

Group A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following :

10×1=10

(i) van der Waals type of bond is formed by

- (a) sharing of electrons (b) transferring of electrons from one atom to the other
(c) sharing of electrons by one atom only (d) weak electrostatic force of attraction among fluctuating dipoles.

(ii) Which of the following defects arises due to misplace of ions in a crystal lattice?

- (a) Schottky defect (b) Frenkel defect (c) Metal excess defect (d) Non-stoichiometric defect.

(iii) The coupling between base units of DNA is through

- (a) Covalent bonding (b) Electrovalent bonding
(c) van der Waals forces (d) Hydrogen bonding.

(iv) CO₂ is isostructural with

- (a) C₂H₂ (b) HgCl₂ (c) NO₂ (d) NH₃

(v) ZnO is white when cold and yellow when hot, this is due to

- (a) charge transfer (b) d-d transition (c) metal excess defect (d) none of these

(vi) The phenomenon of superconductivity was coined by

- (a) Carnot (b) C.V. Raman (c) Einstein (d) Kammerlingh Onnes

(vii) The presence of intermolecular and intramolecular hydrogen bonding is distinguished by

- (a) UV-Visible spectroscopy (b) IR-spectroscopy
(c) ¹H-NMR spectroscopy (d) Both IR and ¹H-NMR spectroscopy.

(viii) Caprolactum is a monomer of

- (a) Bakelite (b) PVC (c) Nylon-66 (d) Teflon

(ix) The ion conductance of an ion depends on its

- (a) charge only (b) speed only
(c) charge and speed (d) charge, speed and hydration

(x) Anomalous expansion of water from 0°-4°C occurs due to

- (a) van der Waals interaction (b) hydrogen bonding
(c) non-covalent weak interaction (d) dipole-induced dipole interaction

(xi) The hybridization of Xe in XeF₂ is

- (a) sp (b) sp³ d² (c) sp³ (d) sp³ d.

- (xii) $[\text{Co}(\text{NH}_3)_5\text{CN}]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5\text{NC}]\text{Cl}_2$ are
 (a) coordination isomers (b) geometrical isomers
 (c) linkage isomers (d) ionization isomers.

Ans. Q.1. (i) d ; (ii) a/d ; (iii) d ; (iv) a ; (v) c ; (vi) d ; (vii) b ; (viii) nylon 6 (All the options are incorrect) ; (ix) d ; (x) b ; (xi) d ; (xii) c.

Group - B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. Define ionic mobility. Mention the unit of equivalence conductance and ionic mobility. How does equivalence conductance vary with concentration for both strong and weak electrolytes? 1+1+3

Ans. Ionic mobility : The velocity with which an ion moves under a potential gradient of 1 volt/m. or 1 volt/cm in a solution is called absolute ionic velocity or ionic mobility.

$$\text{Ionic mobility} = \frac{\text{velocity}}{\text{voltage / distance}}$$

Unit of Equivalent conductance : $\text{Ohm}^{-1} \text{cm}^2 \text{gm-eq}^{-1}$ (C.G.S.)

$\text{Ohm}^{-1} \text{m}^2 \text{gm-eq}^{-1}$ (S.I.)

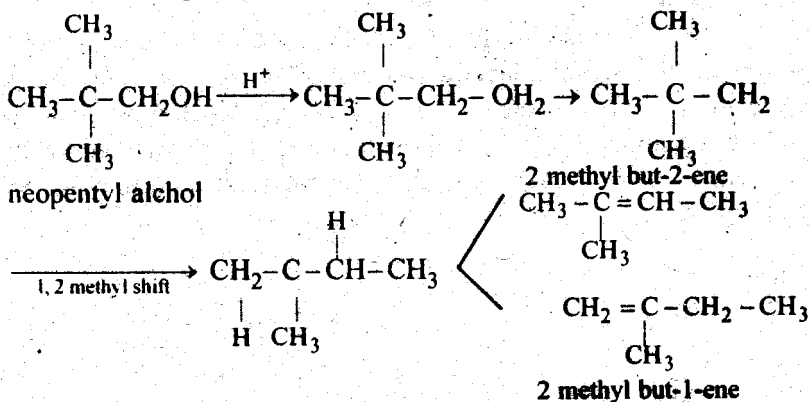
& Ionic mobility : $\text{cm}^2 \text{s}^{-1} \text{v}^{-1}$ (C.G.S.)
 $\text{m}^2 \text{s}^{-1} \text{v}^{-1}$

Variation of equivalent conductance with concentration for strong & weak electrolytes : The equivalent conductance or the molar conductance (A_m) of an electrolytes increases with decrease in concentration of electrolyte or with increase in its dilution. Equivalent conductance of strong electrolytes like HCl, KCl, CaCl_2 , CH_3WONa , etc with concentration have a comparatively small increase through they have very high equivalent conductance at or binary temperature ; where as weak electrolyte, like CH_3COOH show marked increase in equivalent conductance at high dilution.

