2023	12	27	TS-C6	SEAT NUMBER				

IIT INSPIRE
ACADEMY OF SCIENCE
A Place for Excellence & Perfection

XI & XII Science (CBSE/state)
IIT- JEE (Mains + Advance)
NEET, MH-CET , NDA
Mo. No. 9595445177/9021445177

Branches : Chhatrapati Sq., Mangalmurti Sq.

6

(4 Pages)

calculator is not allowed.
5. All symbols having their usual meanings unless otherwise stated.
6. For each MCQ, correct answer must be written along with its alphabet.
7. Evaluation of each MCQ would be done for the first attempt only.

SECTION-A

Q.1 Select and write the correct answers to the following questions: **[10]**

1)The packing efficiency of bcc is _____.

Ans:

b) 68% **(1)**

2)Depending on states of solute and solvent there are _____ types of solutions.

Ans:

c) 9 **(1)**

3)The dissociation constant (K_2) for NH_4OH is 1.8×10^{-5}. The degree of dissociation in 0.01 M solution is _____.

Ans:

a) 0.04242 **(1)**

4)Which of the following is intensive property?

Ans:

d) Boiling point **(1)**

5)E^0_{cell}(Standard Potential of cell) for the following cell reaction is_____.

$Cd_{(s)}+Sn^{2+¿}_{(aq)}\rightarrow Cd^{2+¿}_{(aq)}+Sn_{(s)};(E^0_{Cd}=-0.403\,V\wedge E^0_{Sn}=-0.136\,V)¿¿$

Ans:

d) 0.267 V **(1)**

6)The transition elements are placed in period_____.

Ans:

c) 4 to 7 **(1)**

7)The IUPAC name of [Fe$(CO)_5¿$ is _____.

Ans:

c) Pentacarbonyliron (0) **(1)**

8)Cumene on air oxidation followed by decomposition by dilute acid gives _____.

Ans:

c) phenol **(1)**

9)ɣ-isomer (gamma isomer) of BHC is called as _____.

Ans:

c) Lindane **(1)**

10) Which of the following compound does not react with acutely chloride?

Ans:

c) $(CH_3-CH_2)_3N$ **(1)**

Q.2 Answer the following questions in one sentence: [8]

(1) What is solubility? (1)

Ans:

The solubility of a solute is its amount per unit volume of saturated solution at a specific temperature. The solubility of a solute is its maximum concentration and expressed in the concentration units mol L^{-1}.

(2) What is the oxidation state of 'S' in H_2SO_4?

(1)

Ans:

$(Oxidation\ number\ of\ H)+¿\ of\ S¿+(Oxidation\ number\ of\ O)=0$

$2\times(+1)+(Oxidation\ number\ of\ S)+4\times(-2)=0$

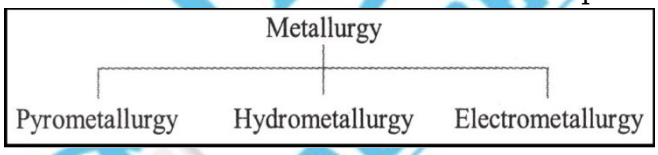
$Oxidation\ number\ of\ S+2-8=0$

Hence, Oxidation number of 'S' in $H_2SO_4=+6$

(3) Define metallurgy? Give its classification. (1)

Ans:

Commercial extraction of metals from their ores is called metallurgy. Different methods are used for their extraction depending on the nature of a metal and its ore.



(4) For the reaction, $N_{2(g)}+3H_{2(g)}\longrightarrow 2NH_{3(g)}$, what is the relationship among (1)

$\frac{d[N_2]}{dt}, \frac{\frac{d[H_2]}{dt}\wedge d[NH_3]}{dt}$

Ans:

The relationship among $\frac{d[N_2]}{dt}, \frac{\frac{d[H_2]}{dt}\wedge d[NH_3]}{dt}$ $is-\frac{d[N_2]}{dt}=\frac{-1}{3}\frac{d[H_2]}{dt}=\frac{1}{2}\frac{d[NH_3]}{dt}$.

(5) What are isomers? (1)

Ans:

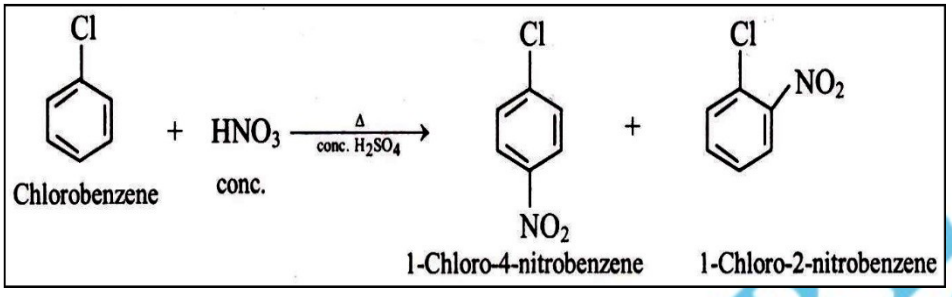
Isomers are different compounds that have the same molecular formula but different chemical reactivities and physical properties such as colour, solubility and melting point.

