CBSE Class 12 - Chemistry

Sample Paper 06 (2020-21)

Maximum Marks: 70

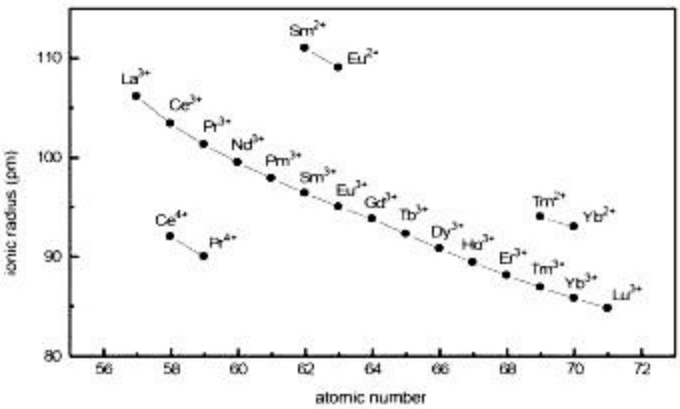
Time Allowed: 3 hours

General Instructions:

a. There are 33 questions in this question paper. All questions are compulsory.
b. Section A: Q. No. 1 to 16 are objective type questions. Q. No. 1 and 2 are passage based questions carrying 4 marks each while Q. No. 3 to 16 carry 1 mark each.
c. Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.
d. Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.
e. Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.
f. There is no overall choice. However, internal choices have been provided.
g. Use of calculators and log tables is not permitted.

Section A

1. **Read the following passage and answer any four out of the following questions:**
   The f-block consists of the two series, lanthanoids (the fourteen elements following lanthanum) and actinoids (the fourteen elements following actinium). Because lanthanum closely resembles the lanthanoids. The chemistry of the actinoids is much more complicated. The complication arises partly owing to the occurrence of a wide range of oxidation states in these elements and partly because their radioactivity creates special problems in their study. The overall decrease in atomic and ionic radii from lanthanum to lutetium (the lanthanoid contraction) is a unique feature in the chemistry of the lanthanoids. In the lanthanoids, La(II) and Ln(III) compounds are predominant species.



The following questions are multiple-choice questions. Choose the most appropriate answer.

i. Which of the following lanthanoids show +2 oxidation state besides the characteristic oxidation state +3 of lanthanoids?
   a. Ce
   b. Eu
   c. Zn
   d. Ho

ii. Why there is a fairly regular decrease in the sizes of lanthanoid with increasing atomic number?
   a. Due to shielding of one 4f electron by another
   b. Due to increasing nuclear charge along with the series
   c. Both (a) and (b)
   d. None of these

iii. Which of the following have almost identical radii?
   a. Hf and Zr
   b. La and Ce
   c. Sm and Dy
   d. Ho and Tb

iv. The E^o value for Ce^{4+}/Ce^{3+} is:
   a. +1.74V
   b. +6.78V
   c. +3.45V
   d. +6.22V

v. Which of the following exhibit +4 state in oxides, MO_2?
   a. Pr

b. Nd
c. Tb
d. all of these

2. **Read the passage and answer any four out of the following questions:**

The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds and are known to play many important functions in the area of analytical chemistry, metallurgy, biological systems, industry and medicine. The selective estimation of these ions can be done due to the difference in the stability constants of calcium and magnesium complexes. Coordination compounds are of great importance in biological systems. The pigment responsible for photosynthesis, chlorophyll, is a coordination compound of magnesium. Among the other compounds of biological importance with coordinated metal ions are enzymes like carboxypeptidase and carbonic anhydrase (catalysts of biological systems). Coordination compounds are used as catalysts for many industrial processes. Articles can be electroplated with silver and gold much more smoothly and evenly from solutions of the complexes, $[Ag(CN)_2]^-$ and $[Au(CN)_2]^-$ than from a solution of simple metal ions.

In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

i. **Assertion:** Hardness of water is estimated by simple titration with Na_2EDTA.

Reason: The Ca^{2+} and Mg^{2+} ions form stable complexes with EDTA.

ii. **Assertion:** Gold combines with cyanide in the presence of oxygen and water to form the coordination entity $[Au(CN)_2]^-$ in aqueous solution.

Reason: Gold can be separated in metallic form from this solution by the addition of zinc.

iii. **Assertion:** Impure nickel is converted to $[Ni(CO)_4]$, which is decomposed to yield pure nickel.

Reason: Purification of metals can be achieved through the formation and subsequent decomposition of their coordination compounds.

iv. **Assertion:** Haemoglobin, the red pigment of blood which acts as an oxygen carrier is the coordination compound of iron.
Reason: Vitamin B_{12}, cyanocobalamin, the anti–pernicious anaemia factor, is a coordination compound of mercury.

v. **Assertion:** EDTA is not effective in the treatment of lead poisoning.
Reason: Coordination compounds of platinum effectively inhibit the growth of tumours.

