CBSE SAMPLE PAPER-01

Class – XII Chemistry (Theory)

Time allowed: 3 hours, Maximum Marks: 70

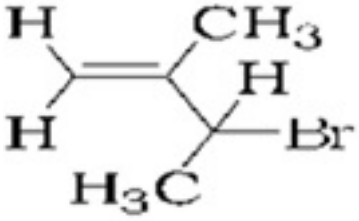
General Instructions:

1. All the questions are compulsory.
2. There are **26** questions in total.
3. Questions **1** to **5** are very short answer type questions and carry **one** mark each.
4. Questions **6** to **10** carry **two** marks each.
5. Questions **11** to **22** carry **three** marks each.
6. Questions **23** is value based question carrying **four** marks.
7. Questions **24** to **26** carry **five** marks each.
8. There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such questions.
9. Use of calculators is **not** permitted. However, you may use log tables if necessary.

1. Why a Schottky defect is formed when calcium chloride is added to silver chloride crystal?

Ans. When calcium chloride is added to silver chloride crystal, an impurity defect is formed. The addition of one calcium ion will replace two silver ions to maintain electrical conductivity. One of the positions of silver ion will be occupied by one calcium ion and other will be left as a hole similar to Schottky defect.

2. Give the IUPAC name of



Ans. 3-Bromo-2-methylbut-1-ene.

3. In Haber's process, it is necessary to remove CO when ammonia is obtained. Give Reason

Ans. Since CO acts as a poison for the catalyst in Haber's process, it lowers the activity of the catalyst and so, CO must be removed when ammonia is obtained.

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4. What are point defects? Mention its types.

Ans. The imperfections in a crystal are caused by a departure from the periodic arrangement in the vicinity of an atom or group of atoms, the imperfections are called point defects. These arise from an error at a single point. Point defects are classified into three types namely, stoichiometric defects, impurity defects and non-stoichiometric defects.

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5. Why the process of adsorption is always exothermic?

Ans. This is because there is a force of attraction between adsorb ate and adsorbent due to which there is decrease in surface energy which appears as heat.

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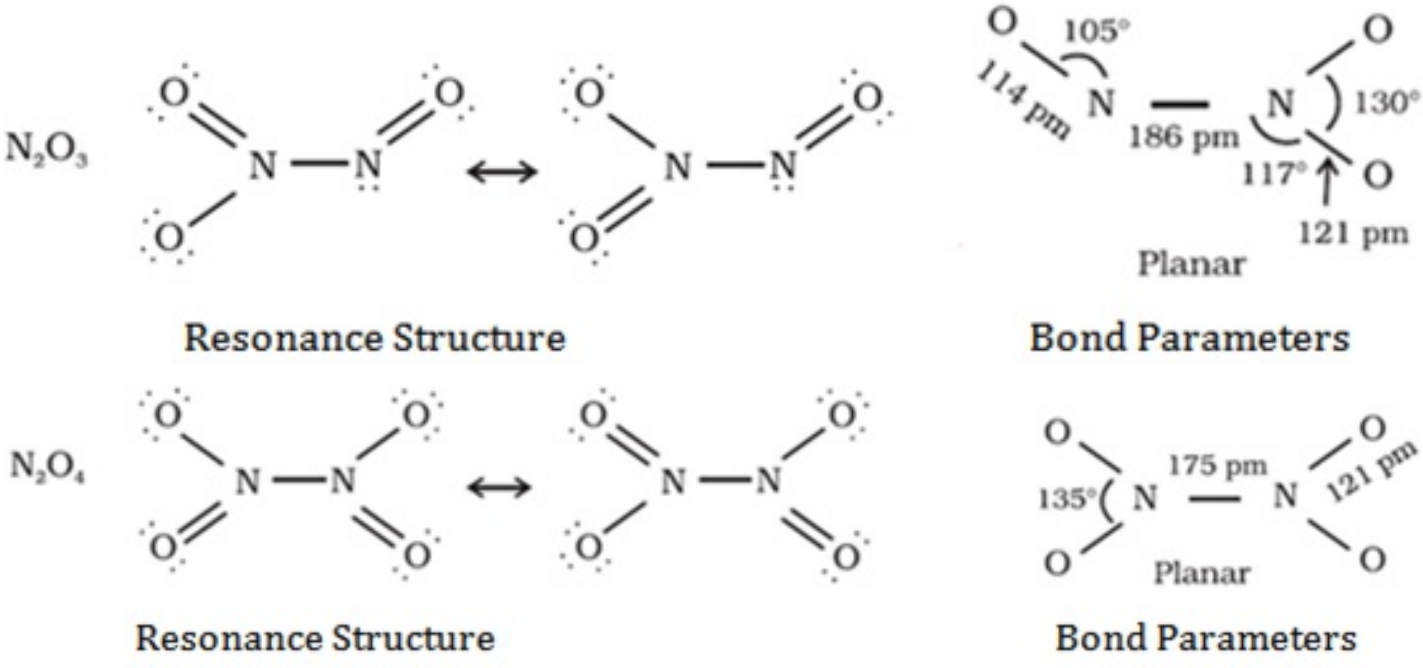
6. Give the resonance structures and bond parameters for N_2O_3 and N_2O_4.