(6) Explain the following reaction with respect to chlorobenzene. **(1)**

1. Nitration

Ans:

Nitration: It is carried out by heating haloarene with conc. HNO_3 in presence of conc. H_2SO_4.

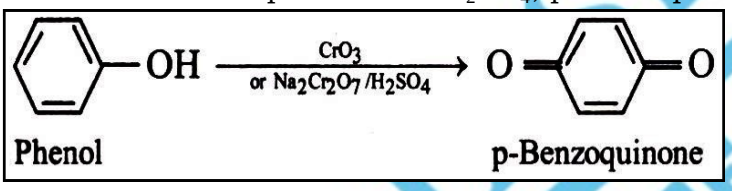


(7) How is phenol converted into the following? **(1)**

1. Benzoquinone

Ans:

Benzoquinone: When phenol is oxidised with chromic anhydride or sodium dichromate in the presence of H_2SO_4, p-benzoquinone is formed.



(8) Explain the terms; Homopolymer **(1)**

1. Homopolymers

Ans:

Homopolymers:

1. The polymers, which have only one type of repeating unit, are called homopolymers.
2. They are formed from a single monomer. In some cases, the repeating unit is formed by condensation of two distinct monomers.

Eg: Polythene, polypropene, Nylon 6, polyacrylonitrile, Nylon 6, 6

SECTION-B

Attempt any eight of the following questions: **[16]**

Q.3 Define: Average rate of reaction. **(2)**

Ans:

The average rate of a reaction is the change in concentration of reactant or product divided by time interval over which the change occurs.

$$Average\,rate = \frac{change \in concentration\ of\ a\ species}{change \in time} = \frac{\Delta C}{\Delta t}$$

Q.4 Calculate the number of particles in cubic unit cells of following: **(2)**

1. Body-centred cubic unit cell

Ans:

a. A body-centred cubic (bcc) unit cell has particles at the eight corners plus particles at the centre of cube.

b. Each particle presents at the corner of a given unit cell is shared with seven other neighbouring unit cells. As a result, its contribution to the given unit cell is only $\frac{1}{8}$.
Thus, the number of particles present at corner per unit cell = 8 corner atoms × $\frac{1}{8}$ atom per unit cell = 1

c. Each particle at the centre of the cube is not shared by any other cube. Thus, it belongs entirely to the given unit cell.
Therefore, bcc unit cell has one corner particle plus one particle in the centre of the cube, making total of 2 particles per unit cell.

Q.5 Explain Wurtz reaction. **(2)**

Ans:

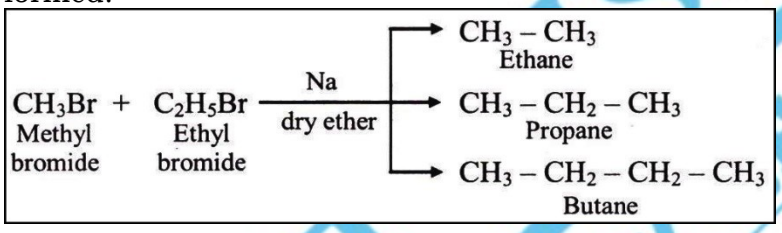
Wurtz reaction: Alkyl halides react with metallic sodium in dry ether as solvent, and form higher alkanes containing double the number of carbon atoms present in alkyl halide. This reaction is called Wurtz reaction.

$2\,R-X+2\,Na \xrightarrow{dry\ ether} R-R+2\,NaX$

Example:

$2\,C_2H_5Br+2\,Na \xrightarrow{dry\ ether} CH_3-CH_2-CH_2-CH_3+2\,NaBr$

When mixture of two different alkyl halides is used, all the three possible alkanes are formed.



Q.6 Sucrose is non-reducing sugar. Justify. **(2)**

Ans:

Structure of sucrose contains glycosidic linkage between C-1 of $\alpha-$¿glucose and C-2 of $\beta-$¿fructose. Since the potential aldehyde and ketone groups of both the monosaccharide units are involved in the formation of the glycosidic bond, sucrose is a non-reducing sugar.