3. Which of the following is an example of secondary amine?
   a. N,N – dimethylaniline
   b. 3 – pentanamine
   c. methylamine
   d. N – ethyl – 1 – propanamine
4. Glucose does not give Schiff's test because of the formation of cyclic _____.
   a. β – D – (-) – Glucose
   b. forms of α – and β – D – (+) – Glucose
   c. β – L – (-) – Glucose
   d. α – D – (-) – Glucose

OR

Amino acid is.
   a. $H_2N.CH_2.COOH$
   b. Cl - CH_2. COOH
   c. HO. CH_2COOH
   d. CH_3COONH_4
5. Which of the following does not show a positive deviation from Raoult's law?
   a. benzene + CCl_4
   b. benzene + acetone
   c. benzene + ethanol
   d. benzene + chloroform
6. IUPAC name of neo-Pentylbromide is:

a. 1-Bromo-3-methylbutane
b. 1-Bromo-2,2-dimethylpropane.
c. 1-Bromo-1,2-dimethylpropane
d. 1-Bromo-2-methylbutane

OR

Which of the following compounds has the highest boiling points?

a. $CH_3CH_2CH_2Cl$
b. $CH_3CH_2CH_2CH_2Cl$
c. $(CH_3)_3Cl$
d. $CH_3CH(CH_3)CH_2Cl$

7. The nitration reaction of amines can be controlled in order to obtain the desired para nitro derivative as the major product by:
   a. Reacting with a desired nitro compound
   b. By acetylation reaction
   c. By using aliphatic amines
   d. By treating with acetic acid

OR

Amines are soluble in:

a. only slightly soluble in water
b. water
c. organic solvents
d. only slightly soluble in organic solvents

8. Which of the following process does not occur at the interface of phases?
   a. Corrosion
   b. Homogeneous catalysis
   c. Crystallization
   d. Heterogeneous catalysis

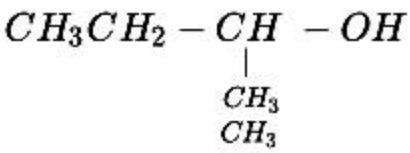
OR

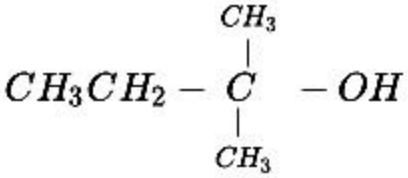
Micelles are:

a. Ideal solution
b. Associated colloids
c. Adsorbed solution
d. Emulsion cum gel

9. Which is correct in case of Van der waal adsorption?
   a. High temperature, high pressure
   b. Low temperature, high pressure
   c. Low temperature, low pressure
   d. High temperature, low pressure
10. The order of reactivity of following alcohols with halogen acids is _____.

   A. $CH_3CH_2—CH_2—OH$

   B. 

   C. 

   a. (A) > (C) > (B)
   b. (C) > (B) > (A)
   c. (B) > (A) > (C)
   d. (A) > (B) > (C)
11. The correct order of the packing efficiency in different types of unit cells is:
   a. fcc < bcc > simple cubic
   b. fcc > bcc > simple cubic
   c. bcc < fcc > simple cubic
   d. fcc < bcc < simple cubic
12. **Assertion:** The ligands -NO_2- and ONO^- are ambient in nature.

   Reason: They form linkage isomers.
   a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
   b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
   c. Assertion is CORRECT but, reason is INCORRECT.

d. Assertion is INCORRECT but, reason is CORRECT.

13. **Assertion:** Purine base present in DNA are adenine and guanine.
Reason: The base thymine is present in RNA whereas base uracil is present in DNA.
    a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
    b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
    c. Assertion is CORRECT but, reason is INCORRECT.
    d. Assertion is INCORRECT but, reason is CORRECT.
14. **Assertion:** Camphor is usually used in molecular mass determination.
Reason: Camphor has low cryoscopic constant and therefore, causes greater depression in freezing point.
    a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
    b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
    c. Assertion is CORRECT but, reason is INCORRECT.
    d. Assertion is INCORRECT but, reason is CORRECT.

OR

Assertion: When methyl alcohol is added to water, the boiling point of water increases.
Reason: When a volatile solute is added to a volatile solvent elevation in the boiling point is observed.
    a. Assertion and reason both are correct statements and reason is the correct explanation for the assertion.
    b. Assertion and reason both are correct statements but the reason is not the correct explanation for the assertion.
    c. The assertion is a correct statement but the reason is the wrong statement.
    d. Assertion and reason both are incorrect statements.
15. **Assertion:** o-Nitrophenol is less soluble in water than the m- and p-isomers.
Reason: m- and p-Nitrophenols exist as associated molecules.
    a. Assertion and reason both are correct and the reason is the correct explanation of assertion.

b. Assertion and reason both are wrong statements.
c. The assertion is a correct statement but the reason is the wrong statement.
d. Both assertion and reason are correct statements but the reason is not the correct explanation of assertion.

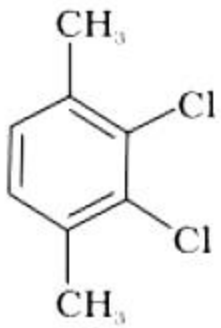
16. **Assertion:** Aryl halogen undergoes nucleophilic substitution reactions with ease.
Reason: The carbon halogen bond in aryl halides has partial double bond character.
a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
c. Assertion is CORRECT but, reason is INCORRECT.
d. Assertion is INCORRECT but, reason is CORRECT.

