CBSE Class 12 - Chemistry

Sample Paper 07 (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 actinoids include the fourteen elements from Th to Lr. The actinoids are radioactive elements and the earlier members have relatively long half-lives, the latter ones have half-life values ranging from a day to 3 minutes for lawrencium. The latter members could be prepared only in nanogram quantities. Actinoids show a greater range of oxidation states. The elements, in the first half of the series frequently exhibit higher oxidation states. The actinoids resemble the lanthanoids in having more compounds in +3 state than in the +4 state. All the actinoids are believed to have the electronic configuration of $7s^2$ and variable occupancy of the 5f and 6d subshells. The magnetic properties of the actinoids are more complex than those of the lanthanoids. The variation in the magnetic susceptibility of the actinoids with the number of unpaired 5f electrons is roughly parallel to the corresponding results for the lanthanoid.
   The following questions are multiple-choice questions. Choose the most appropriate answer.

i. The electronic configurations of Am is
   a. [Rn] $5f^8 7s^2$
   b. [Rn] $5f^7 7s^2$
   c. [Rn] $5f^9 7s^2$
   d. [Rn] $5f^{10} 7s^2$

ii. The actinoids show in general oxidation state of
   a. +4
   b. +3
   c. +5
   d. +6

iii. A member of the lanthanoid series which is well known to exhibit +4 oxidation state is
   a. Cerium (Z=58)
   b. Neodymium (Z=60)
   c. Terbium (Z=65)
   d. Holmium (Z=67)

iv. The 5f electrons of actinoid are more effectively shielded from the nuclear charge than the 4f electrons of the corresponding lanthanoid because
   a. the outer electrons are less firmly held
   b. outer electrons are available for bonding in the actinoids
   c. the outer electron is tightly held
   d. both (a) and (b)

v. Hydrochloric acid attacks all metals but most are slightly affected by
   a. hydrochloric acid
   b. sulphuric acid
   c. nitric acid
   d. none of these

2. **Read the passage and answer the following questions:**

The crystal field theory (CFT) is an electrostatic model which considers the metal-ligand bond to be ionically arising purely from electrostatic interactions between the metal ion and the ligand. Ligands are treated as point charges in case of anions or point dipoles in case of neutral molecules. The five d orbitals in an isolated gaseous metal atom/ion have the same energy, i.e., they are degenerate. In an octahedral coordination entity with six

ligands surrounding the metal atom/ion, there will be repulsion between the electrons in metal d orbitals and the electrons (or negative charges) of the ligands. This splitting of the degenerate levels due to the presence of ligands in a definite geometry is termed as crystal field splitting and the energy separation is denoted by Δ_0 . The colour in the coordination compounds can be readily explained in terms of the crystal field theory.

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:** The $d_{x^2-y^2}$ and d_{z^2} orbitals which point towards the axes along the direction of the ligand will experience more repulsion.
Reason: The d_{xy}, d_{yz} and d_{xz} orbitals which are directed between the axes will be lowered in energy.

ii. **Assertion:** The complex $[Ti(H_2O)_6]^{3+}$, which is red in colour.
Reason: The crystal field theory attributes the colour of the coordination compounds to d-d transition of the electron.

iii. **Assertion:** Ligands for which Δ_0 < P are known as weak field ligands and form high spin complexes.
Reason: If Δ_0 > P, than the fourth electron enters one of the e_g orbitals giving the configuration $t_{2g}^3\, e_g^1$.

iv. **Assertion:** In tetrahedral coordination entity formation, the d orbital splitting is inverted and is smaller as compared to the octahedral field splitting.
Reason: Spectrochemical series is based on the absorption of light by complexes with different ligands.

v. **Assertion:** The crystal field model is successful in explaining the formation, structures, colour and magnetic properties of coordination compounds.
Reason: The anionic ligands are found at the low end of the spectrochemical series.