Q.7 Obtain the relationship between freezing point depression of a solution containing non-volatile-nonelectrolyte solute and its molar mass. **(2)**

Ans:

1. The freezing point depression (ΔT_f) is directly proportional to the molality of solution.
Thus,
$\Delta T_f = K_f\, m$
2. Suppose we prepare a solution by dissolving $W_2\,g$ of solute in $W_1\,g$ of solvent.

Moles of solute in $W_1\,g$ of solvent ¿ $\frac{W_2}{M_2}$

Where, M_2 is the molar mass of solute

Mass of solvent ¿ $W_1\,g = \frac{W_1\,g}{1000\,g/kg} = \frac{W_1}{1000}\,kg$

3. The molality is expressed as,

$$m = \frac{Moles\ of\ solute}{Mass\ of\ solvent \in kg}$$

$$m = \frac{W_2/M_2\, mol}{W_1/1000\, kg}$$

$$m = \frac{1000\, W_2}{M_2 W_1} mol\, kg^{-1} \ldots\ldots\ldots (2)$$

4. Substitution equation (2) in equation (1), we get,

$$\Delta T_f = \frac{1000\, K_f W_2}{M_2 W_1}$$

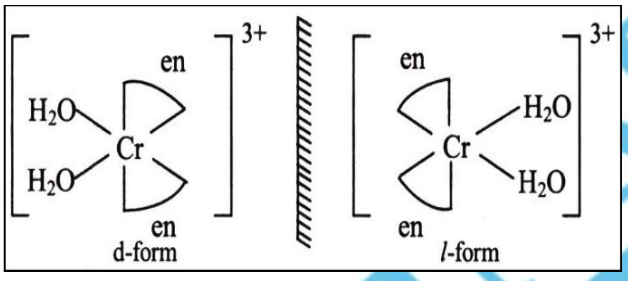
Hence,

$$M_2 = \frac{1000\, K_f W_2}{\Delta T_f W_1}$$

Q.8 Predict whether the $\left[Cr(en)_2(H_2O)_2\right]^{3+}$ complex is chiral. Write structures of its enantiomers. (2)

Ans:

1. The complex $\left[Cr(en)_2(H_2O)_2\right]^{3+}$ is chiral.
2. Structure of enantiomers:



Q.9 Explain the trend in following atomic properties of group 16 elements:
1) Atomic radii 2) Ionization enthalpy 3) Electronegativity (2)

Ans:

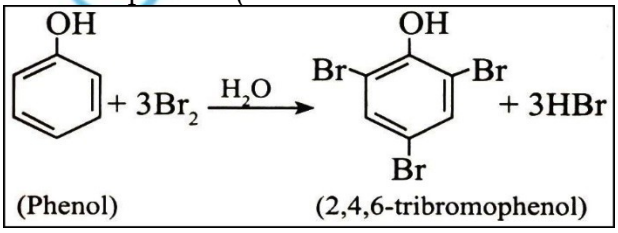
1. **Atomic Radii:** The atomic radii increase down the group, as a result of increase in the number of quantum shells.
2. **Ionization Enthalpy:** The ionization enthalpy decreases down the group due to increase in the atomic size. Group 16 elements have less ionization energy than corresponding group 15 elements.
3. **Electronegativity:** The electronegativity decreases down the group. Oxygen has the highest electronegativity next to fluorine amongst all the elements.

Q.10 What happens when phenol is treated with the following? (2)

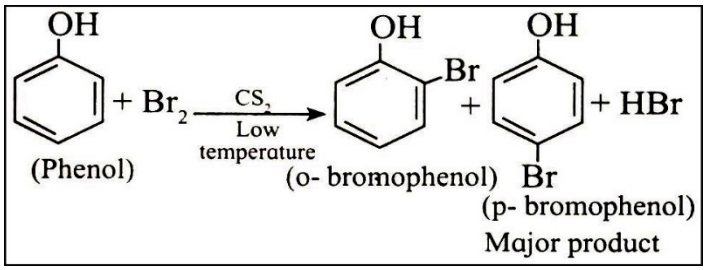
a) Br_2 **in water** **b)** $Br_2 \in CS_2$

Ans:

a. $Br_2 \in water$**:** Phenol reacts with aqueous solution of bromine to give 2, 4, 6 - tribromophenol (chlorine reacts in the same way.)



b. $Br_2 \in CS_2$**:** If the reaction is carried out in a solvent of lower polarity than water, such as $CHCl_3$, CCl_4 or CS_2, a mixture of ortho- and para-bromophenol is formed.