This is due to the result of an inter ionic attraction between (+)ve and (-) ve ions. The two opposite ions may even give rise to some ion pair of the type (A+B). This type of interionic attraction effectively reduces the speed of the ions and ultimately reduce the equivalent conductance of the electrolytic solution. But when concentration is lowered by increasing the dilution, the ions go far apart, the interionic forces are reduced. Then the ions can move freely. So in that case conductance can be increased with delution.

3. Write down the possible products on the dehydration of neopentyl alcohol. Write down the main features of transition state theory. What is the unit of rate constant of a second order reaction? 2+2+1

Ans. Possible products on the dehydration of neopentyl alcohol :



Main features of transition state theory :

- (i) The reacting molecular, possession necessary energy approach to form an activated complex by rearrangement of atoms.
- (ii) The energy necessary to approach the reactant molecular to form this transition state or activated complex is the energy of activation.
- (iii) For normal or direct reactions, the activated complex formed is assumed to be in equilibrium with reactant.
- (iv) The activated complex is not a stable species or a reaction intermediate. It is very short lived.
- (v) The potential energy of the activated complex is very high compared to that of the reactant as well as product.
- (vi) Transition state does not represent an observable, but can be assumed to possess properties such as bond length, molecular weight, enthalpy, etc.
- (vii) The activated complex subsequently breaks up into products.

The unit of rate constant if a second order reaction is $\text{litre mole}^{-1} \text{sec}^{-1}$.

4. (a) What is pseudo-unimolecular reaction ? Give one example.

(b) Explain the physical significance of activation energy.

3+2

Ans. (a) Pseudo-Unimolecular reaction : Those reactions which are bimolecular but are of 1st order are called pseudo unimolecular reaction example : **Hydrolysis of an ester in presence of mineral acid.** Hydrolysis of esters in presence of mineral acids follows first order kinetics. eg. hydrolysis of ethyl acetate in presence of HCl.



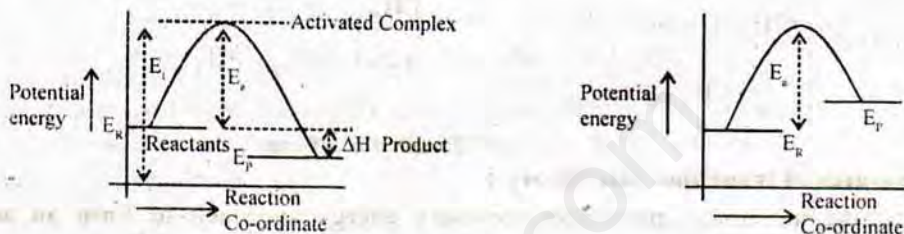
Here HCl acts as a catalyst and does not take part in the rate equation. The reaction is bimolecular. However the rate of reaction is given by the rate.

$$\text{rate} = K [\text{ester}]$$

This is because the water is present in large excess and its active mass remains practically constant. Therefore its active mass gets included in the constant. Since the rate of the reaction

is determined by one concentration term only i.e. ester, the reaction is 1st order. So such reaction is called pseudo-unimolecular reaction.

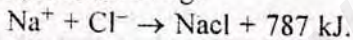
Ans. (b) A chemical reaction occurs as a result of collision between reacting molecules possessing sufficient high energy to react. Molecules possessing energy less than threshold energy, simply collide and rebound without reacting. The extra energy which must be given to molecules to enable them to bring about effective collisions is called activation energy (E_a). A reaction whose activation energy is high will proceed at slow rate and a reaction whose E_a value is low will proceed at high rate.



when $\rightarrow E_R > E_P$, the reaction is exothermic

5. Define lattice energy and hybridization. Arrange the following ionic crystals in order of their increasing lattice energy: LiF , CaF_2 and MgS . 3+2

Ans. Lattice Energy: The lattice energy of an ionic compound is defined as the amount of energy released when oppositely charged ions get packed closely to form one mole of crystalline solid. eg.