Section B

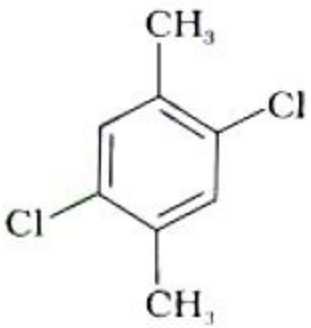
17. Differentiate between geminal and vicinal halides.

OR

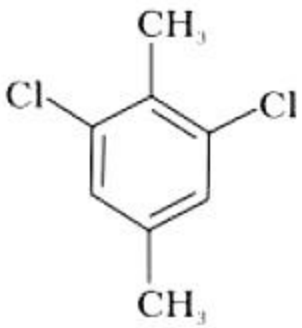
Which of the following compounds will have the highest melting point and why?



(I)



(II)



(III)

18. State Henry's law and mention its two important applications.
19. Why does bleeding stop by rubbing moist alum?

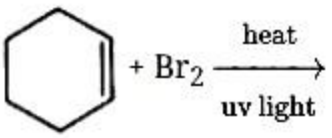
OR

Explain the term dialysis with a suitable example.

20. Define activation energy of a reaction.
21. A reaction is of second order with respect to a reactant. How is the rate of reaction affected, if the concentration of the reactant is reduced to half? What is the unit of rate

constant for such a reaction?

22. What happens when ethanol is heated with concentrated sulphuric acid at 453 K? Explain the mechanism of this reaction.
23. What is lanthanoid contraction? What is its effect on the chemistry of the elements which follow the lanthanoids?
24. Draw the structure of the major monohalo product in the following reaction:



25. The window panes of the old buildings are thick at the bottom. Why?

Section C

26. Why is H_2O a liquid and H_2S a gas?

OR

i. Draw the structures of the following molecules.
   a. $XeOF_4$
   b. H_2SO_4

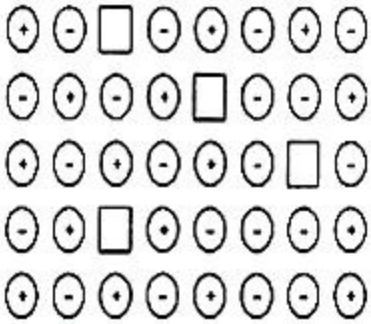
ii. Write the structural difference between white phosphorus and red phosphorus.

27. Write equations for
   i. Gabriel phthalimide reaction
   ii. Hofmann bromamide reaction

OR

A compound 'A' of molecular formula $C_3H_7O_2N$ on reaction with Fe and conc. HCl gives a compound 'B' of molecular formula C_3H_9N. Compound 'B' on treatment with $NaNO_2$ and HCl gives another compound 'C' of molecular formula C_3H_8O. The compound 'C' gives effervescence with Na. On oxidation with CrO_3, the compound 'C' gives a saturated aldehyde containing three carbon atoms. Deduce the structures of A, B and C and write the equations for the reactions involved.

28. Examine the illustration of a portion of the defective crystal given below and answer the following questions:



i. What are the type of vacancy defect called?

ii. How is the density of a crystal affected by these defects?

iii. Name one ionic compound which can show this type of defect in the crystalline state.

iv. How is the stoichiometry defect of the compound affected?

29. Define the following terms with a suitable example of each :
    a. Anomers
    b. Denaturation of protein
    c. Essential amino acids
30. Phenol is acidic in nature.

Section D

31. i. Account for the following:
        a. Ozone is thermodynamically unstable.
        b. Solid PCl_5 is ionic in nature.
        c. Fluorine forms only one oxoacid HOF.
    ii. Draw the structures of
        a. BrF_5
        b. XeF_4

OR

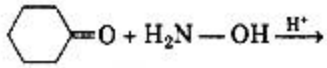
Assign reasons for the following:

i. When a moist blue litmus paper is dipped in a solution of HOCl, it first turns red and then later gets decolourised. Explain.

ii. Iodine is liberated when KI is added to the solution of Cu^{2+} ions but Cu^{2+} is not liberated when KCl is added to a solution of Cu^{2+} ions. Why?

iii. Name a compound of fluorine which shows +1 oxidation state. How is this compound prepared? Is this a disproportionation reaction?

32. i. Write the products of the following reactions:

a. 

b. $2C_6H_5CHO + \text{conc. } NaOH \longrightarrow$

c. $CH_3COOH \xrightarrow{Cl_2/P}$

ii. Give simple chemical tests to distinguish between the following pairs of compounds:

a. Benzaldehyde and benzoic acid

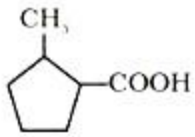
b. Propanal and propanone

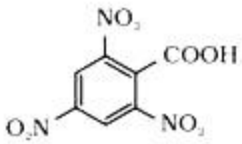
OR

Give the IUPAC names of the following compounds:

i. Ph CH_2CH_2COOH

ii. $(CH_3)_2$ C = CHCOOH

iii. 

iv. 