Q.11 Explain the classification of aldehydes. **(2)**

Ans:

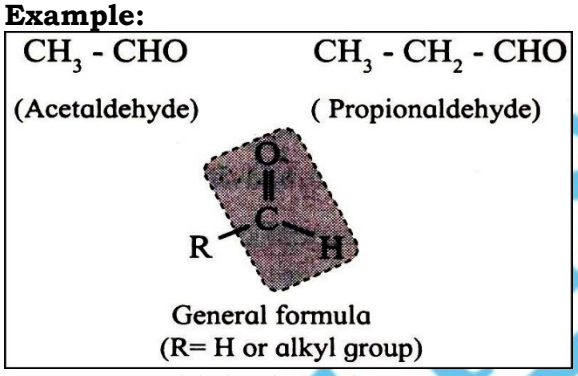
Aldehydes are classified as aliphatic and aromatic aldehydes.

1. **Aliphatic Aldehydes:**

a. The compounds in which the $-CHO$ group (formyl group) is attached directly to sp3 hybridized carbon atom that is saturated carbon atom are called aliphatic aldehydes.

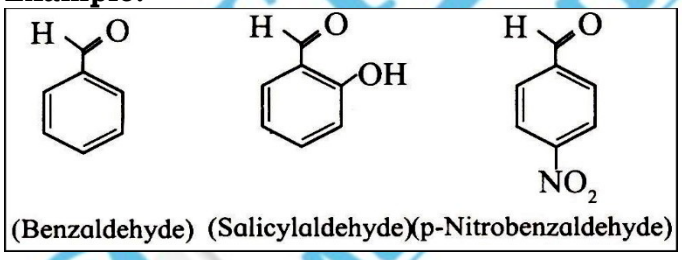
b. Formaldehyde, $H-CHO$ is also classified as aliphatic aldehyde though $-CHO$ group is not attached to any carbon.

Example:



2. **Aromatic Aldehydes:** The compounds in which –CHO group is attached directly to an aromatic ring are called aromatic aldehydes.

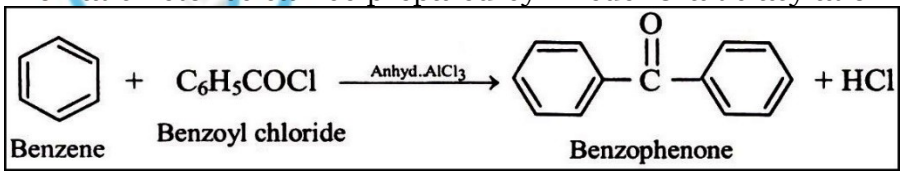
Example:



Q.12 Explain the preparation of aromatic ketones by Fridel Craft's acylation reaction. **(2)**

Ans:

Aromatic ketones can be prepared by Friedel Craft's acylation reaction.



Q.13 The standard potential of the electrode, $Zn^{2+¿|0.02M||Zn_{(s)}¿}$ is -0.76 V. Calculate its potential. **(2)**

Ans:

Given: $E^{\circ}_{Zn} = -0.76\ V$

To find: Electrode potential

Formula: $E_{electrode} = E^{\circ}_{electrode} - \frac{0.0592\ V}{n} \log_{10} \frac{[Product]}{[Reactant]}$

Calculation: Electrode reaction:

$Zn^{2+}(0.02\ M) + 2e^{-} \longrightarrow Zn_{(s)}$

Using formula,

$$E_{Zn} = E^{\circ}_{Zn} - \frac{0.0592\ V}{n} \log_{10} \frac{1}{[Zn^{2+}]}$$

$$= -0.76\ V + \frac{0.0592\ V}{2} \log_{10}(0.02)$$

$$= -0.76\ V + \frac{0.0592\ V}{2} \times (-1.6990)$$

$$= -0.76\ V - 0.0503\ V = \mathbf{-0.81\ V}$$

Q.14 What is the enthalpy of solutions? Give an example. **(2)**

Ans:

Enthalpy of Solution:

1. Enthalpy of solution is the enthalpy change in a process when one mole of a substance is dissolved in specified amount of solvent.
   It is denoted by $\Delta_{soln} H$.
2. For example,
   $NaCl_{(s)} + aq \rightarrow NaCl_{(aq)}\ ;\ \Delta_{soln} H = 4\ kJ\ mol^{-1}$

SECTION-C

Attempt any eight of the following questions:
[24]

Q.15 Cerium and Terbium behaves as good oxidizing agents in +4 oxidation state. Explain. **(3)**

Ans:

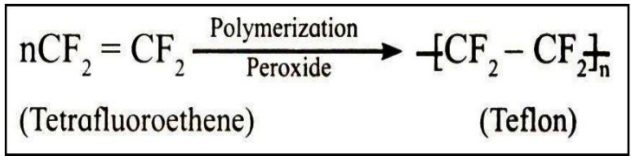
1. Cerium (Ce) and Terbium (Tb) show +4 oxidation states.
   Their electronic configurations are given below:
   $Ce = [Xe]\,4f^1 5d^1 6s^2 : Ce^{4+} = [Xe]$
   $Tb = [Xe]\,4f^9 6s^2 : Tb^{4+} = [Xe]\,4f^7$
2. It is clear from the configuration of Ce that Ce^{4+} is favoured by its noble gas configuration. But it can be easily converted into stable Ce^{3+} by gain of an electron. Due to this reason, Ce^{4+} is a good oxidizing agent.
3. Similarly, Tb^{4+} ion is stabilized due to half filled f-subshell. It can be easily converted into stable Tb^{3+} by gain of an electron. Due to this reason, Tb^{4+} as a good oxidizing agent.

Q.16 Write preparation, properties and uses of Teflon. **(3)**

Ans:

Chemically Teflon is polytetrafluoroethylene. The monomer used in preparation of Teflon is tetrafluoroethylene, $(CF_2 = CF_2)$ which is a gas at room temperature.

Tetrafluoroethylene is polymerized by using free radical initiators such as hydrogen peroxide or ammonium persulphate at high pressure.



Properties: Teflon is tough, chemically inert and resistant to heat and attack by corrosive reagents.
C-F bond is very difficult to break and remains unaffected by corrosive alkali, organic solvents.
Uses: Teflon is used in making non-stick cookware, oil seals, gaskets, etc.

Q.17 Define the following terms: **(3)**

1. Nanoscience
2. Nanotechnology
3. Nanomaterial

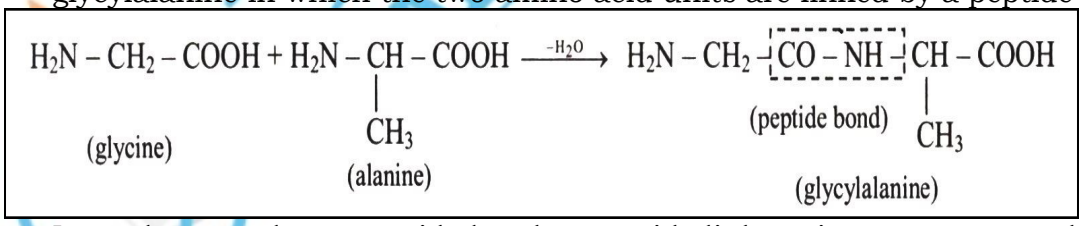
Ans:

1. **Nanoscience:** Nanoscience is the study of phenomena and manipulation of materials at atomic, molecular and macromolecular scales where properties differ significantly from those at a larger scale.
2. **Nanotechnology:** Nanotechnology is the design, characterization, production and application of structures, devices and systems by controlling shape and size at nanometer scale.
3. **Nanomaterial:** The nanomaterial is a material having structural components with at least one dimension in the nanometer scale, that is, 1-100 nm.

Q.18 What is peptide bond? How is it formed? **(3)**

Ans:

1. The bond that connects ∝-amino acids to each other is called peptide bond.
2. Consider, for example, linking of a molecule of glycine with that of alanine.
   a. One way of doing this is to combine carboxyl group of glycine with $\alpha-$¿amino group of alanine.
   b. This results in elimination of a water molecule and formation of a dipeptide called glycylalanine in which the two amino acid units are linked by a peptide bond.



   c. It can be seen that a peptide bond or peptide linkage is same as secondary amide

Q.19 Explain the action of following on alcohols. **(3)**

1. HC1 **2. HBr** **3. HI**

Ans:

1. **Reaction with HCl:**
   a. Primary and secondary alcohols when treated with hydrogen chloride in presence of zinc chloride forms primary and secondary alkyl halide.
   $R-OH+HCl\,anhydrous/\,ZnCl_2\,R-Cl+H_2O$
   b. Tertiary alcohols readily react with concentrated hydrochloric acid in absence of zinc chloride.
   $R-OH+HCl\longrightarrow R-Cl+H_2O$
2. **Reaction with HBr:**

a. Primary, secondary and tertiary alcohols when treated with constant boiling hydrobromic acid (48%) forms corresponding alkyl bromides.
b. Primary alcohols when treated with NaBr and H_2SO_4 in situ forms primary alkyl bromides.
$R-OH+HBr \xrightarrow{NaBr,\ H_2SO_4/heat} R-Br+H_2O$

3. **Reaction with HI:** Alcohols when heated with sodium or potassium iodide in 95% phosphoric acid yield alkyl iodide. Here, HI is generated in situ.
$R-OH+HI \xrightarrow{NaI/H_3PO_4} R-I+H_2O$