3. The geometry of amines is_____.

a. trigonal
b. pentagonal
c. pyramidal
d. tetragonal

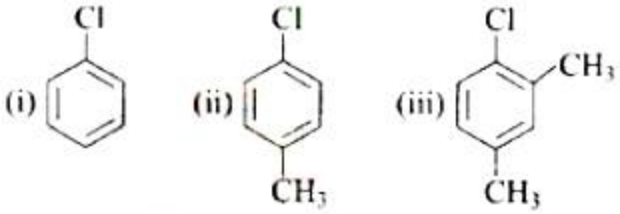
4. Hydrolysis of proteins in the presence of enzymes produces:
   a. Amino acids
   b. Dicarboxylic acids
   c. Hydroxy acids
   d. Aromatic acids

OR

Adenosine is
   a. Nucleic acid
   b. Nucleoside
   c. Base
   d. Nucleotide

5. The depression in freezing point for 1M urea, 1 M glucose and 1 M NaCl are in the ratio of
   a. 1:1:2
   b. 3:2:2
   c. 1:1:1
   d. 1:2:3

6. In the given question, arrange the compounds in increasing order of rate of reaction towards nucleophilic substitution.



   a. (iii) < (ii) < (i)
   b. (i) < (iii) < (ii)
   c. (i) < (ii) < (iii)
   d. (ii) < (i) < (iii)

OR

The compound formed on heating chlorobenzene with nitric acid in the presence of concentrated sulphuric acid is:

a. DDT
b. Gammexene
c. Freon
d. Hexachloroethane

7. Which one of the following is used to increase blood pressure?
   a. None of these
   b. Ephedrine
   c. Benadryl
   d. Novocain

OR

Hinsberg's reagent reacts with primary and secondary amines to form sulphonamides. This reagent is also known as

a. p – toluenesulphonyl chloride
b. None of these
c. N Methylbenzamide
d. Benzenesulphonyl chloride

8. Whipped cream is an example of
   a. Solid emulsion
   b. Suspension
   c. Foam
   d. Lyophilic sol

OR

Which of the following processes does not involve a catalyst?

a. Thermite process
b. Haber process
c. Oswald process
d. Contact process

9. Which of the following will show Tyndall effect?
   a. Aqueous solution of soap above critical micelle concentration

b. Aqueous solution of sugar
c. Aqueous solution of soap below critical micelle concentration
d. Aqueous solution of sodium chloride

10. A halogen used in potential blood substitutes in surgery is:
    a. Fluorine
    b. Bromine
    c. Iodine
    d. Chlorine
11. A compound formed by elements A and B crystallizes in the cubic structure where A atoms are at the corners of a cube and B atoms are the face centre. The formula of the compound is:
    a. A_2B
    b. A_2B_3
    c. AB_2
    d. AB_3
12. **Assertion:** $[Fe(CN)_6]^{3-}$ ion shows a magnetic moment corresponding to two unpaired electrons.

    Reason: Because it has d^2sp^3 type hybridization.
    a. Assertion and reason both are true, the reason is the correct explanation of assertion.
    b. Assertion and reason both are true but the reason is not the correct explanation of assertion.
    c. The assertion is true, the reason is false.
    d. The assertion is false, the reason is true.
13. **Assertion:** All naturally occurring α-amino acids except glycine are optically active.
    Reason: Most naturally occurring amino acids have L-configuration.
    a. Both assertion and reason are wrong statements.
    b. The assertion is the correct statement and reason is the wrong statement.
    c. The assertion is the wrong statement and reason is the correct statement.
    d. Assertion and reason both are correct statements but reason does not explain assertion.
14. **Assertion:** Osmotic pressure of 0.1 M urea solution is less than that of 0.1 M NaCl solution.

Reason: Osmotic pressure is not a colligative property.

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: Increasing pressure on water decreases its freezing point.

Reason: Density of water is maximum at 273 K.

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.

15. **Assertion:** The acidity of alcohols follows the order $1^\circ > 2^\circ > 3^\circ$.

Reason: The +I effect of alkyl groups $(3^\circ > 2^\circ > 1^\circ)$ favours the dissociation of -OH group.

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.

16. **Assertion:** The nucleophilic substitution of vinyl chloride is difficult than ethyl chloride.

Reason: Vinyl group is electron donating group.

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. How will you bring the following conversion?

    Propene to 1-nitropropane

    OR

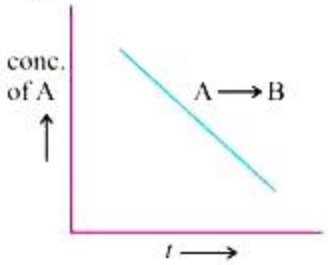
    Write the structure of the major organic product in the following reaction:

    $$H_3C - \underset{\underset{CH_3}{|}}{C} = CH - CH_2 - CH_3 + HBr \xrightarrow{peroxide}$$

18. What happens when blood cells are placed in pure water?
19. How is dialysis carried out? Mention its one application.