Higher lattice energy means greater stability of ionic compound and greater attraction between the cations and anions.

Hybridization: Hybridization is the concept of intermixing of the orbitals of an atom having nearly the same energy to give exactly equivalent orbitals with same energy, identical shapes and symmetrical orientations in space. eg. sp hybridization is formed by mixing of s & p orbital of an atom.

The order of the following ionic crystal in order of their increasing lattice energy is—
 $\text{LiF} < \text{CaF}_2 < \text{MgS}$

6. What is LPG? Why is it used as a domestic fuel? Define Octane number of a fuel and explain how the Octane number can be improved? 1+1+3

Ans.: Q.6. Same as Q.6. 2006.

Group - C

(Long Answer Type Questions)

Answer any *three* of the following.

$3 \times 15 = 45$

7. (a) Distinguish between SN_1 and SN_2 mechanisms with suitable examples. Discuss the role of solvents in SN_1 reactions. 4+2

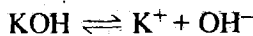
(b) State and explain Hess's law with examples. How does it follow the first law of thermodynamics? 2+2

(c) Using Carnot cycle, prove that the efficiency of a heat engine is always less than one. 6+4+5

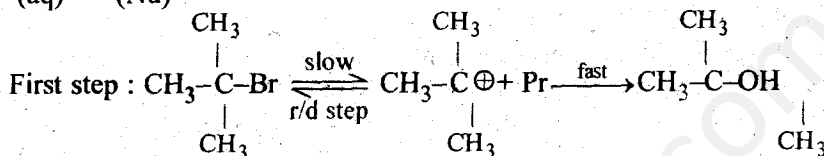
Ans. (a) SN^1 follow first order kinetics ie they are unimolecular.

SN^2 follows 2nd order kinetics ie they are bimolecular.

SN^1 onechanism is generally followed by testitary halides. eg. alkaline hydrolysis of testitary butyl bromide.



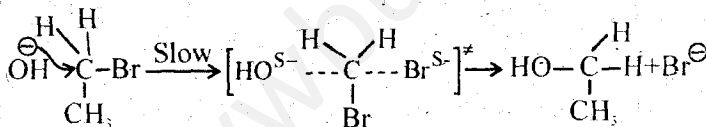
(aq) (Nu)



tert. butyl bromide

tert. butyl bromide

SN^2 mechanism is generally followed by primary halidex. eg. alkaline hydrolysis of ethyl bromide and is a one step onechanism.



SN^1 mechanism are favoured by weak nucleophiles whereas SN^2 mechanism are favaured by strong nucleophiles in the above example OH^- .

SN^1 mechanism are favoured by polar solvents and SN^2 mechanism are favoured by polar aprolic solvents.

Both, back side and front side attack of nudeophile takes place in SN^1 reaction. In case of optical active substrate, configuration dominates because of back side attack till the formation of canbocation.

The nucleophile ex-clusively attacks from back side of substrate in SN^2 reaction. If the substrate in optically active inversion of config takes place.

The electronic factories influence the reaction rates largely in SN^1 mechanism. For the same halogen, the reactivity sequence is tert. > sec. > primary $\approx CH_3X$.

Stenic factors influence the rate if reaction in SN^2 mechanism. The electronic factors do not influence the rate. Thereactivity sequence is $CH_3 > \text{Primary} > \text{Sec.} > \text{tert.}$

Here transition state (T.S.) being more polar man than that of stanting material. This is because, new change is developed and concentrated in the Transition state I (T.S.I) as compared to the stanting material. So in solvents of high polarity, T.S. gets greater stability that of the starting material. As a result, the energy of activation value is decreased and consequently the reaction rate is increased. Moreover, the reaction rate increases with increasing the polarity of solvent, because the stability if carbocation intermediate increases

with increasing the polarity of solvent. Here usually polar protic solvent is used to separate leaving group from carbocation (R^+) is a solvation through intermolecular H-bonding between X^- and H-atom of the solvent molecule. Some example of polar solvent. H_2O , ROH , $RCOOH$, $RCON_2$ etc.

Ans. (b) Hess's law : Same as Q. 10(c) 2007.

Hess's law follows 1st law of thermodynamics : From 1st law of thermodynamics we know, $\Delta E = q - w = q - P\Delta V$

ΔE is a state function and its value depend, only on the initial and final states of the system but not on the path of the transformation. However, the values of q and w depend on the path by which the change is carried out.