33. a. Define molar conductivity of a substance and describe how for weak and strong electrolytes, molar conductivity changes with concentration of solute. How is such change explained?

b. A voltaic cell is set up at 25°C with the following half cells:

$Ag^+(0.001\ M)|Ag$ and $Cu^{2+}(0.10\ M)$ | Cu

What would be the voltage of this cell? $\left(E^0_{cell} = 0.46V\right)$

OR

a. State two advantages of H_2O fuel cell over ordinary cell.

b. Silver is electro deposited on a metallic vessel of total surface area 900 cm^2 by passing a current of 0.5 amp for two hours.

Calculate the thickness of silver deposited.

[Given: Density of silver = 10.9g cm^{-3} Atomic mass of silver = 108 u 1F = 96500Cmol^{-1}]

CBSE Class 12 - Chemistry

Sample Paper 06 (2020-21)

Solution

Section A

1. i. (b) Eu
   ii. (c) Both (a) and (b)
   iii. (a) Hf and Zr
   iv. (a) +1.74V
   v. (d) all of these
2. i. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion
   ii. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
   iii. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion
   iv. (c) Assertion is correct statement but reason is wrong statement
   v. (d) Assertion is wrong statement but reason is correct statement
3. (d) N – ethyl – 1 – propanamine

   Explanation: N of N – ethyl – 1 – propanamine is bonded to two carbon atoms, therefore it is a secondary amine.
4. (b) forms of α – and β – D – (+) – Glucose

   Explanation: Schiff's test is given by aldehydes. Despite having the aldehyde group, glucose does not give Schiff's test as aldehydic group is not free here. It was proposed that one of the —OH groups may add to the —CHO group and form a cyclic hemiacetal structure. It was found that glucose forms a six-membered ring in which —OH at C-5 is involved in ring formation. This explains the absence of —CHO group and also existence of glucose in two cyclic hemiacetal forms α-D-(+)-Glucose and β-D-(+)-Glucose.

OR

(a) $H_2N.CH_2.COOH$

Explanation: Amino acids contain amino ($–NH_2$) and carboxyl (–COOH) functional

groups.

5. (d) benzene + chloroform

   Explanation: benzene + chloroform

6. (b) 1-Bromo-2,2-dimethylpropane.

   Explanation: neo-Pentyl bromide is $(CH_3)_3CCH_2Br$. C attached to Br is given position 1, so 2 $-CH_3$ groups are placed on 2nd C of the propane (parent chain). So, its IUPAC name will be 1-Bromo-2,2-dimethylpropane.

OR

(b) $CH_3CH_2CH_2CH_2Cl$

Explanation: The forces of attraction between the molecules of a compound get stronger as they get bigger in size and have more electrons. Also, for a straight-chain compound, the points of interaction between the molecules are more than for a branched compound having the same molecular formula. Thus $CH_3CH_2CH_2CH_2Cl$ has the highest melting point since it is the longest chain compound among the given options.

7. (b) By acetylation reaction

   Explanation: The activating power of aniline can be controlled by acetylation of $-NH_2$ group by acetic anhydride or acetyl chloride to protect the $-NH_2$ group. This will give the para nitro product as the major product, instead of o,m,p mixture that we get if we do direct nitration of aniline.

   $C_6H_5NH_2 + CH_3COCl \rightarrow C_6H_5NHCOCH_3$

   $C_6H_5NHCOCH_3$ + conc $HNO_3 + H_3O^+ \rightarrow$ p-nitroaniline (major) + o-nitroaniline (minor)

OR

(b) water

Explanation: Amines are soluble in water due to hydrogen bonding with water.

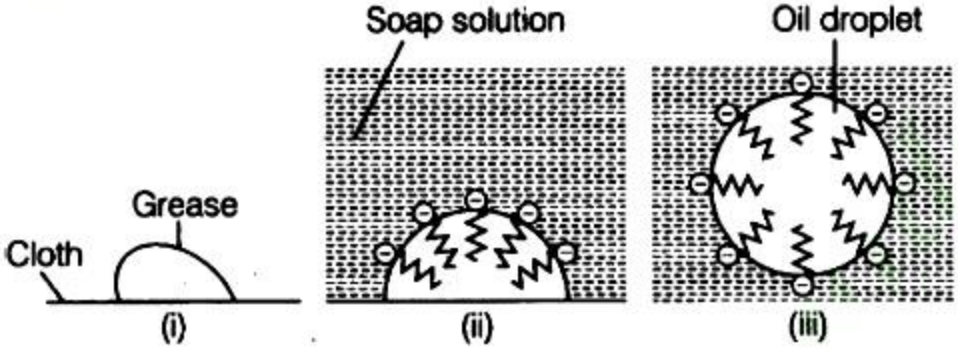
8. (b) Homogeneous catalysis

   Explanation: Homogeneous catalysis is the process in which reactants, products, and catalysts are in the same phase.

OR

(b) Associated colloids

Explanation: Micelles are chemical structures formed with both hydrophilic (they'll mix into water) and hydrophobic (they don't mix into water). Also called as Associated colloids. In the general case, micelles are formed when there is an ideal temperature in the medium (called the Kraft temperature) and a certain concentration of electrolytes (called the CMC: Critical Micelle Concentration) in the medium.



i. Grease or oil on surface of cloth.
ii. Stearate ions arranged around the grease or oil droplet.
iii. Grease or oil droplet surrounded by stearate ions (ionic micelle formed).

