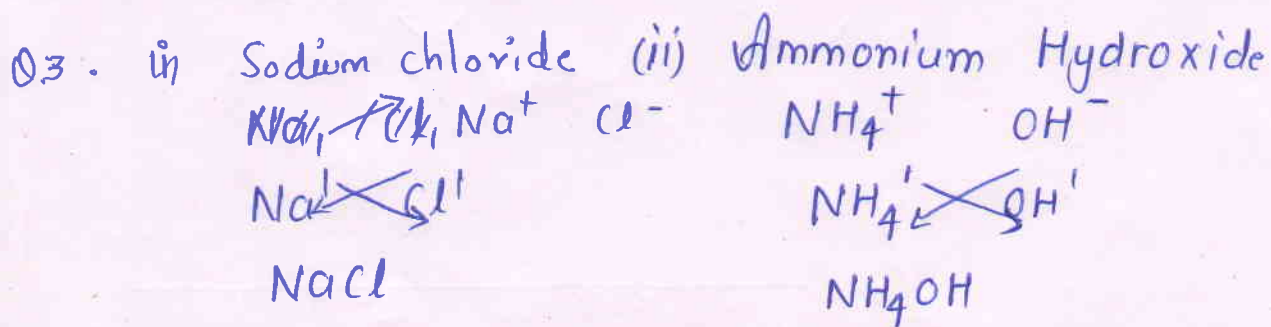
~~1) Word Root 2) Suffix 3) Prefix~~

~~Word Root :- It is the basic unit of IUPAC Name.~~

~~It denotes the number of carbon atoms present in a suitably straight chain called parent chain.~~

- ii) Suffix :- It is the part of IUPAC name which is attached at the end of word root. It shows the saturated or unsaturated nature of the parent chain and the functional group present.
- (iii) Prefix :- It is the part of IUPAC name which is written before the word root. There are two types of prefixes.
- iv) Primary prefix :- A primary prefix cycle, is used immediately before the word root in case of alicyclic compound.
- v) Secondary prefix :- A secondary prefix is added before the word root in alphabetical order to denote the side chain.

Section - C



ii) pH Industrial applications :-

- i) pH has a great importance in certain industrial process linked with paper, dyes, paints and ink industries etc.
- ii) The control of pH of the medium is very important in the preservation of food.

- 3.) for having a smooth, fine and long lasting deposition on the articles to be electroplated, the pH of the electrolyte used has to be adjusted to a proper value.
- 4.) There are certain industries which are located at the Bank of the rivers and streams.
- 5.) The pH value of the waste water is adjusted at about 7.
- 6.) The pH of water is adjusted at about 7 to 10.
- 7.) Hard water used in Boiler forms scale and sludge on the inner sides of the boiler plates.
- 8.) If pH value of ~~waste~~ water used is high, the tendency of scale sludge formation increases.
- 9.) Water is used in nuclear reactors as a coolant.
- 10.) Water removes heat from the reactors and keeps them at a proper temperature.

Q.5 Chlorination :-

Chlorination is the most widely used disinfectant throughout the world. Chlorination can be carried out by following methods :-

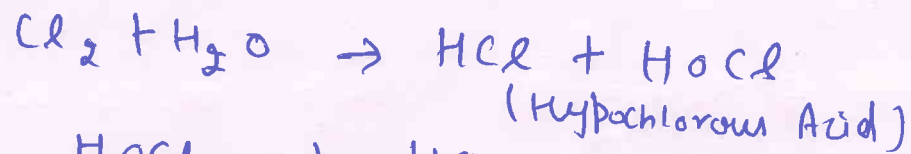
- a) By using chlorine as a gas or a concentrated aqueous solution form.

b) By adding Bleaching powder

c.) By using chloramine.

a) By Using chlorine gas (Cl_2) :-

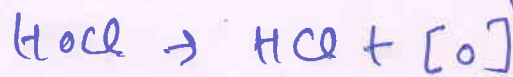
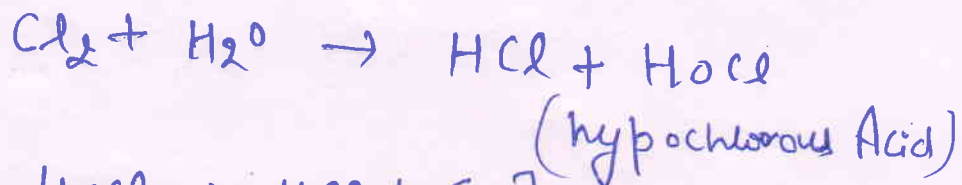
Chlorine can be used directly as a gas or as chlorine water for sterilization in Municipal town water supply.