    OR

    On the basis of Hardy-Schulze rule explain why the coagulating power of phosphate is higher than chloride.

20. 

    i. What is the order of the reaction?

    ii. What is the slope of the curve?

21. In a reaction, $2A \rightarrow$ Products, the concentration of A decreases from 0.5mol L^{-1} to 0.4mol L^{-1} in 10 minutes. Calculate the rate during this interval?
22. Write structural formula and give IUPAC name:-

    Benzyl Alcohol

23. Predict which of the following will be coloured in aqueous solutions? Ti^{3+}, V^{3+}, Cu^{+}, Sc^{3+}, Mn^{2+}, Fe^{3+} and Co^{2+} give reason for each.
24. Write the IUPAC names of the following compounds:

    i. $CH_2 = CHCH_2Br$

    ii. $(CCl_3)_3CCl$

25. The compound CuCl has ZnS structure and the edge length of the unit cell in 500 pm.

Calculate the density. (Atomic masses: Cu = 63, Cl = 35.5, Avogadro no. = 6.022×10^{23} mol^{-1})

Section C

26. Account for the following:
    i. All the bonds in PCl_5 are not equivalent.
    ii. Sulphur in vapour state exhibits paramagnetism
    iii. Fluorine is the strongest oxidant amongst the halogens.
    iv. Among the noble gases, only xenon is known to form true chemical compounds.
    v. PbO_2 is stronger oxidizing agent than SnO_2

OR

Draw the structures of the following:
    i. Peroxodisulphuric acid
    ii. Bromine trifluoride.

27. Write the reactions involved in obtaining p - aminoazobenzene using nitrobenzene as an organic reagent to start with.

OR

Complete the following reactions:
    i. $C_6H_5N_2Cl + C_6H_5NH_2 \longrightarrow$
    ii. $C_6H_5N_2Cl + CH_3CH_2OH \longrightarrow$
    iii. $RNH_2 + CHCl_3 + KOH \longrightarrow$

28. Iron(II) oxide has a cubic structure and each side of the unit cell is $5\ \overset{o}{A}$. If density of the oxide is 4 g/cm^3, calculate the number of Fe^{2+} and O^{2-} ions present in each unit cell. (Atomic mass Fe = 56 u, O = 16 u, Avogadro's number = 6.023×10^{23} atoms mol^{-1}
29. What are the common types of secondary structure of proteins?
30. Write the mechanism of acid dehydration of ethanol to yield ethane.

Section D

31. i. How is ammonia prepared on a large scale? Name the process and mention the optimum conditions for the production of ammonia by this process.
    ii. a. H_2S is more acidic than H_2O. Give reason.

b. Sulphur has a greater tendency for catenation than oxygen. Give reason.

c. What happens when sulphur dioxide reacts with chlorine in the presence of charcoal?

OR

a. i. Write the disproportionation reaction of H_3PO_3.

ii. Draw the structure of XeF_4.

b. Account for the following :

i. Although Fluorine has less negative electron gain enthalpy yet F_2 is strong oxidizing agent.

ii. Acidic character decreases from N_2O_3 to Bi_2O_3 in group 15.

c. Write a chemical reaction to test sulphur dioxide gas. Write chemical equation involved.

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

i. Propanal and propanone.

ii. Benzaldehyde and benzoic acid.

OR

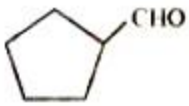
Write the IUPAC names of the following ketones and aldehydes. Wherever possible, give also common names.

i. $CH_3CO(CH_2)_4CH_3$

ii. $CH_3CH_2CHBrCH_2(CH_3)CHO$

iii. $CH_3(CH_2)_5CHO$

iv. Ph - CH = CH - CHO

v. 

vi. PhCOPh

33. State the products of electrolysis obtained on the cathode and the anode in the following cases:

i. A dilute solution of H_2SO_4 with platinum electrodes.

ii. An aqueous solution of $AgNO_3$ with silver electrodes.