Ans.



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7. Give a chemical test to distinguish Ethylamine and diethylamide by giving equations.

Ans. Carbylamines test – Aliphatic and aromatic primary amines on heating with chloroform

and ethanolic potassium hydroxide form isocyanides or carbylamines which are foul smelling substances. Secondary and tertiary amines do not show this reaction. This reaction is known as carbylamines reaction or isocyanides test and is used as a test for primary amines.

$$R\text{-}NH_2 + CHCl_3 + 3KOH \xrightarrow{Heat} R\text{-}NC + 3KCl + 3H_2O$$

8. What is the effect of temperature on the solubility of a solid in a solvent?

Ans. The solubility of a solid in a liquid is significantly affected by temperature changes. Consider the equilibrium represented by equation:

$Solute + Solvent \Leftrightarrow Solution$

This, being dynamic equilibrium, must follow Le Chateliers Principle. If in a nearly saturated solution, the dissolution process is endothermic (Δsol H > 0), the solubility should increase with rise in temperature and if it is exothermic (Δsol H < 0) the solubility should decrease. These trends are also observed experimentally.

9. Give the parameters that characterize a unit cell.

Or

Explain how much portion of an atom located at a) the corner and b) body centre of a cubic unit cell is part of its neighboring unit cell?

Ans. A unit cell is characterized by two parameters,

a) Dimensions along the three edges represented as a, b and c.

b) Angles between edges α between b and c, β between a and c and γ between a and b.

Hence a unit cell is represented by six parameters.

Or

a) The atom of corner of a cubic unit cell is shared by eight adjacent unit cells. Therefore, portion of the atom at the corner = $8 \times \frac{1}{8} = 1\,atom$

b) The atoms present at the center of the body is not shared by its neighbouring unit cell. Therefore, portion of the atom at the center = 1 atom

10. Give reasons:

i. Ortho nitro phenol is more acidic than or thomethoxy phenol.

ii. Ethers possess a dipole moment even if the alkyl radicals in the molecule are

identical.

Ans. This is because the nitro group is electron withdrawing group and will increase the positive charge on oxygen to make it more acidic. On the other hand, methoxy group is electron releasing group and will decrease positive charge on oxygen making it less acidic as O – H bond will not break easily.

Ethers have angular structure similar to water, in which oxygen involves sp^3 hybridisation. Oxygen is surrounded by two O – R bonds and two lone pairs. Due to angular structure, ethers have dipole moment even if the two alkyl groups are identical because two C – O moments do not cancel each other.