At constant volume, $\Delta v = 0$, so $w = 0 \quad \therefore \Delta E = q$

Since ΔE is a definite quantity, therefore at constant volume, q is also a definite quantity. At constant pressure the work done w becomes a definite quantity. Thus at constant pressure, $q = \Delta E + P\Delta v$, becomes a definite quantity. So at constant volume or pressure, the heat evolved or absorbed in the reaction must therefore, Hess's law is only special case of 1st law of thermodynamics.

Ans. (c) Proof : The efficiency of a heat engine is always less than one using Carnot cycle :

When $q_2 = 0$, ie no heat is rejected to the sink.

$$W = q - q_1$$

$$q - q_1 = q \frac{T - T_1}{T} \quad \text{or, } 1 - \frac{q_1}{q} = 1 - \frac{T_1}{T} \quad \text{or, } \frac{q_1}{q} = \frac{T_1}{T} \quad \text{or, } q = q_1 \frac{T}{T_1}$$

$$\text{Therefore } W_{\max} = q \times \frac{T - T_1}{T} = \frac{q_1}{T_1} \times T \times \frac{T - T_1}{T} = \frac{q_1}{T_1} (T - T_1) = 0 \text{ ie no work can be obtained.}$$

Hence to have work, heat must be supplied to the system from the source and moreover some heat must be rejected to the sink by the system ie heat flow from source to sink. So when system does some work, some amount of heat (q_1) must be rejected to the sink.

$$\therefore q - q_1 \text{ must be } < q$$

$$w < q$$

$$\therefore \eta \text{ (efficiency of a heat engine)} < 1$$

$$\frac{q - q_1}{q} < 1$$

ie 100% conversion is not feasible. Thus only a fractional quantity of supplied heat can be converted to work and this fraction is, $\frac{T - T_1}{T}$.

8. (a) What is fingerprint region ? Why is methanol a good solvent for UV but not for IR determination ? What solvents are generally used for IR technique ? Which groups are detected if absorption data are 2841(w), 2755(w), 1686(s), 1605, 1460(m) cm^{-1} ?

(b) What is synthetic metal ? What is electronic polymer ? Write notes on conducting polymers and their importance.

Ans. (a) Finger print Region : The region 1300 to 625 cm^{-1} known as fringer print region. It is here that the pattern of peaks varies from compound to compound. These are some substances containing the same functional group show similar absorption above 1500 cm^{-1} . However absorption positions differ in fingerprint region. This region is very useful in identifying an unknown compound by comparing its IR spectrum will a set of standard spectrum recorded under indentical conditions.

UV spectra are recorded by dissolving the compounds in suitable solvents. A good solvent should be transparent over the desired range of coavelengths. Usually solvent, which do not contain conjugated system are most suitable for running the UV spectrum. Methanol is a good solvent for UV because it is obtained as very high grade purity and it is free from UV absorbing substances.

In case if IR spectra, method is not used as solvent because it is not transparent in the IR range and it has strong IR absorption band. It not only dissolve ont the cells made of rock salt but would also give overlapping bands in certain cases.

The most convenient way to obtain IR spectra of solid substance is to use them in solution form. Effective solvent are those which have poor absorption of their own. No one solvent is transparent in the entire region and the solvent has to be selected keeping in view the region where the compound under study is expected to absorb. The most commonly used solvents in IR spectra scopy are CCl_4 , CHCl_3 and CS_2 .

Cm^{-1}	
2841 (W)	Aliphatic C-H, Aldehyde C-H.
2755 (W)	Aldehyde C-H
1686 (S)	Amide, $> \text{C} = \text{O}$
1605	Aromatic
1460 (m)	Ester (aromatic) $\text{C} = \text{O}$, Amine $\text{C} = \text{N}$

Ans. (b) Synthetic Metal : Polymer that possess the characteristic properties of metals such as electrical conductivity while retaining the mechanical properties processibility, etc commonly associated with conventional polymers are called intvinsically conducting polymers (ICP) or sythetic metal. Example of syathetic metal is the crystalline poly sulphubmitride polymer $(\text{SN})_n$. It has an appreciable conductivity at room temperature.

Electricic Polymer : Semiconducting polymers whose conductivity can be increased by several times are generally known as electronic polymers. The conductivity of electronic polymers can be increased by doping.