9. (b) Low temperature, high pressure

Explanation: Physisorption is favoured only at low temperature and high pressure.

10. (b) (C) > (B) > (A)

Explanation: Haloalkanes are prepared from alcohol and halogen acids where the hydroxyl group of the alcohol is replaced by the halogen. Options (A) (B) and (C) are primary, secondary, tertiary alcohols respectively. Tertiary alcohols are more reactive than secondary and primary alcohol, the secondary halide is more reactive than primary halide and they form haloalkanes from haloacids at room temperature without catalysts. The order of reactivity of alcohols is 3°>2°>1°.

11. (b) fcc > bcc > simple cubic

Explanation: Packing efficiency (is the percentage of total space filled by the particle) in different types of unit cells can be tabulated as

Unit Cell	Packing Efficiency
fcc	74%
bcc	68%
Simple Cubic	52.4%

Hence, correct order is fcc (74%) > bcc (68%) > simple cubic (52.4%)

12. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

    Explanation: Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
13. (c) Assertion is CORRECT but, reason is INCORRECT.

    Explanation: Assertion is CORRECT but, reason is INCORRECT.
14. (c) Assertion is CORRECT but, reason is INCORRECT.

    Explanation: Assertion is CORRECT but, reason is INCORRECT.

OR

(d) Assertion and reason both are incorrect statements.

Explanation: When methyl alcohol (volatile) is added to water, the boiling point of water decreases because vapour pressure increases when a volatile solute is added to a volatile solvent.

15. (d) Both assertion and reason are correct statements but the reason is not the correct explanation of assertion.

    Explanation: In o-nitrophenol, there is an intramolecular H-bonding, and due to this its surface area decreases and becomes less polar.

    Thus, o-nitrophenol does not form H-bond with H_2O with but m-nitrophenol and p-nitrophenol form H-bonds with H_2O. Also, due to intermolecular H-bonding m-nitrophenol and p-nitrophenol exist as associated molecules.
16. (d) Assertion is INCORRECT but, reason is CORRECT.

    Explanation: Assertion is INCORRECT but, reason is CORRECT.

Section B

17. The dihalo-compounds having same type of halogen atoms are classified as geminal halides (halogen atoms are present on the same carbon atom) and vicinal halides (halogen atoms are present on the adjacent carbon atoms).

OR

Compound (II) has both methyl groups, as well as chlorine atoms, are placed symmetrically at para-positions, due to this, these molecules fit in the crystal lattice better than others i.e (I) and (III) isomers, hence compound (II) it has the highest melting point.

18. Henry's law states that the partial pressure (P) of the gas in the vapour phase is directly

proportional to the mole fraction (m) of the gas in the solution.

Mathematically,

m = KP where K is the proportionality constant known as Henry's constant.

Applications of Henry's Law

i. To increase the solubility of CO_2 in soft drinks and soda water, the bottle is sealed under high pressure.

ii. To minimise the painful effects of bends or decompression sickness in deep-sea divers, oxygen diluted with less soluble helium gas is used as breathing gas.

19. Blood is a colloidal sol. This contains charged protein molecules. Moist alum has highly charged Al^{3+} and SO_4^{2-} ions which neutralize the charged protein molecules present in the blood. This results in the coagulation of different blood proteins and bleeding stops while rubbing the injured part with moist alam.

OR

Dialysis is the process of removing a dissolved substance from a collidal solution by means of diffusion through a suitable membrane. For example, if egg albumin sol is mixed with sodium chloride solution,Na^+ and Cl^- ions will pass through semipermeable membrane whereas pure colloidal solution will be obtained.

20. The minimum extra energy over and above the average potential energy of the reactants which must be supplied to the reactants to enable them to cross over the energy barrier between reactants and products is called activation energy.

21. When the concentration rs reduced to half

$R^* = \frac{R}{2}$

New rate, $r'' \propto [R'']^2 \propto \left[\frac{R}{2}\right]^2 = \frac{1}{4}[R]^2$ ..... (iii)

From Eqs. (i) and (iii),

$\frac{r}{r''} = \frac{[R]^2}{\frac{1}{4}[R]^2} = 4$

Or $r'' = \frac{r}{4}$

Hence, the rate becomes one fourth of the initial rate when concentration of the reactant is reduced to half.

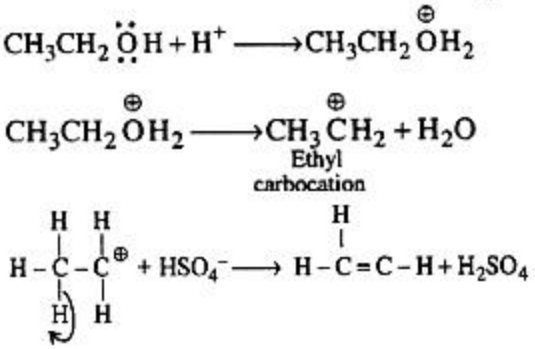
The unit of rate constant is L mol^{-1} s^{-1}

(second order reaction).