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11. What mass of propane is obtained from 34.0 g of 1-iodo-propane on treating with ethanolic KOH, if the yield is 36%?

Ans. $CH_3CH_2CH_2I + KOH\,(alc.)$

$\rightarrow CH_3CH = CH_2 + KI + H_2O$

Molecular mass of iodopropane = $3 \times 12 + 7 \times 1 + 127$ = 170

Molecular mass of propane = $3 \times 12 + 6 \times 1$ = 42

170 g of iodopropane gives 42 g of propane

Therefore,

34 g of iodopropane gives $\frac{42}{170} \times 34 = 8.4\ g$

But the actual yield is 36%, so

The actual mass of propane obtained = $8.4 \times \frac{3.6}{100} = 3.024\ g.$

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12. What are the forces that stabilize the protein structures?

Ans. a. Hydrogen bonding – these are weak forces which arise between a partially positive hydrogen and a partially negative atom on the same or different molecule.

b. Ionic bonding – these takes place between an ionic and cationic side chains resulting side chain cross linking.

c. Covalent bonding –it is a inter chain bonding is the disulphide bond formed between the sulphur atoms of two cysteine residues.

Hydrophobic bonding – proteins in aqueous solutions fold so that most of the hydrophobic chains become clustered inside the folds. The polar side chains which are hydrophilic lie on the outside the protein.

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13. Complete the reactions:

i. $POCl_3 + H_2O \rightarrow$

ii. $P_4O_{10} + H_2O \rightarrow$

iii. $P_4 + KOH + H_2O \rightarrow$

Ans. (i) $POCl_3 + 3H_2O \rightarrow H_3PO_4 + 3HCl$

(ii) $P_4O_{10} + 6H_2O \rightarrow 4\ H_3PO_4$

(iii) $P_4 + 3KOH + H_2O \rightarrow PH_3 + 3\ KH_2PO_2$

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14. Define the following term with an example:

a) Tranquilizers

b) Analgesics

c) Antipyretics

Ans. (a) The chemical substances which are used for the treatment of stress, mild and severe mental diseases are called tranquilizers. Example – Iproniazid.

(b) The chemical substances which are used to relieve pains without causing impairment of consciousness, mental confusion, paralysis and other disturbances of nervous system are called analgesics. Example – Novalgin.

(c) The chemical substances which are used to lower the temperature of the body in high fever are called antipyretics. Example – Aspirin.

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15. Explain the term copolymerisation with two examples.

Ans. Copolymerization is defined as a process in which two or more monomers combine to form a polymer. It contains a multiple units of each monomer in the chain.

Examples – 1,3-butadiene and acrylonitrile, 1,3-butadiene and styrene

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16. Give four criterions to be followed for the selection of stationary phase in chromatography.

Ans. a) It should be high and selective adsorption power.

b) It should be finely divided to offer greater surface area for adsorption.

c) It should be pure.

d) It should not react chemically either with the sample components.

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17. i. Why noble gases have low boiling points?
ii. Why are the elements of group 18 known as noble gases?
iii. Why He is used in diving apparatus?
Ans. (i) Noble gases are monatomic gases and are held together by weak Vander Waals forces. Therefore, they are liquefied at very low temperatures. Hence they have low boiling points.
(ii) The elements in group 18 have completely filled valence shell except He. So, they have neither any tendency to lose nor to gain electrons. However, they react with few elements only under certain conditions and so are called noble gases.
(iii) He is used as a diluent for oxygen in diving apparatus because of its low solubility in blood.

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18. What are the factors which determine the magnitude of the orbital splitting energy?
Or
How the nature of the ligand affect the stability of a complex ion?
Ans. a. Nature of the ligand.
b. Oxidation state of the metal ion.
c. Nature of the metal ion.
d. Geometry of coordination entity.
Or
The more basic a ligand, the greater is the ease with which it can donate its lone pairs of electrons and therefore, the greater is the stability of the complexes formed by it. For anionic ligands, the higher the charge and the smaller the size, the more stable is the complex formed.