Q.20 Write in brief the application of coordination compounds. **(3)**

Ans:

1. **In biology:**
Several biologically important natural compounds are metal complexes. They play important role in a number of processes occurring in plants and animals.
For example, chlorophyll present in plants is a complex of Mg. Haemoglobin present in blood is a complex of iron.
2. **In medicines**
a. Pt complex cisplatin is used in the treatment of cancer.
b. EDTA is used for treatment of lead poisoning.
3. **To estimate hardness of water:**
Hardness of water is due to the presence of $Ca^{2+¿¿}$ and $Mg^{2+¿¿}$ ions. The ligand EDTA forms stable complexes with $Ca^{2+¿¿}$ and $Mg^{2+¿¿}$. It can, therefore, be used to estimate hardness.
4. **In electroplating:**
Usually, stable coordination complexes on dissolution dissociate to small extent and furnish a controlled supply of metal ions. The metal ions when reduced clump together to form the clusters or nanoparticles. When the coordination complexes are used the ligands in the complex keep the metal atoms well separated from each other. These metal atoms tend to form a protective layer on the surface. Certain cyanide complexes $K\left[Ag(CN)_2\right]$ and $K\left[Au(CN)_2\right]$ find applications in the electroplating of these noble metals.

Q.21 Write a short note on lanthanoid contraction. **(3)**

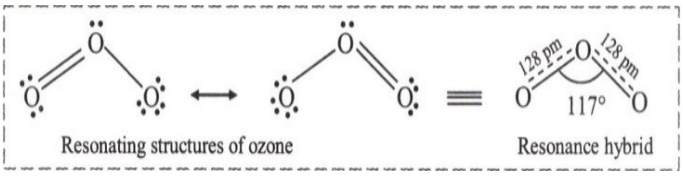
Ans:

1. As we move along the lanthanoid series, there is a decrease in atomic and ionic radii. This steady decrease in the atomic and ionic radii is called Lanthanoide contraction.
2. As we move from one element to another, the nuclear charge increases by one unit and one electron is added.
3. The new electrons are added to the same inner4f subshell. Thus, the 4f electrons shield each other from the nuclear charge poorly owing to their diffused nature.
4. With increasing atomic number and nuclear charge, the effective nuclear charge experienced by each 4f electrons increases. As a result, the whole of 4f electron shell contracts at each successive element.

Q.22 Describe the structure of ozone. Give its uses. **(3)**

Ans:

Structure of Ozone: Ozone (O_3) is an angular molecule. The two $O-O$ band lengths in the ozone molecule are identical, 128 pm and the $O-O-O$ bond angle of about 117^0. It is a resonance hybrid of two canonical forms.



Resonating structures of ozone Resonance hybrid

Uses of Ozone:

1. Ozone is used for air purification at crowded places like cinema halls, tunnels, railways, etc.
2. In sterilizing drinking water by oxidising all germs and bacteria.
3. For bleaching ivory, oils, starch, wax and delicate fabrics such as silk.
4. In the manufacture of synthetic camphor, potassium permanganate, etc.

Q.23 Distinguish between isothermal process and adiabatic process. **(3)**

Ans:

No.	Isothermal process	No.	Adiabatic process
i.	It is a process in which temperature of the system remains constant throughout the transformation.	i.	It is a process in which there is no exchange of heat between system and surroundings.
ii.	Heat flows from the system to surroundings and vice versa. ($Q \neq 0$).	ii.	System is completely insulated with respect to heat from the surroundings. ($Q = 0$).
iii.	Temperature remains constant ($\Delta T = 0$):	iii.	Temperature may increase or decrease ($\Delta T \neq 0$).
iv.	Change in internal energy is zero ($\Delta U = 0$).	iv.	Internal energy may increase or decrease ($\Delta U \neq 0$).

Q.24 Explain: Molecularity of reaction **(3)**

Ans:

1. The molecularity of an elementary reactions refers to how many reactant molecules are involved in reactions.
2. The elementary reactions in which only one reactant molecules in involved are called unimolecular reactions.

   E.g., $O_{3(g)} \longrightarrow O_{2(g)} + O_{(g)}$

   $C_2H_5I_{(g)} \longrightarrow C_2H_{4(g)} + HI_{(g)}$
3. The elementary reactions in which two reactant molecules are involved are called bimolecular reactions

   E.g., $2NO_{2(g)} \longrightarrow 2NO_{(g)} + O_{2(g)}$

   $O_{2(g)} + O_{(g)} \longrightarrow O_{3(g)}$
4. The molecularity of an elementary reaction is the number of reactant molecules taking part in it.