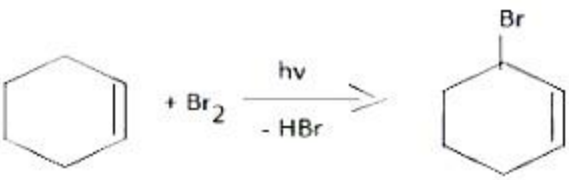
22. When ethanol is heated with concentrated sulphuric acid at 453 K, ethane is formed.

$$CH_3CH_2OH \xrightarrow[453K]{Conc,\ H_2SO_4} CH_2 = CH_2 + H_20$$

Mechanism of the reaction is explained as under:



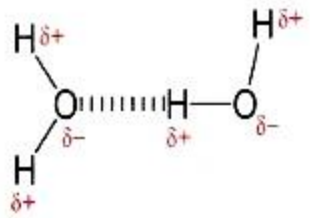
23. The decrease in atomic and ionic size with increase in atomic number among lanthanoids is called lanthanoid contraction. The elements after lanthanoids closely resemble with the elements exactly above them due to similar ionic size for example Zr and Hf have similar sizes.

24. 

25. Glass panes of old buildings are not true solid but a supercooled liquid of high viscosity, called as Pseudo solids and has the property to flow.They flow down very slowly and makes the bottom portion thicker.

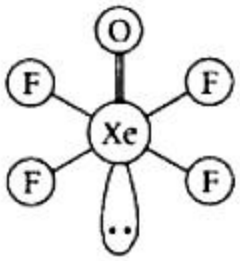
Section C

26. Due to greater electronegativity of O than S, H_2O undergoes extensive intermolecular H-bonding. As a result, H_2O is a liquid at room temperature. In contrast, H_2S does not undergo H-bonding. It exists as discrete molecules which are held together by weak Vander Waals forces of attraction. To break these forces of attraction, only a small amount of energy is required. Therefore, H_2S is a gas at room temperature.



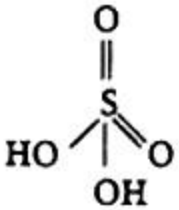
OR

i. a. Structure of $XeOF_4$ is given below:



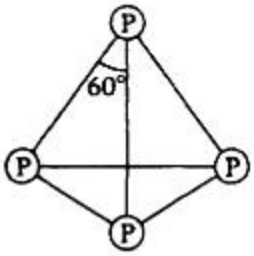
Square pyramidal

b. The structure of H_2SO_4



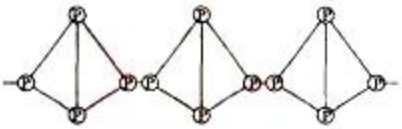
Sulphuric acid
(H_2SO_4)

ii. **White phosphorus** It consists of discrete tetrahedral P_4 molecules as shown below:

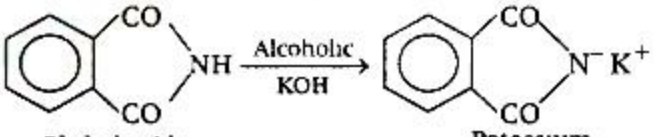


There is angular strain in the P_4 molecule where the angles are only 60^o.

Red phosphorus It is a polymeric structure having chain of P_4 tetrahedra linked together in the manner.

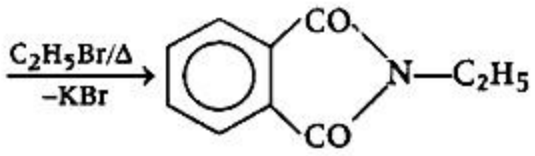


27. i. **Gabriel Phthalimide Reaction**

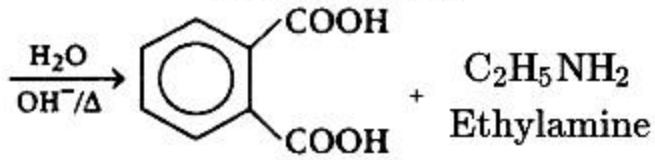


Phthalimide

Potassium phthalimide



N-ethylphthalimide



Phthalic acid

ii. **Hofmann Bromamide Reaction**

$$R-\overset{\overset{O}{\|}}{C}-NH_2 + Br_2 + 4NaOH \longrightarrow R\text{-}NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

OR

Based on the observations, structures of A, B and C are deduced as under:

$$\underset{\substack{'A'\\ 1-Nitropropane\\ (Mol.\ Formula = C_3H_7O_2N)}}{CH_3CH_2CH_2NO_2} \xrightarrow{Fe/HCl} \underset{\substack{'B'\\ 1-\text{Pr}opanamine\\ (Mol.\ Formula = C_3H_4N)}}{CH_3CH_2CH_2NH_2}$$

$$\xrightarrow{NaNO_2/HCl} \underset{\substack{'C'\\ \text{Pr}opan-1-ol\\ (Mol.\ Formula = C_3H_8O)}}{CH_3CH_2CH_2OH} \xrightarrow{Na} \underset{Sodium\ propoxide}{CH_3CH_2CH_2ONa} + H_2$$

$$\underset{1-\text{Pr}opanol}{CH_3CH_2CH_2OH} \xrightarrow{CrO_3} \underset{\text{Pr}opanal}{CH_3CH_2CHO}$$

28. i. Schottky defect
    ii. Density decreases as equal number of cations and anions are missing from crystal.
    iii. Na^+Cl^-
    iv. Stoichiometry of crystal does not affected.
29. a. **Anomers:** These are the hemi-acetal forms of glucose which differ in the configuration at C_1 of hydroxyl group.

    e.g.- α -glucose and β-glucose.

    b. **Denaturation of proteins:** When native protein is subjected to change in temperature and pH, then it loses its biological activity.

    e.g.- Curdling of milk.

