



MARCH-2020 (AP)

PREVIOUS PAPERS

IPE: MARCH-2020(AP)

Time : 3 Hours

SR.CHEMISTRY

Max.Marks : 60

SECTION-A**I. Answer all questions :****10 × 2 = 20**

- What are artificial sweetening agents? Give example.
- What is Zeigler -Natta Catalyst?
- Name two most familiar antioxidants used as food additives.
- Write names of the monomers used for getting the polymers (a) Bakelite (b) Glyptal
- What are colligative properties? Give any one.
- Identify the reaction order from each of the following rate constants:
(a) $K = 2.3 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$ (b) $K = 3 \times 10^{-4} \text{ s}^{-1}$
- What is the role of cryolite in the metallurgy of aluminium?
- Why Zn^{2+} is diamagnetic whereas Mn^{2+} is paramagnetic?
- Complete the following: (a) $\text{XeF}_4 + \text{O}_2\text{F}_2 \rightarrow$ (b) $\text{XeF}_2 + \text{H}_2\text{O} \rightarrow$
- Give the hybridization of sulphur in the following: (a) SO_2 (b) SO_3 (c) SF_4 (d) SF_6

SECTION-B**II. Answer any six of the following Questions.****6 × 4 = 24**

- (a) What are aminoacids ? Give two examples.
(b) Write any two differences between Globular and fibrous proteins.
- Explain (a) Wurtz reaction (b) Fittig reaction with one example for each:
- Explain Werner's theory of coordination compounds with suitable examples
- How does PCl_5 react with (a) Water (b) $\text{C}_2\text{H}_5\text{OH}$ (c) CH_3COOH (d) Ag
- Define (a) Anti-ferromagnetism (b) Frenkel defect with suitable examples:
- State Henry's law. Calculate the mass of a nonvolatile solute (molar mass 40 g mol^{-1}) which should be dissolved in 114g Octane to reduce its vapour pressure to 80%.
- What is catalysis? How is catalysis classified? Give one example for each of catalysis.
- Write any two ores of (a) Aluminium (b) Zinc (c) Iron (d) Copper

SECTION-C**III. Answer any two of the following Questions:****2 × 8 = 16**

- (i) Explain the following with suitable examples:
(a) Conversion of alkylhalide to ether. (b) Conversion of phenol to salicylic acid.
(ii) (a) How do you prepare carboxylic acid and alcohols from Grignard's reagent ? Give example.
(b) What is carbylamine reaction? Give example.
- (i) State Faraday's first and second laws of electrolysis.
A solution of CuSO_4 is electrolysed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at the cathode?
(ii) What is 'molecularity' of a reaction? How is it different from 'order' of a reaction? Name one bimolecular and one trimolecular gaseous reactions.
- (i) How does chlorine react with (a) acidified FeSO_4 ? (b) dry slaked lime?
(ii) Describe the manufacture of H_2SO_4 by contact process.

IPe AP MARCH-2020

SOLUTIONS

SECTION-A

1. **What are artificial sweetening agents? Give example.**

A: 1) **Artificial Sweetening Agent:** These are low calorie sweeteners used as sugar substitutes.

2) **Ex:** Saccharin, aspartame, Sucrolose etc.

2. **What is Ziegler-Natta catalyst?**

A: 1) Triethylaluminium and titanium tetrachloride ($(C_2H_5)_3Al + TiCl_4$) is known as Ziegler -Natta catalyst.

2) It is used in the preparation of high density polythene.

3. **Name two most familiar antioxidants used as food additives.**

A: Butylated hydroxy toluene (BHT) and

Butylated hydroxy anisole (BHA).

4. **Write names of the monomers used for getting the polymers**

(a) Bakelite (b) Glyptal

A: **(a) Bakelite:** (i) C_6H_5OH

Phenol

(ii) $HCHO$

Formaldehyde

(b) Glyptal: (i) $HO - CH_2 - CH_2 - OH$
EthyleneGlycol

(ii) 
Phthalic acid

5. **What are colligative properties? Give any one.**

A: 1) **Colligative properties:** These are properties of dilute solutions which depend on number of non-volatile solute particles present in the solution.

2) **Ex:** i) RLVP of a solution ii) Osmotic pressure(π)

6. Identify the reaction order from each of the following rate constants:

(a) $K = 2.3 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$

(b) $K = 3 \times 10^{-4} \text{ s}^{-1}$

A:

7. What is the role of cryolite in the metallurgy of aluminium?

A: Role of cryolite :

1) Cryolite increases the 'conductivity of alumina'.