Conducting polymers and their importance : In general polymers are poor conductors of electricity while metals are good conductors. There are some organic polymers such as poly aniline, poly pyoole, poly this phene, etc. They are good conductors like metals. These polymer compound are wholly composed of elements like carbon, hydrogen and occasiowally nitrogen, oxygen or sulphur. More over they have the mechanical properties of polymers, such as flexibility. Such type of polymers are called conducting by a zieglar-Natta process is a

It requires no external battery for its own operations, i.e. it is self generating.

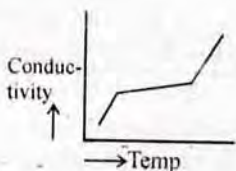
The internal emf and hence current generated by it are large enough to be measured on a pointer galvanometer. Hence, such cells are used in devices like portable exposure meters, direct reading illumination meters and low resistance relays for on/off operations and other monitoring operations in industry.

Ans. (d) Effect of temperature on the Conductivity :

Conductivity of n-type and p-type semiconductors increases with increase in temperature. In case of conductors the free electron concentration and hole depends temperature.

n - type Semiconductors : For loop n-type semiconductors close to absolute zero, there are no free carriers in the conduction band, as was in the case of ---- semiconductors. Hence the conductivity is negligible. With increase in temperature, the conductivity increases but after a particular temperature it become constant and then again increases with increase in temperature.

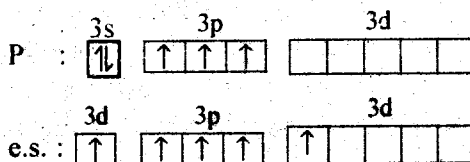
P - type semiconductors : Also for p-type semiconductors, the conductivity increases with increase in temperature, reaching a maximum value and then it becomes constant as in case of n-type semiconductors. However, the increase in conductivity with increase in temperature is mainly due to the increase in number of electrons from the valence band of the semiconductors to the acceptor band if the doping agent. When all the acceptor atom get filled up will the electrons from the valence band, conductivity becomes constant. Now above this temperature, the rise in conductivity of the semiconductor is mainly due to the increase in ---- conductivity.



Effect of temperature on conductivity of type terms conductor.

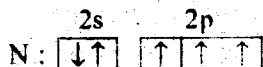
10. (a) 'Phosphorous forms both PF_3 and PF_5 but nitrogen forms only NF_3 . Explain.
- (b) Arrange the following in increasing order of bond lengths : O_2 , O_2^+ , O_2^- .
- (c) Using Kohlrausch's law how do we determine the equivalent conductance of acetic acid at infinite dilution?
- (d) 'Carboxylic acid is stronger acid than phenol.' Explain.
- (e) What is calorific value of fuel ? Distinguish between gross and net calorific values.
- (f) What are the constituents of coal as determined by proximate analysis?

Ans. (a) The ground state electronic-configuration of phosphorous is-



Here phosphorous has vacant 3d orbital. In excited state phosphorous may promote an electron from 3s to vacant ed orbital. It PF₅ phosphorous having gained five electrons from fluorine alons and through sp³d hybridization phosphorous formed PF₅. It can also form PF₃ by Sp³ d hybridization phosphorous having gained three electrons from ----- atoms in PF₃ molecule.

The ground state electronic of nitrogen is



gs

Since nitrogen does not have any accant d-orbital, it can only from NF₃ by Sp³ hybridization.

Ans. (b) O₂ ⇒ 16 'e'

$$\sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2p_x}^2 \left\{ \begin{array}{l} \pi_{2py}^2 \\ \pi_{2pz}^2 \end{array} \right\} \left\{ \begin{array}{l} \pi_{2py}^{*1} \\ \pi_{2pz}^{*1} \end{array} \right\} \quad \text{B.O.} = \frac{10-6}{2} = 2$$

O₂⁺ ⇒ 15 'e'

$$\sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2p_x}^2 \left\{ \begin{array}{l} \pi_{2py}^2 \\ \pi_{2pz}^2 \end{array} \right\} \left\{ \begin{array}{l} \pi_{2py}^{*1} \\ \pi_{2pz}^{*0} \end{array} \right\} \quad \text{B.O.} = \frac{10-5}{2} = 2.5$$

O₂⁻ ⇒ 17 'e'

$$\sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2p_x}^2 \left\{ \begin{array}{l} \pi_{2py}^2 \\ \pi_{2pz}^2 \end{array} \right\} \left\{ \begin{array}{l} \pi_{2py}^{*2} \\ \pi_{2pz}^{*1} \end{array} \right\} \quad \text{B.O.} = \frac{10-7}{2} = 1.5$$

greater the Bond lower the bond length.