Q.25 Acetic acid is 5% ionized in its decimolar solution. Calculate the dissociation constant of acid. **(3)**

Ans:

Given: Percent dissociation = 5%, Concentration (c) = 1 decimolar

To find: Dissociation constant of acid (K_a)

Formulae: i. Percent dissociation = $\alpha \times 100$ ii. $K_a = \alpha^2 c$

Calculation: Using formula (i),

$$\alpha = \frac{\text{Percent dissociation}}{100} = \frac{5}{100} = 0.05$$

$c = 1$ decimolar $= 0.1$ M

Using formula (ii),

$K_a = (0.05)^2 \times (0.1)$

$= \mathbf{2.5 \times 10^{-4}}$

Q.26 explain the preparations of aliphatic and aromatic ketones from acyl chloride using dialkyl cadmium. (3)

Ans:

Ketones are obtained from acyl chloride by reaction with dialkyl cadmium which is prepared by the treatment of cadmium chloride with Grignard reagent. The reaction can be represented as,

$$\underset{\text{Grignard reagent}}{2R - MgX} + \underset{\text{cadmium chloride}}{CdCl_2} \longrightarrow \underset{\text{Dialkyl cadmium}}{R_2Cd} + 2Mg(X)Cl$$

$$\underset{\text{Acyl chloride}}{2R' - COCl} + R_2Cd \longrightarrow \underset{\text{Ketone}}{2R' - CO - R} + CdCl_2$$

e.g. i. Ethanoyl chloride to propanone

$$\underset{\text{Ethanoyl chloride}}{2CH_3 - COCl} + \underset{\text{Dimethyl cadmium}}{(CH_3)_2Cd} \longrightarrow \underset{\text{Propanone (Acetone)}}{2CH_3 - CO - CH_3} + CdCl_2$$

ii. Benzoyl chloride to acetophenone

$$\underset{\text{Benzoyl chloride}}{2C_6H_5 - COCl} + \underset{\text{Dimethyl cadmium}}{(CH_3)_2Cd} \longrightarrow \underset{\text{Acetophenone}}{C_6H_5 - CO - CH_3} + CdCl_2$$

SECTION-D

Attempt any three of the following question: [12]

Q.27 a. Define the following terms: (4)

1) Osmatic pressure, 2) Hypertonic solution, 3) Hypotonic solution

b. Define crystal defects or imperfections.

Ans:

a)

1. **Osmotic Pressure:** The hydrostatic pressure (on the side of solution) that stops osmosis is called an osmotic pressure of the solution.
2. **Hypertonic Solutions:** If two solutions have unequal osmotic pressures, the more concentrated solution with higher osmotic pressure is said to be hypertonic solution.
3. **Hypotonic Solutions:** The more dilute solution exhibiting lower osmotic pressure is

said to be hypotonic solution.

b) Irregularities in the arrangement of constituent particles of a solid crystal are called defects or imperfections.

Q.28 Define pH and pOH. Derive the relationship between pH and pOH. **(4)**

Ans:

1. The pH of a solution is defined as the negative logarithm to the base 10, of the concentration of $H^{+¿¿}$ ions in solution in $mol\,dm^{-3}$.
   pH is expressed mathematically as
   $pH = -\log_{10} ¿$
2. Similarly, pOH of a solution can be defined as the negative logarithm to the base 10, of the molar concentration of $OH^{-¿¿}$ ions in solution.
   $pOH = -\log_{10} ¿$

   Relationship between pH and pOH:

   The ionic product of water is given as:

   $K_w = ¿$

   Now, $K_w = 1 \times 10^{-14}\, at\, 298\, K$

   Thus, ¿

   Taking logarithm of both the sides, we write

   $\log_{10} ¿$

   $-\log_{10} ¿$

   Now, $pH = -\log_{10} ¿$ and $pOH = -\log_{10} ¿$

   $\therefore pH + pOH = 14$

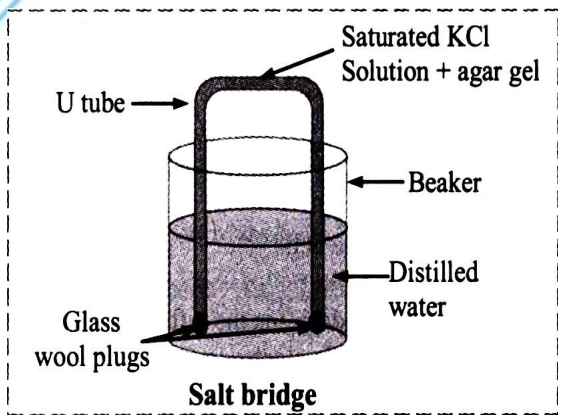
Q.29 a) Explain salt bridge with diagram? Gve its functions? **(4)**

b) How many moles of electrons are required for reduction of 3 moles of $Zn^{2+¿¿}$ to Zn? How many faradays of electricity will be required?