Nascent oxygen

B.) By adding Bleaching powder (CaOCl_2) :-

Bleaching powder contains CaCl_2 and $\text{Ca(OH)}_2 \cdot 2\text{H}_2\text{O}$ which has about 30% available chlorine. It reacts with water to form hypochlorous Acid and Nascent oxygen, both of which are powerful germicides.

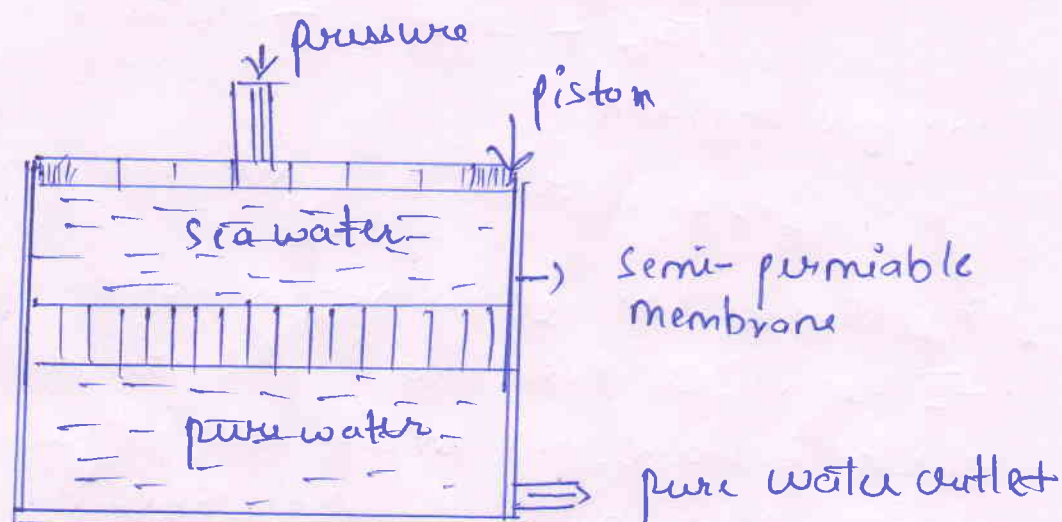


(Nascent oxygen)

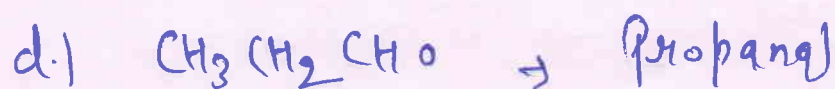
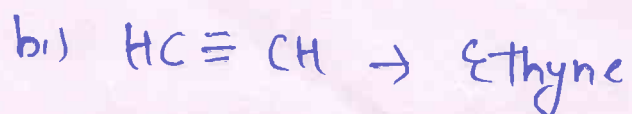
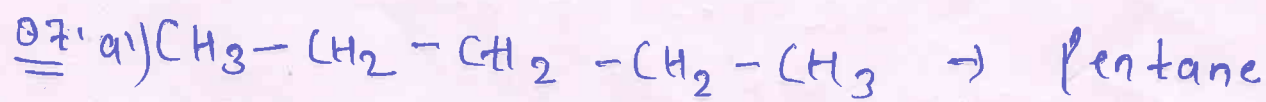
(b) Reverse Osmosis :-

This Method removes ionic as well as non-ionic called high Molecular mass organic Matter.

Principle :- When two solutions of unequal concentration are separated by a semi-permeable membrane, flow of solvent takes place from dilute to concentrated side due to osmosis. The pressure on the highly concentrated solution side due to the process of osmosis is known as osmotic pressure. If the hydrostatic pressure is excess of osmotic pressure is applied on the concentrated side. This is the principle of Reverse Osmosis.