So the in creasing order of bond length is O₂⁺ < O₂ < O₂⁻.

Ans. (c) Equivalent Conductance of acitic acid at infinite dilution using kohlraush's law : Equivalent conductance of eveak electrolytes such as CH₃COOH, can not found out by extra polution of the curve obtained when exponentially determined values of equivalent conductance of the electrolyte are plotted against $\sqrt{\text{conc}}$. However kohlraush's law helps to find out Λ_0 for CH₃COOH (weak electrolyte) by knowing Λ_0 values for certain strong electrolytes as CH₃COONa, Hel and Nacl.

$$\Lambda_0 (\text{CH}_3\text{COOH}) = \lambda_{\text{CH}_3\text{COO}^-}^0 + \lambda_{\text{H}^+}^0$$

Adding and subtracting limiting ionic conductances of each of Na^+ and Cl^- to the R.H.S. we get,

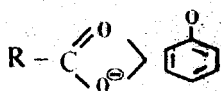
$$\Lambda_0(\text{CH}_3\text{COOH}) = \lambda_{\text{CH}_3\text{COO}^-}^0 + \lambda_{\text{H}^+}^0 + \lambda_{\text{Na}^+}^0 + \lambda_{\text{Cl}^-}^0 - \lambda_{\text{Na}^+}^0 - \lambda_{\text{Cl}^-}^0$$

$$= (\lambda_{\text{CH}_3\text{COO}^-}^0 + \lambda_{\text{Na}^+}^0) + (\lambda_{\text{H}^+}^0 + \lambda_{\text{Cl}^-}^0) - (\lambda_{\text{Na}^+}^0 + \lambda_{\text{Cl}^-}^0)$$

$$\Lambda_0(\text{CH}_3\text{COOH}) = \Lambda_0(\text{CH}_3\text{COONa}) + \Lambda_0(\text{HCl}) - \Lambda_0(\text{NaCl})$$

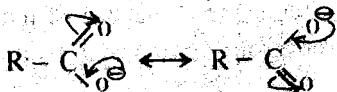
Hence by knowing Λ_0 for strong electrolytes i.e. CH_3COONa , HCl and NaCl , Λ_0 for CH_3COOH can be found out.

Ans. (d) The stability of conjugate bases is in the order

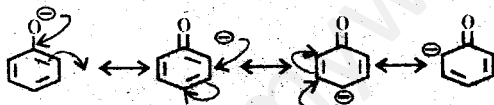


R = alkyl group.

The delocalisation structure of carboxylate anion is as follows :



and the phenoxide ion is



Phenols are considerably weaker acid than carboxylic acid. This is due to the fact that delocalisation of the (-) ve charge in the carboxylate anion ---- structures of identical energy content and of the centres of highly electronegative oxygen atom ; where as in the phenoxide anion, the structures be higher energy content than the one in which it is on oxygen atom. The relative stabilization of anion w.r. to the undissociated molecule is these likely to be less effective with a phenol than with a carboxylic acid, leading to the lower relative acidity of the former.

Ans. (e) **Calorific value of fuel** : Calorific value of a fuel may be defined as the amount of heat produced by completely burning of unit mass or volume of the fuel. Higher the calorific value better the fuel will be. S.I. unit : J kg^{-1} and C.G.S unit : cal g^{-1}

Distinguish between gross and net calorific value : Same as Q. 9(a) 2003.

Ans. (f) **Constituents of coal as determined by proximate analysis** : This analysis provides data for a first general assessment of the quality and type of coal. The properties tested include.

- (i) The determination of moisture content.
- (ii) Volatile Carbonaceous Matter (VCM)
- (iii) Ash content
- (iv) Fixed carbon

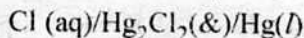
Applications : (i) **Identification of substances :** Man spectrum is highly characteristic of a compound. No two compounds can have exactly similar man spectra.

(ii) Determination of molecular man and formula.

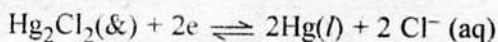
(iii) Determination of molecular structure.

Ans. (c) Same as Q.8(c) 2005.