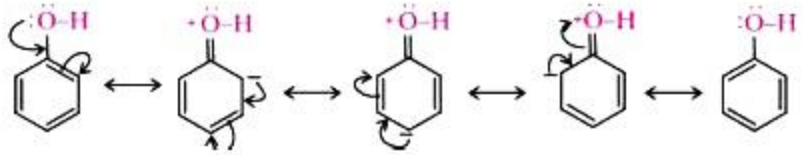
    c. **Essential amino acids:** The amino acid which do not get synthesised by our body are

called essential amino acid.

e.g.-Valine.

30. Phenol is acidic in nature because

i. phenol, due to resonance, the positive charge rests on oxygen making the shared pair of electrons more towards oxygen and hydrogen as H^+



ii. The carbon attached to OH is SP^2 hybridize and is more electronegative, this decreases the electron density on oxygen, increasing the polarity of O-H bond and ionization of phenol. The phenoxide ion formed by loss of H^+ is more resonance stabilized than phenol itself.

Section D

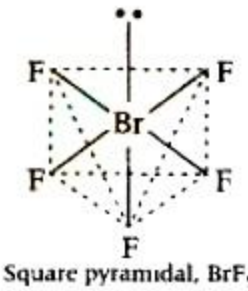
31. i. a. Ozone is thermodynamically unstable because of its decomposition into oxygen results in the liberation of heat (ΔH is negative) and increase in entropy (ΔS is positive). These two effects reinforce each other resulting in large negative Gibbs energy change (ΔG) for its conversion into oxygen.

$2O_3 \rightarrow 3O_2$; ΔH = -142 kJ/mol

b. Gaseous and molten PCl_5 is a neutral molecule with trigonal bipyramidal. This trigonal bipyramidal structure persists in non-polar solvents, such as CS_2 and CCl_4. While in the solid-state, PCl_5 exist as $[PCl_4]^+$, $[PCl_6]^-$, therefore is ionic in nature.

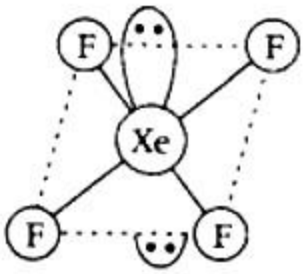
c. Due to high electronegativity and small size, fluorine forms only one oxoacid, HOF known as fluoric (I) acid or hyperfluorous acid.

ii. a. Structure of BrF_5 is square pyramidal.



Square pyramidal, BrF_5

b. Structure of XeF_4 is square planar.



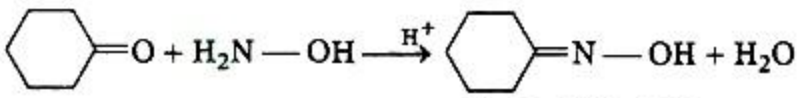
Square planar, XeF_4

OR

i. HOCl acts as an acid and, hence, tums blue litmus red. $HOCl \rightarrow H^+ + OCl^-$ It also works as a bleaching agent, an thus decolourised red litmus by nascent oxygen.
$HOCl \rightarrow HCl + [O]$

ii. The I- ion being a strong reducing agent reduces Cu^{2+} to Cu^+ and itself gets oxidised to I_2
$2Cu^{2+} + 4KI \rightarrow Cu_2I_2 + I_2 + 4K^+$
Since Cl^- ion does not act as reducing agent, therefore, Cl_2 is not liberated when KCl is added to a solution of Cu^{2+} ions.

iii. The compound of F which shows an oxidation state +1 is HOF. It is prepared by passing F_2 over ice at 233 K.
$F_2 + H_2O(ice) \overset{233K}{\rightleftharpoons} HOF^{+1} + HF^{-1}$
This is a disproportionation reaction since the oxidation state of F decreases from zero in F_2 to -1 in HF and increased to +1 in HOF.

32. i. a. 

b. $2C_6H_5CHO + \text{conc. NaOH} \longrightarrow \underset{\text{Benzyl alcohol}}{C_6H_5CH_2OH} + \underset{\text{Sodum benzoate}}{C_6H_5CO\overline{O}Na^+}$

c. $CH_3COOH \xrightarrow{Cl_2/P} \underset{\text{Monochloroacetic acid}}{ClCH_2COOH}$

ii. a. **Benzaldehyde and benzoic acid:**
Both can be distinguished by using sodium bicarbonate ($NaHCO_3$) test. Benzoic acid being an acid reacts with $NaHCO_3$ solution to produce brisk effervescence due to evolution of CO_2 gas while benzaldehyde does not.