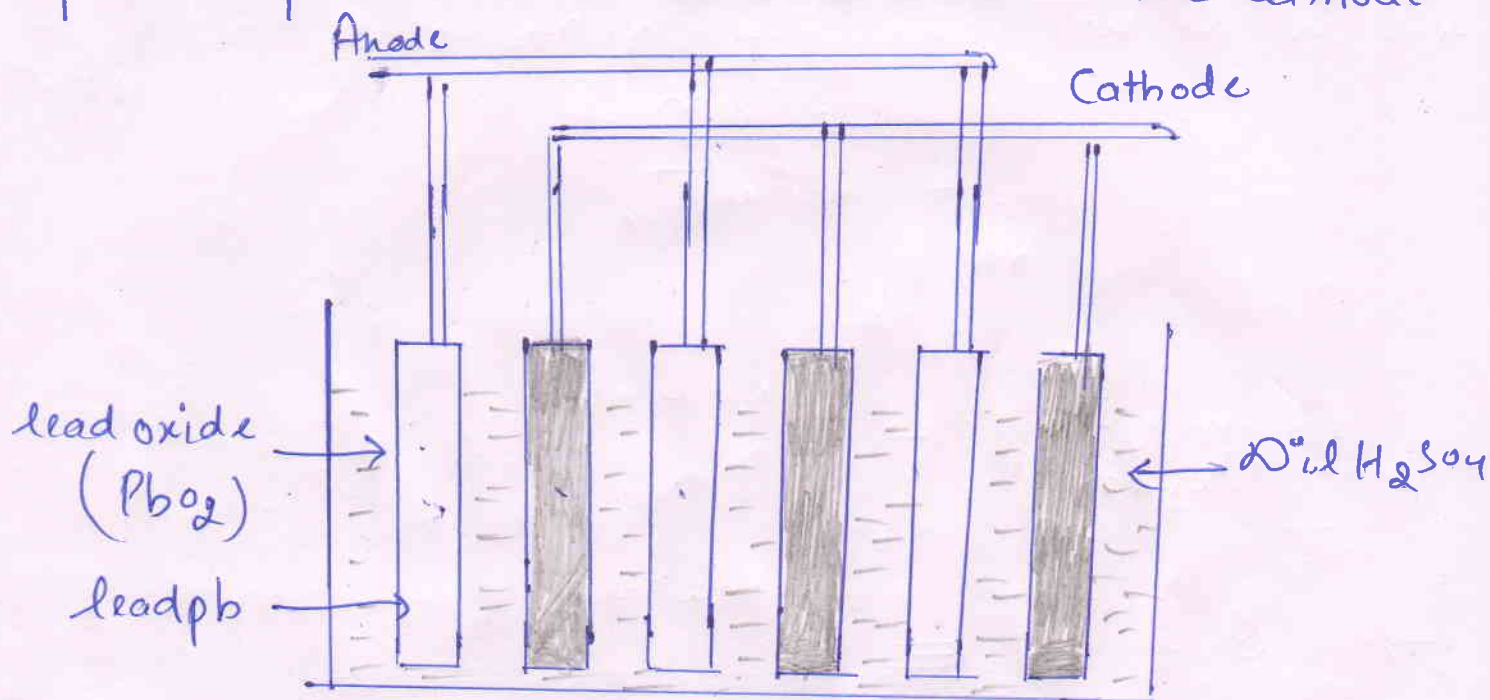


Thus pure water is obtained, which does not contain dissolved undesirable salts.

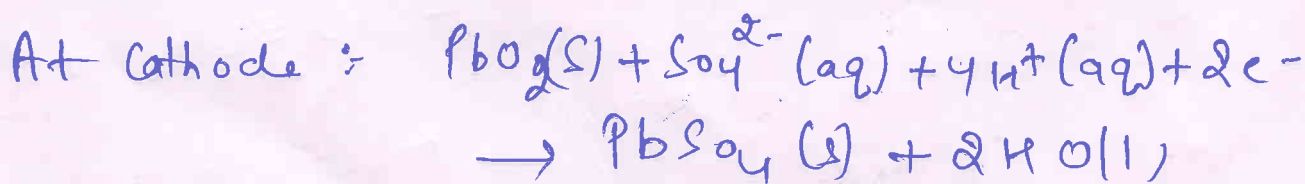
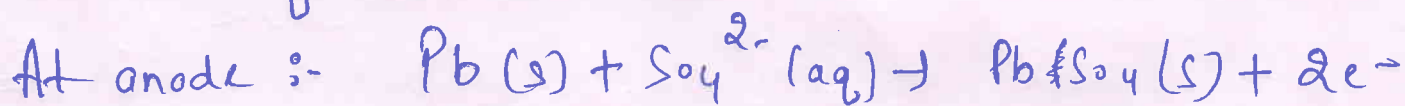