OR

A voltaic cell is set up at 25°C with the half cells, $Al|Al^{3+}$ (0.001 M) and $Ni|Ni^{+}$ (0.50 M). Write the equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.

Given: $E^0_{(Ni^{2+}/Ni)} = -0.25V\, E^0_{(Al^{3+}/Al)} = -1.66V$

CBSE Class 12 - Chemistry

Sample Paper 07 (2020-21)

Solution

Section A

1. i. (b) [Rn] $5f^{7}7s^{2}$
   ii. (b) +3
   iii. (a) Cerium (Z = 58)
   iv. (d) both (a) and (b)
   v. (c) nitric acid
2. i. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
   ii. (d) Assertion is wrong statement but reason is correct statement
   iii. (c) Assertion is correct statement but reason is wrong statement
   iv. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
   v. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
3. (c) pyramidal

   Explanation: An amine molecule has the shape of a somewhat flattened triangular pyramid, with the nitrogen atom at the apex. An unshared electron pair is localized above the nitrogen atom.
4. (a) Amino acids

   Explanation: Only α-amino acids are obtained on hydrolysis of proteins.

   OR

   (b) Nucleoside

   Explanation: A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside. Adenosine is nucleoside composed of adenine attached a ribose sugar molecule.
5. (a) 1:1:2

   Explanation: NaCl has i=2 while urea and glucose will have i=1

6. (a) (iii) < (ii) < (i)

   Explanation: Electron releasing group increase the reactivity of aryl halides, less is the number of electrons releasing group, the less is rate towards nucleophilic substitution reaction.

OR

(a) DDT

Explanation: **Dichloro diphenyl trichloroethane** (DDT), non-water soluble chlorinated hydrocarbon in use since the Second World War (1939-1945) as an insecticide for the control of lice (that spread typhus) and mosquitoes (that spread malaria and yellow fever.

7. (b) Ephedrine

   Explanation: Ephedrine is a stimulant used to prevent low blood pressure during spinal anaesthesia. It increases heart rate and blood pressure, expands bronchial tube, and increases body heat.

OR

(d) Benzenesulphonyl chloride

Explanation: $C_6H_5SO_2Cl_2$.This is benzene sulphonyl chloride known as hinsberg reagent. It is used to distinguish between primary, secondary, and tertiary amine.

8. (c) Foam

   Explanation: Whipped cream is example of foam. It is formed by combination of gas (dispersed phase) and liquid (dispersion medium).

OR

(a) Thermite process

Explanation: Thermite process doesn't require a catalyst. It can easily proceed without the help of a catalyst.

9. (a) Aqueous solution of soap above critical micelle concentration

   Explanation: At high concentration, soap solution behaves as associated colloid and form micelles. But micelles formation occurs only above Kraft temperature(T_K) and above a particular concentration called critical micelle concentration (CMC). Colloidal particles can only show the Tyndall effect.

10. (a) Fluorine

    Explanation: Certain fully fluorinated compounds are being considered as potential blood substitutes in surgery. So fluorine is the element used in these blood substitutes.

11. (d) AB_3

    Explanation: No.of elements of A in 1 unit cell = $\frac{1}{8} \times 8 = 1$

    No. of elements of B in face centre= $\frac{1}{2} \times 6 = 3$

    So, formula of the compound is: AB_3

12. (d) The assertion is false, the reason is true.

    Explanation: $[Fe(CN)_6]^{3-}$ ion shows a magnetic moment corresponding to one unpaired electron.

13. (d) Assertion and reason both are correct statements but reason does not explain assertion.

    Explanation: All α-amino acids except glycine contain at least one chiral carbon.

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

    Explanation: Assertion is CORRECT but, reason is INCORRECT.

    OR

    (c) Assertion is CORRECT but, reason is INCORRECT.

    Explanation: Assertion is CORRECT but, reason is INCORRECT.

15. (c) Assertion is CORRECT but, reason is INCORRECT.

    Explanation: Assertion is CORRECT but, reason is INCORRECT.

16. (c) Assertion is CORRECT but, reason is INCORRECT.

    Explanation: Assertion is CORRECT but, reason is INCORRECT.