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19. Differentiate addition and condensation polymers.
Ans.

S.No	Addition polymers	Condensation polymers
1.	It involves one monomer.	It involves two monomers.
2.	The monomers are unsaturated compounds.	The monomers contain two functional groups.
	Different monomers add to form a	A large number of monomers combine with the

3.	polymer having same molecular formula of the repeating structural unit as that of starting monomer.	loss of simple molecules to form a polymer having molecular formula of the repeating structural unit different than that of starting monomers.
4.	Egs – PVC, polythene etc.	Egs – Bakelite, nylon etc.

20. Calculate the number of active hydrogen atoms in the molecule of an organic compound, if an excess of methyl magnesium iodide reacts with 0.6 g of an organic compound $C_3H_6O_3$ to evolve 295.7 mL of methane gas at STP.

Ans. Molecular mass of $C_3H_6O_3$ = $12 \times 3 + 6 \times 1 + 3 \times 16$ = 90 g

Now, 0.6 g of the compound evolve methane at STP = 295.7 mL

90 g of compound evolve methane at STP = $\frac{295.7}{0.6} \times 90 = 44355$

Moles of methane produced = $\frac{44355}{22400} = 1.98$ or 2 approx.

Therefore, one mole of compound produces two moles of methane gas. There are two active hydrogen atoms present in one molecule of compound.

21. The decomposition of N_2O_5 in CCl4 at 318K has been studied by monitoring the concentration of N_2O_5 in the solution. Initially the concentration of N_2O_5 is 2.33 mol and after 184 minutes, it is reduced to 2.08 mol . The reaction takes place according to the equation $2N_2O_5\ (g) \rightarrow 4\ NO_2\ (g)\ +\ O_2\ (g)$

a) Calculate the average rate of this reaction in terms of hours, minutes and seconds.

b) What is the rate of production of NO_2 during this period?

Ans. $\text{Average Rate} = \frac{1}{2}\left\{-\frac{\Delta[N_2O_5]}{\Delta t}\right\}$

Substituting the values, we get $1.13 \times 10^{-5} mol/L/s$

Rate = $\text{Average Rate} = \frac{1}{4}\left\{-\frac{\Delta[NO_2]}{\Delta t}\right\}$

Substituting the values,

$\frac{\Delta[NO_2]}{\Delta t} = 2.72 \times 10^{-3} mol/L/min$

22. Why F shows only one oxidation state whereas other halogens show more than two positive oxidation states?

Ans. F is most electronegative element and so cannot show positive oxidation states whereas the other halogens are less electronegative and so show various positive oxidation states.

They also have vacant d-or bitals and hence can expand their octets and show +1, +3, +5 and +7 oxidation states.

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23. Ethanol is used for drinking purpose. But to refrain people from drinking industrial alcohol, it is denatured. Now a days some countries use ethanol as an additive in gasoline since it is cleaner fuel.
a. What is denatured alcohol? Why it is denatured?
b. Would you support the use of ethanol as an additive in gasoline for India?
c. What are the values associated with your decision?
Ans. a. Industrial alcohol is made unfit for drinking by adding methyl alcohol $CuSO_4$ and pyridine. This alcohol is called denatured alcohol.
b. Ethanol is an excellent solvent and if taken in large quantity it is harmful for humans. So in order to supply ethanol and to refrain people from drinking it is denatured.
c. Yes, because it will help im meeting energy crisis and reduce our fiscal deficit which is created due to import of gasoline.
Values – Concern for energy crisis and Concern for economy of country.