Q.6 Lead Acid Battery :-

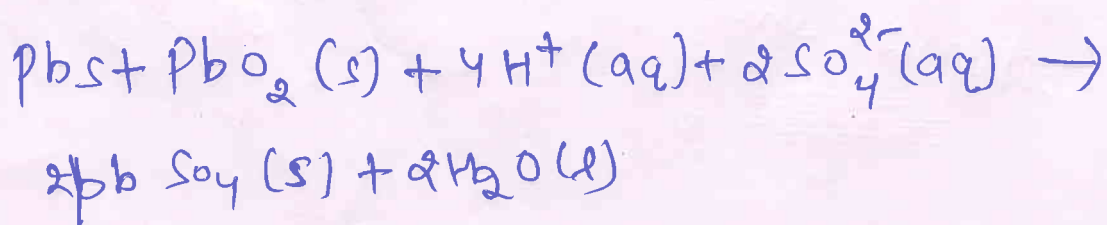
This is the most commonly used battery in automobiles. As the voltage of individual cell is only 2 V, therefore 3 or 6 such cells are connected in series to get 6 V or 12 V battery. Each cell consists of a lead anode and a grid of lead packed with lead dioxide as the cathode.



The electrode reaction which occur during discharging are as follows :-



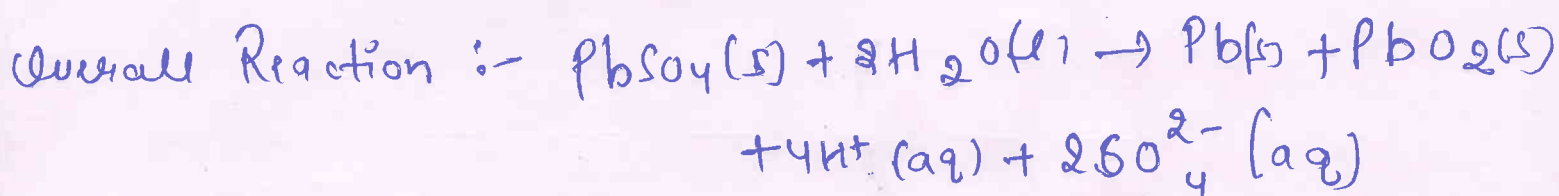
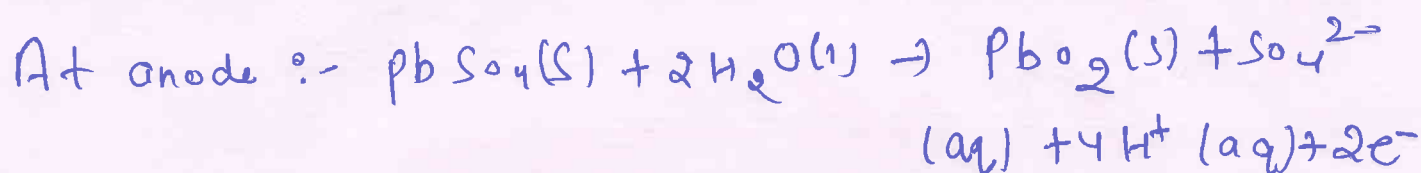
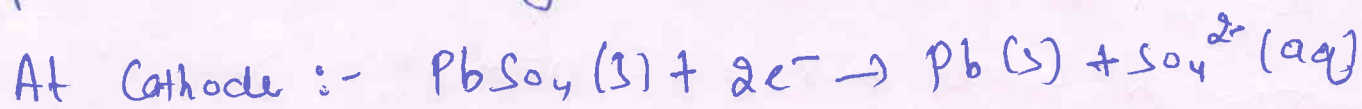
Overall reaction :-



It is clear from the above reaction that H_2SO_4 is used up during the discharging.

Recharging the Battery :-

The Battery can be charged By passing electric current of a suitable voltage in the opposite direction.



Recharging is possible in this case because $PbSO_4$ formed during discharging is a solid and sticks to the electrodes. Therefore, it can either take up or give electrode during recharging.

Q.4 The Lewis Concept By suggesting that when the both atom taking part in a chemical combination are short of electrons than the nearest noble gas configuration.

They are formed as a result of covalent Bond. Covalent formed mostly occur in the form of liquid or gases at room temperature.

They are mostly non-polar in nature.
 They bond in their compound is rigid and directional
 Examples are - H_2 , O_2 , H_2O

Characteristics of Covalent Bond:-

- i) The shape of molecules containing covalent bond.
- ii) The release of energy during the formation of a covalent bond.
- iii) The atoms are held together in the molecules like H_2 , Cl_2 etc.
- iv) Two important theories of covalent bond formation are
 - i) valence bond theory
 - ii) Molecular orbital theory.
- v) They are generally liquids or gases.
- vi) They have low m.p. & b.p.
- vii) They are insoluble in water and soluble in the organic solvents.

eg. HCl - $H = 1$, $Cl = 2, 8, 7$