Section B

17. Propene on treatment with HBr in presence of peroxide gives anti-markownikov's product 1-bromopropane which on treatment with $AgNO_2$ gives 1-nitropropane and AgBr.

$$\underset{\text{Propene}}{CH_3 - CH = CH_2} + HBr \xrightarrow{Peroxide} \underset{1-Bromopropane}{CH_3 - CH_2 - CH_2Br}$$

$$\xrightarrow{AgNO_2} AgBr + \underset{1-Nitropropane}{CH_3 - CH_2 - CH2NO_2}$$

OR

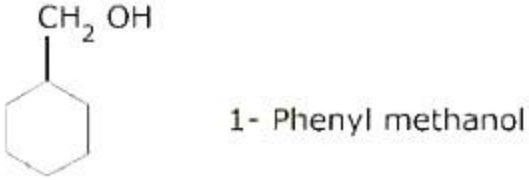
$$H_3C - \underset{\underset{CH_3}{|}}{C} = CH - CH_2 - CH_3 + HBr$$

$$\xrightarrow{peroxide} H_3C - \underset{\underset{CH_3}{|}}{C}\ H - CHBr - CH_2 - CH_3$$

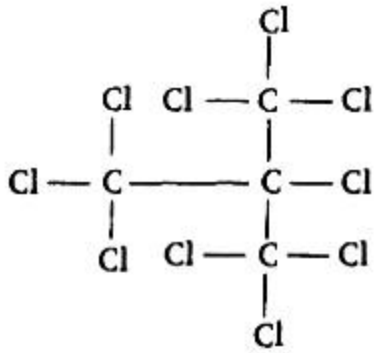
18. Due to osmosis, water molecules move into blood cells through the cell walls. As a results, blood cells swell and may even burst. As osmosis is the process of movement of molecules from lower concentration to higher concentration.
19. Dialysis is used for purification of colloidal solution. It is carried out by putting impure colloidal solution in parchment paper bag and then dipping it in distilled water.

OR

According to the Hardy-Schulze rule, the coagulation property of an electrolyte depends upon the valency of the coagulation ion. Higher the charge on flocculating ion added, the greater is its power to cause precipitation. Phosphate ion has -3 charge while chloride ion carries only -1 charge. So the coagulating power of phosphate is higher than chloride.

20. i. Zero order reaction.
    ii. $[R] = [R_0] - kt \therefore$ Slope = -k
21. Average rate $= -\frac{1}{2}\frac{\Delta[A]}{\Delta t}$
    $= -\frac{1}{2}\frac{[A]_2 - [A]_1}{t_2 - t_1}$
    $= -\frac{1}{2}\frac{0.4 - 0.5}{10}$
    $= -\frac{1}{2}\frac{-0.1}{10}$
    $= 0.005\ mol\ L^{-1}\ min^{-1}$
22. 

    1- Phenyl methanol
23. Ti^{3+}, V^{3+}, Mn^{2+}, Fe^{3+} and Co^{2+} are coloured due to the presence of unpaired electrons, they can undergo d-d transitions. Cu^{+}, Sc^{3+} are colourless due to the absence of unpaired electrons in them.
24. i. $\underset{3-bromoprop-1-ene}{\overset{1}{C}H_2 = \overset{2}{C}H\overset{3}{C}H_2Br}$
    ii. $(CCl_3)_3CCl$ The structure can be drawn as



tris-(trichloromethyl) chloromethane

25. Since ZnS has fcc structure, therefore, CuCl also has fcc structure.

Here, Z=4 , M= 1 × Cu + 1 × Cl = 1 × 63 + 1 × 35.5 = 98.5 g/mol

$N_A = 6.022 \times 10^{23}\ mol^{-1}$;

$a = 500\ pm = 5 \times 10^{-8}\ cm$; $a^3 = 125 \times 10^{-24}\ cm^3$

Now, $d = \frac{ZM}{N_A a^3} = \frac{4 \times (98.5\ g/mol)}{(6.022 \times 10^{23}\ mol^{-1}) \times (125 \times 10^{-24}\ cm^3)} = \frac{394 \times 10}{6.022 \times 125} = 5.23\ g/cm^3$

Section C

26. i. As a result of sp^3d hybridization, there are two axial bonds and three equatorial bonds in PCl_5 molecule. As the axial bond pairs suffer more repulsive interactions from the equatorial bond pairs, therefore, the axial bonds are slightly elongated and slightly weaker than equatorial bonds.