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24. Calculate the equivalent conductivity of $1\ M\ H_2SO_4$ solution whose conductivity is $26 \times 10^{-2} ohm^{-1} cm^{-1}$.
Or
How long will it take to deposit 1.0 g of Cr when a current of 1.25 A flows through a solution of chromium (III) sulphate? [Molar mass of Cr = 52].
Ans. Conductivity = $26 \times 10^{-2} ohm^{-1} cm^{-1}$
Resistance of solution = 31.6 ohm
Concentration = $1\ M\ H_2SO_4$ = 98 g/L
Equivalent weight of sulphuric acid = 49
Gram equivalents per litre = $\frac{98}{49}$ = 2
Equivalent conductivity = $k \times 1000/C$
= $26 \times 10^{-2} \times 1000/2$
$= 130\ ohm^{-1} cm^2 equiv^{-1}$.
Or
$Cr^{3+} + 3e^- \rightarrow Cr\,(s)$
3 mol of electricity are required to deposit 1 mol of Cr.

52 g of Cr require current of $3 \times 96500\ C$

1 g of Cr will require current = $3 \times \frac{96500}{52}$ = 5567.3 C

The number of coulombs = current x time

Time = no. of coloumbs/ current

= $\frac{5567.3}{1.25}$ = 4453.8 sec or 1.24 hrs.

25. a) Give the structures of chromate ion and dichromate ion.

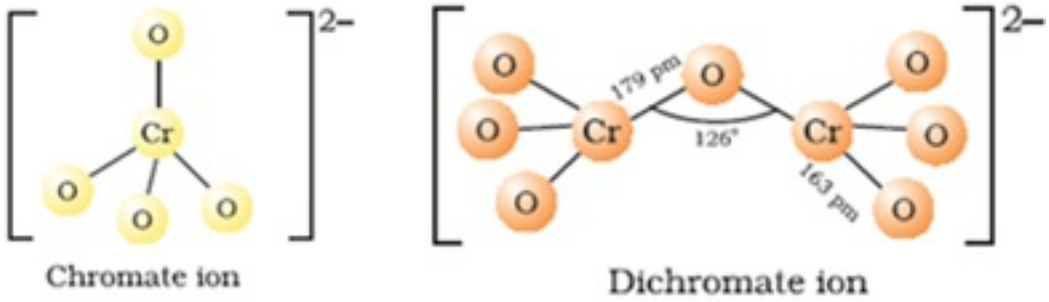
b) Give the preparation of potassium permanganate.

Or

a) Give the structure of manganite ion and permanganate ion.

b) Give the schematic representation of chemical reactions of lanthanoids.

Ans. a)



Chromate ion Dichromate ion

b) Potassium permanganate is prepared by fusion of MnO_2 with an alkali metal hydroxide and an oxidising agent like

KNO_3. This produces the dark green K_2MnO_4 which disproportionates in a neutral or acidic solution to give permanganate.