$\underset{\text{Benzolc acid}}{C_6H_5COOH} + NaHCO_3 \longrightarrow C_6H_5CO\overline{O}Na^+ + CO_2 \uparrow + H_2O$

$\underset{\text{Benzaldehyde}}{C_6H_5CHO}$ + $NaHCO_3 \longrightarrow$ No effervescence (due to the evolution of CO_2 gas).

b. **Propanal and propanone:**

These compounds can be distinguished by using Tollen's test. Propanal being an aldehyde reduces Tollen's reagent to shining silver mirror and propanone being a ketone does not.

$$\underset{\text{Propanal}}{CH_3CH_2CHO} + \underset{\text{Tollen's reagent}}{2[Ag(NH_3)_2]^+} + 3OH^- \longrightarrow \underset{\text{Propanoate ion}}{CH_3CH_2COO^-} + \underset{\text{Silver mirror}}{2Ag\downarrow} + 4NH_3 + 2H_2O$$

$$\underset{\text{Propanone}}{CH_3COCH_3} \xrightarrow[reagent]{Tollen's} \text{No silver mirror}$$

OR

i. The compound contains carboxylic acid -COOH as the functional group and Ph means a phenyl group. The longest chain contains 3 carbon (prop) atom with a phenyl group at carbon 3 position so the IUPAC name of the compound is <u>3-phenylpropanoic acid.</u>

ii. The longest chain of the compound contains 4 carbon atom(but) with a methyl group as a substituent and a carboxylic acid as a functional group. The no. of the chain starts from the carbon atom of the –COOH group with a double bond on carbon 2 so the IUPAC name of the compound is <u>3-Methylbut-2-enoic acid.</u>

iii. The longest chain of the compound has 5 carbon atom(all are saturated (pent)) which are cyclic with the carboxylic group attached and a methyl group as a substituent. The no. of the chain starts from the carbon atom of the –COOH group(carboxylic acid) so the IUPAC name of the compound is 2-<u>Methylcyclopentanoic acid.</u>

iv. The longest chain of the compound is a derivative of benzene with the carboxylic group attached and 3 nitro groups. The no. of the chain starts from the carbon atom of the –COOH group so the IUPAC name of the compound is <u>2,4,6-Trinitrobenzoic acid.</u>

33. a. **Molar conductivity:** Molar conductivity of a solution is defined as the conductance of the solution which contains one mole of the electrolyte such that the entire solution is placed between the two electrodes kept one centimeter apart. It is denoted by λ_m

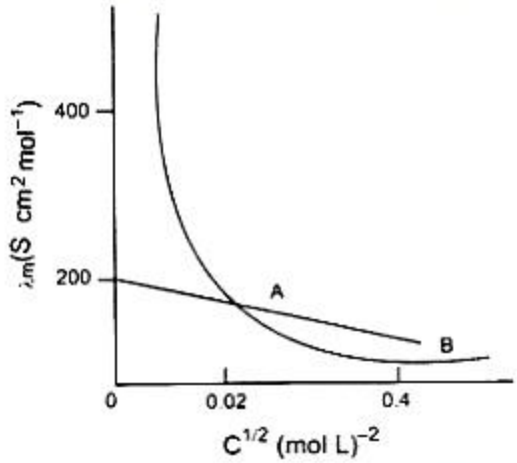
Molar conductivity $\lambda_m = \frac{k(kappa)}{C}$

Its unit is S cm^2 mol^{-1}

Weak electrolytes: When the concentration of weak electrolyte becomes very low, its degree of ionization rises sharply. There is sharp increase in the number of ions in the solution.

Hence the molar conductivity of a weak electrolyte rises steeply at low concentration.

Strong electrolyte: The molar conductivity of a strong electrolyte decreases slightly with the increase in concentration.



b. The reaction takes place in cell is

Cu^{2} + (aq) + 2Ag(s) $\rightarrow$ Cu(s) + $2Ag^{+}$ (aq)

Here n = 2

$$E^0_{cell} = 0.46V$$

$$E_{cell} = E^0_{cell} - \frac{0.059}{n}\log\frac{[Ag^+]^2}{[Cu^{2+}]}$$

$$= 0.46 - \frac{0.059}{2}\log\frac{[0.001]^2}{0.10}$$

$$= 0.46 - \frac{0.059}{2}\log 10^{-5}$$

$$= 0.46 - \frac{0.059}{2} \times 5\log 10$$

$$= 0.046\ \frac{0.059}{2}\ 5\log 10$$

$$= 0.046 + 1.46\ [\because \log 10 = 1][\because \log\ 10 = 1]$$

OR

a. i. It is highly efficient and do not produce pollution.

ii. The H_2O produced can be used by astronauts for drinking purpose.

b. We have, mass(m) deposited is

$$m = Z \times I \times t$$

$$m = \frac{108}{96500} \times 0.5 \times 2 \times 60 \times 60$$

$$= \frac{108\times5}{965\times10} \times 2 \times 6 \times 6 = 4.03\ g$$

$4.03g = V \times d$

$4.03g = V \times 10.5gcm^{-3}$

V = Area $\times$ Thickness

$V = \frac{4.03}{10.5}$

$\frac{4.03}{10.5} = 900cm^2 \times$ thickness

Thickness $= \frac{0.338cm^3}{900cm^2}$

$= 4.26 \times 10^{-4}cm$