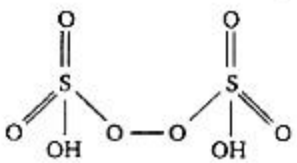
ii. In vapour state, sulphur partly exists as S_2 molecule and S_2 molecule has two unpaired electrons in antibonding π orbital and hence exhibits paramagnetism.

iii. Xenon has the lowest ionization energy among the noble gases except radon which is however radioactive.

iv. Due to inner pair effect the lower oxidation state gets more stabilized in the increase in atomic number in the same group of p-block elements. Hence PbO_2 is stronger oxidizing agent than SnO_2.

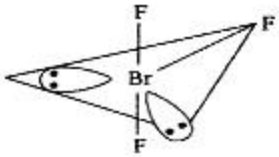
OR

i. The structure of $H_2S_2O_8$ peroxydisulphuric acid is shown below:



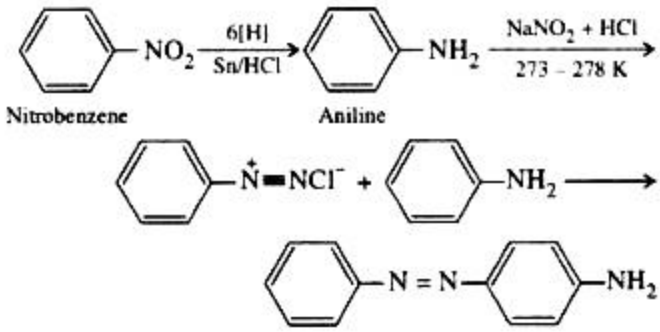
Peroxydisulphuric acid ($H_2S_2O_8$)

ii. The structure of BrF_3 is shown below:



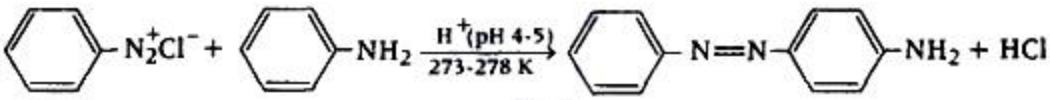
Bromine trifloride (BrF_3)

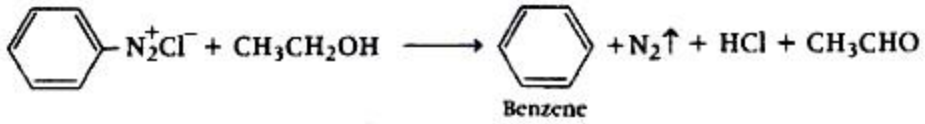
27. p-aminodiazobenzene can be obtained from nitrobenzene as under:



p-Aminoazobenzene

OR

i. 

ii. 

iii. $R\text{-}NH_2 + CHCl_3 + 3KOH \xrightarrow{\Delta} RNC + 3KCl + 3H_2O$

28. Given,

$$a = 5\,\overset{o}{A} = 5 \times 10^{-8}\,cm$$

d = 4 g/cm^3 ; M = 72 g/mol

$$Z = \frac{dN_A a^3}{M} = \frac{(4g/cm^3) \times (6.023 \times 10^{23}\ atom\ mol^{-1})(5 \times 10^{-8}\ cm)^3}{(72\ g/mol)}$$

$Z = 4.18 \simeq 4.$

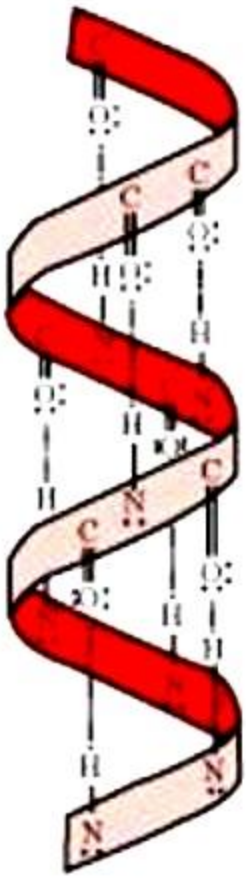
29. There are two common types of secondary structure of proteins:

i. $\propto$ -helix structure

ii. β pleated sheet structure

$\propto$ - Helix structure

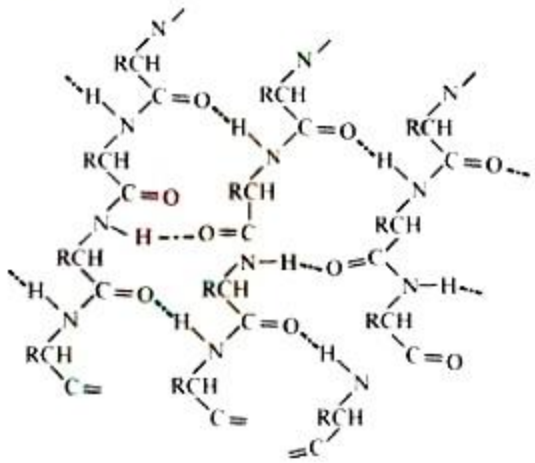
In this structure, the $-NH$ -NH group of an amino acid residue forms H-bond with the $\rangle C=O$ group of the adjacent turn of the right-handed screw ($\propto$ -helix).



β pleated sheet structure:

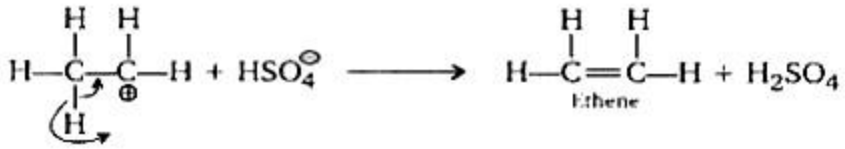
β pleated sheet structure:

This structure is called so because it looks like the pleated folds of drapery. In this structure, all the peptide chains are stretched out to nearly the maximum extension and then laid side by side. These peptide chains are held together by intermolecular hydrogen bonds.



30. i. $\underset{Ethanol}{CH_3CH_2OH} \xrightarrow{H^+} CH_3CH_2\overset{\ominus}{O}H_2$

ii. $CH_3 - CH_2 - \overset{\oplus}{O}H_2 \xrightarrow{-H_2O} CH_3 - \overset{\oplus}{C}H_2$

iii. 

Section D

31. i. On a large scale, ammonia is manufactured by Haber's process.

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g); \Delta_f H^\circ = -461 \ KJ\ mol^{-1}$

In accordance with the Le-Chatelier's principle, high pressure and constant temperature would favour the formation of ammonia.

Use of a catalyst such as iron oxide with small amounts of K_2O and Al_2O_3 increases the rate of attainment of equilibrium.

ii. a. Due to the decrease in bond dissociation enthalpy down the group, the acidic character increases.

Thus, H_2S is more acidic than H_2O.

b. The bond energy of S-S bond$(213\ KJ\ mol^{-1})$ is greater than O-O bond $(138\ KJ\ mol^{-1})$.

Due to the small size of an oxygen atom, there is greater lp-bp repulsion in O-O, resulting in weakening of O-O bond more than in S-S bond.

c. When sulphur dioxide reacts with chlorine in the presence of charcoal sulphuryl chloride is formed.

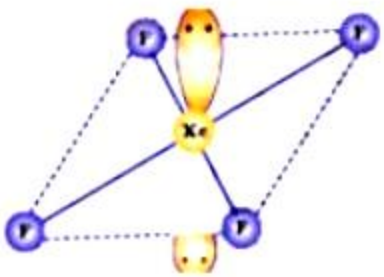
$SO_2(g) + Cl_2(g) \rightarrow SO_2Cl_2(l)$

OR

a. i. Disproportionation reaction of H_3PO_3:

$4H_3PO_3 \rightarrow 3H_3PO_4 + PH_3$

ii. Structure of XeF_4:



b. i. Fluorine (F_2) is strong oxidizing agent due to small size and low bond dissociation

enthalpy.

ii. As the size increases, electronegativity decreases and non-metallic character also decreases. So, acidic character decreases from N_2O_3 to Bi_2O_3 in group 15.

c. Chemical reaction to test sulphur dioxide gas:

$$5SO_2 + 2MnO_4 + 2H_2O \rightarrow 5SO_4^{2-} + 4H^+ + 2Mn^{2+}$$

32. i. **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.