$2MnO_2 + 4KOH + O_2$

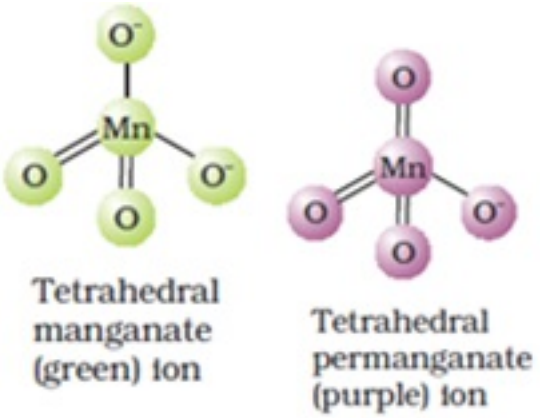
$\rightarrow 2K_2MnO_4 + 2H_2O$

$3MnO_4^{2-} + 4H^+$

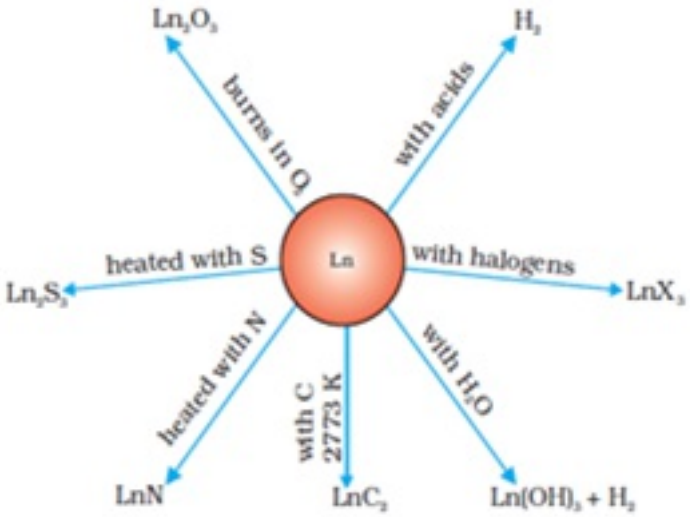
$\rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

Or

a)



b)



26. Convert the following into benzoic acid:

a. Ethylbenzene

b. Acetophenone

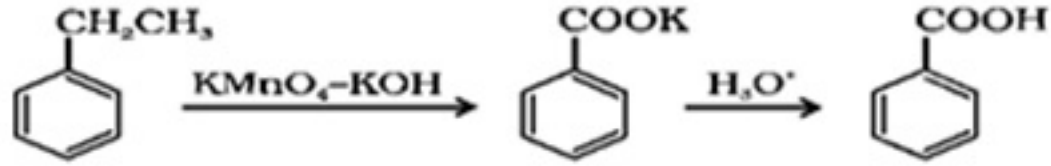
c. Bromobenzene

d. Styrene

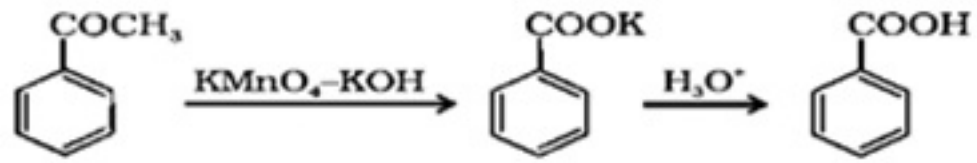
Or

An organic compound X contains 69.77% C, 11.63% H and rest Oxygen. The molecular mass of the compound is 86. The compound X does not reduce Tollen's reagent, but forms an addition compound with sodium hydrogen sulphite and gives positive iodoform test. On vigorous oxidation, X gives ethanoic and propanoic acids. Identify the possible structure of X.

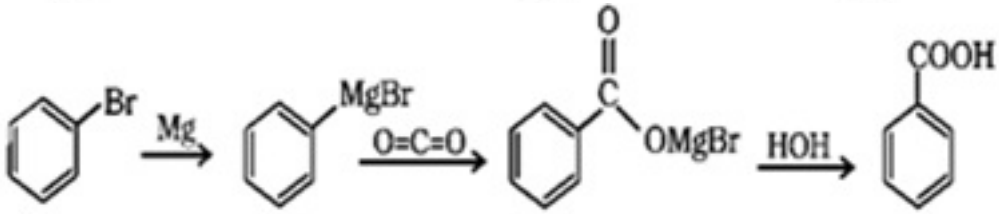
Ans. a.



b.



c.



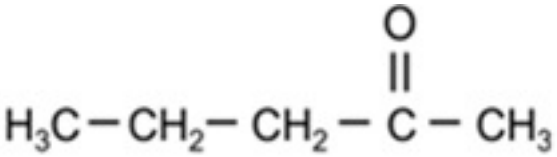
d.

Or

Since the compound X does not reduce Tollen's reagent, the compound X must belong to ketone group.

The compound X forming an addition compound with sodium hydrogen sulphite and giving positive iodoform test confirms that the compound is methyl ketone.

Also, compound X on oxidation gives ethanoic and propanoic acid, so the compound can be



Since this compound is unsymmetrical ketone, the compound is Pentan-2-one with molecular mass 86.