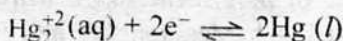
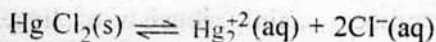
Ans. (d) Calomel Electrode : Calomel electrodes is an example of secondary reference electrode. A calomel electrode consists of mercury in contact with a paste of sparingly soluble salt of mercurous chloride in mercury and a solution of soluble chloride ions such as KCl known concentration. It is represented as :



The half cell reaction is



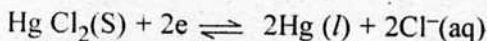
Which is the resultant of the following reactions taking place :



The calomel electrode is, therefore, reversible w.r. to Cl^- ions (anions).

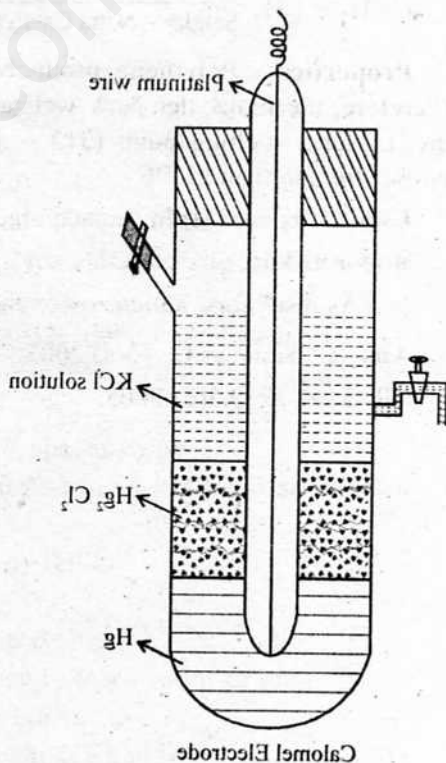
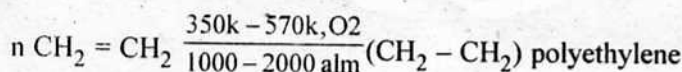
In case a saturated solution of KCl is used, the electrode is called saturated calomel electrode. This electrode is commonly used in laboratory. A dip type saturated calomel electrode is now available for use. The electrode potential of electrode on H-scale, represented as

$\text{KCl}(\text{aq})/\text{Hg}_2\text{Cl}_2(\text{s})/\text{Hg}$ depends upon the concentration of KCl solution contained in it and on the temperature.



The tenth molar electrode (0.1M KCl) has the lowest temperature Co-efficient and is preferred for accurate work. However, saturated calomel electrode is the most convenient due to the ease of replacing the solution and is, thus frequently employed.

Ans. (e) LDPE : It is manufactured by heating ethylene to 350 K to 570 K under a pressure of 1000 – 2000 atm. and in presence of traces of oxygen (0.03 – 0.1y.)

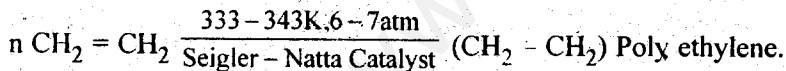


This polymerisation reaction occurs through a free radical mechanism initiated by oxygen. Polythene produced by this process has a molecular mass around 20,000 and has a branched chain structure. Since branched chain molecules do not pack well, this type of polythene has low density (0.92 gm cm^{-3}) and low melting point (384 K). That is why polythene produced by this method is called low density polythene.

Properties : It is transparent, has moderate tensile strength and high toughness. It is chemically inert, slightly flexible and poor conductor of electricity.

Uses : It is used (i) as packing material (in the form of this film, bags, etc. ; (ii) for insulating wires and cables, etc.

HDPE : It is manufactured by heating ethylene at about 333 – 343 K under a pressure 96 – 7 atm. in presence of a catalyst such as triethyl-aluminium and titanium tetrachloride (Ziegler-Natta catalyst).



Properties : Polythene produced by this process mainly consists of linear chains. Therefore, the molecules pack well and hence this type of polythene has density (0.97 gm cm^{-3}), higher melting point (313 – 423K) and is inert but harder, tougher and has greater tensile strength than LDPE.

Uses : It is used (i) in the manufacture of containers (buckets, tubes, etc.)

(ii) for making pipes, bottles, toys, etc.

(iii) As insulators, anticorrosive and packaging material.

Ans. (f) Same as Q. 10(a) 2003.

OR. Same as Q.3(d) 2005.