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

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

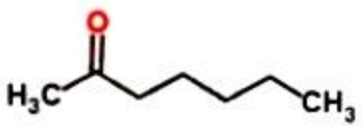
ii. Benzaldehyde and benzoic acid Both can be distinguished by using sodium bicarbonate ($NaHCO_3$) test. Benzoic acid being an acid reacts with $NaHCO_3$ solution to produce brisk effervescence due to evolution of CO_2 gas while benzaldehyde does not.

$$\underset{\text{Benzolc acid}}{C_6H_5COOH} + NaHCO_3 \longrightarrow C_6H_5CO\overline{N}a + CO_2\uparrow + H_2O$$

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

OR

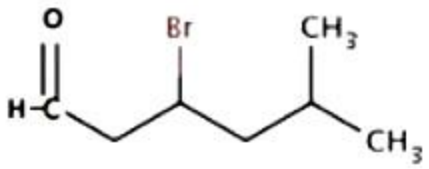
i. $CH_3CO(CH_2)_4CH_3$



IUPAC name of compound: Heptan-2-one

Common name: Methyl n-propyl ketone

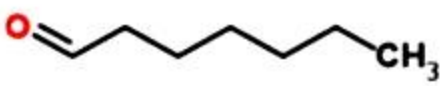
ii. $CH_3CH_2CHBrCH_2(CH_3)CHO$



IUPAC name of compound: 4-Bromo-2-methylhaxanal

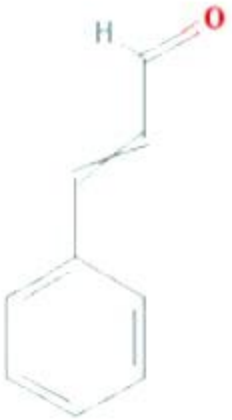
Common name: (γ-Bromo-α-methyl-caproaldehyde)

iii. $CH_3(CH_2)_5CHO$



IUPAC name of compound: Heptanal

iv. Ph - CH = CH - CHO



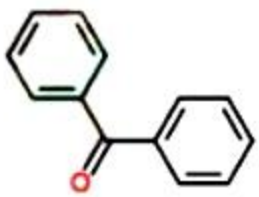
IUPAC name of compound: 3-phenylprop-2-enal

Common name: β-Pheynolacrolein

v. 

IUPAC name: Cyclopentanecarbaldehyde

vi. PhCOPh



IUPAC name: Diphenylmethanone

Common name: Benzophenone

33. i. **At cathode:** $2H^+(aq) + 2e^- \rightarrow H_2(g)$

At anode: $2OH^-(aq) \rightarrow O_2(g) + 2H^+(aq) + 4e^-$

$H_2(g)$ is evolved at cathode and $O_2(g)$ is evolved at anode.

ii. **At cathode:** $Ag^+(aq) + e^- \rightarrow Ag(s)$

At anode: $Ag(s) \rightarrow Ag^+(aq) + e^-$

OR

Half cell equation are:

$Al \longrightarrow Al^{3+} + 3e^-$ (At Anode)

$Ni^{2+} + 2e^- \longrightarrow Ni$ (At cathode)

$2Al + 3Ni^{2+} \longrightarrow 2Al^{3+} + 3Ni$ (Overall reaction)

The cell may be represented as:

$Al|Al^{3+}||Ni^{2+}|Ni$

$E^0_{cell} = E^0_{right} - E^0_{left}$

= (-0.25) - (-1.66)

= -0.25 + 1.66

= 1.41 V

Applying Nernst equation to the above cell reaction.

$$\mathbf{E}_{\text{cell}} = 1.41\text{V} - \frac{0.0591}{6}\log\frac{(10^{-3})^2}{(0.5)^3} = 1.41\text{ V} - \frac{0.0591}{6}\log\left(8 \times 10^{-6}\right)$$

$$= 1.41\text{V} - \frac{0.0591}{6}\left(\log 2^3 + \log 10^{-6}\right)$$

$$= 1.41\text{V} - \frac{0.0591}{6}\left[3 \times \log 2 + (-67)\log 10\right]$$

$$= 1.41\text{V} - \frac{0.0591}{6}\left[3 \times 0.3010 - 6\right]$$

= 1.41 V + 0.050 V

E_{cell} = 1.46 V