Ans:

a)

1. Salt bridge is a U tube containing a saturated solution of an inert electrolyte such as KCl or NH_4NO_3 and 5 % agar solution.
2. Salt bridge is used to connect two solutions of galvanic cell.
3. It is prepared by filling a U tube with hot saturated of the KCl or NH_4NO_3 and 5 % agar solution and allowed to cool. The cooled solution sets into a gel which does not come out when the tube is inverted.
4. The salt bridge is kept dipped in distilled water when not in use.



Functions:

1. It provides an electrical contact between two solutions and thereby completes the electrical circuit.
2. It prevents mixing of two solutions.
3. It maintains electrical neutrality in both the solutions by transfer of ions.

b)

For reduction of 3 moles of $Zn^{2+¿¿}$, 6 moles of electrons will be required and 6 F of electricity will be required.

Q.30 a) How does electrical conductivity of a semiconductor change with temperature? Why? **(4)**

b) Give two reactions showing oxidizing property of concentrated H_2SO_4

Ans:

a)

1. The electrical conductivity of a semiconductor increases with increasing temperature.
2. This is because, the number of electrons with sufficient energy so as to get promoted to the conduction band increases as temperature rises. Thus, at higher temperatures, there are more mobile electrons in the conduction band and more vacancies in the valence band than at lower temperature.

b) Metals and nonmetals both are oxidized by hot, concentrated sulfuric acid which itself gets reduced to SO_2.

i. $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$

Copper; Sulfuric acid (Conc.); Copper sulfate; Sulfur dioxide

ii. $S + 2H_2SO_4 \longrightarrow 3SO_2 + 2H_2O$

Sulfur; Sulfuric acid (Conc.); Sulfur dioxide

Q.31 Convert the following **(4)**

1. Propene to propan-1-o1

2. Benzyl alcohol to benzyl cyanide

3. Ethanol to propane nitrile

4. Propene to 1-nitropropane

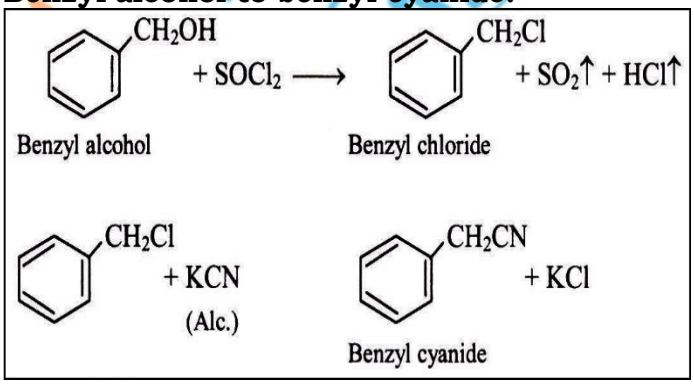
Ans:

1. **Propene to propan-1-ol:**

$H_3C-CH=CH_2 + HBr \xrightarrow{\text{Peroxide}} H_3C-CH_2-CH_2Br + NaOH \xrightarrow{\Delta} CH_3CH_2CH_2OH + NaBr$

Propene; 1-Bromopropane; (aq.); Propan-1-ol

2. **Benzyl alcohol to benzyl cyanide:**

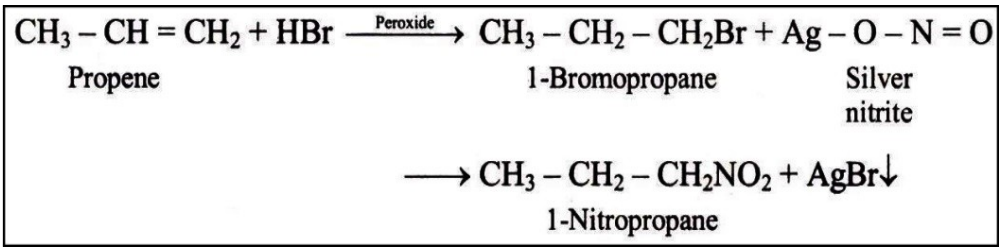


3. **Ethanol to propane nitrile:**

$CH_3CH_2OH + HCl \xrightarrow[\text{process}]{\text{Groove's}} CH_3CH_2Cl \xrightarrow[-H_2O]{\text{Alc.KCN},\Delta} CH_3CH_2CN$

Ethanol; Chloroethane; Propane nitrile

4. **Propene to 1-nitropropane:**



"All the Best"

"When you focus on problems,
you get more problems,
When you focus on possibilities,
you have more opportunities."