2) It decreases the melting point of melt.

8. Why Zn^{2+} is diamagnetic whereas Mn^{2+} is paramagnetic?

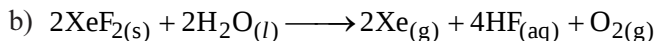
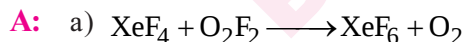
A: 1) Electronic configuration of Zn^{2+} is $[\text{Ar}] 4s^0 3d^{10}$.

It has paired d electrons. So it is diamagnetic.

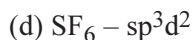
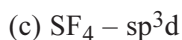
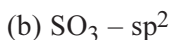
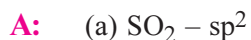
2) Electronic configuration of Mn^{2+} is $[\text{Ar}] 4s^0 3d^5$

It has five unpaired electrons. So it is paramagnetic.

9. Complete the following:



10. Give the hybridization of sulphur in the following:



SECTION-B

11. (a) What are aminoacids ? Give two examples.

(b) Write any two differences between Globular and fibrous proteins.

A: (a) Amino acids are biomolecules which contain ($-\text{NH}_2$) group and a carboxylic acid group ($-\text{COOH}$) at α -carbon

Ex: 1. Glycine $\text{H}_2\text{N}-\text{CH}_2-\text{COOH}$

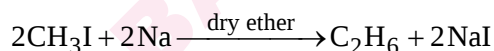
2. Alanine $\text{H}_2\text{N}-\overset{\text{CH}_3}{\underset{|}{\text{CH}}}-\text{COOH}$

Globular Proteins	Fibrous Proteins
1. Polypeptide chains are arranged as coils 2. They have spherical shape 3. They are water soluble. 4. Ex: Insulin, albumins etc.,	1. Polypeptide chains are parallel to each other 2. They have thread like structure 3. They are insoluble in water 4. Ex: Keratin, Myosin etc.,

12. Explain the following with one example for each:

(a) Wurtz reaction (b) Fittig reaction

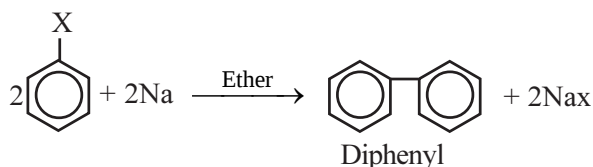
A: (a) **Wurtz reaction :** Methyl iodide is heated with sodium metal in the presence of dry ether to form ethane.



Methyl iodide

Ethane

(b) **Fittig reaction:** Aryl halides when treated with sodium in dry ether gives Diphenyl ie., aryl groups joined together. It is called Fittig reaction.



13. Explain Werner's theory of coordination compounds with suitable examples.

A: 1) Werner's theory : This theory explains the structures of 'coordination compounds'.

In co-ordination compounds the central metal atom shows two types of valencies,

- a) Primary valency b) Secondary valency.

2) Primary Valency:

- It is equal to the oxidation number of the central atom.
- It is satisfied only by the negative ions.
- It is ionisable.
- It is non-directional and it is represented by dotted lines.

3) Secondary Valency:

- It is equal to the co-ordination number of the central atom.
- It is satisfied by negative ions, neutral molecules and rarely by positive ions.
- It is non-ionisable.
- It is directional and it is represented by solid lines. It exhibits isomerism.

4) Example: Hexaammine cobalt (III) chloride- $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$:

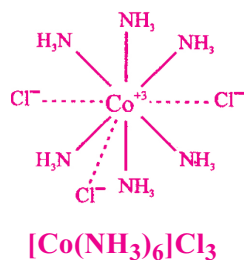
- i) Here, primary valency of Co is 3.

It is satisfied by 3 Cl^- ions.

- ii) Secondary valency of Co is 6.

It is satisfied by 6 NH_3 molecules.

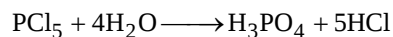
- iii) Shape of complex is Octahedral.



14. How does PCl_5 react with the following?

- (a) Water (b) $\text{C}_2\text{H}_5\text{OH}$ (c) CH_3COOH (d) Ag

A: a) $\text{PCl}_5 + \text{H}_2\text{O} \longrightarrow \text{POCl}_3 + 2\text{HCl}$



b) $\text{C}_2\text{H}_5\text{OH} + \text{PCl}_5 \longrightarrow \text{C}_2\text{H}_5\text{Cl} + \text{POCl}_3 + \text{HCl}$

c) $\text{CH}_3\text{COOH} + \text{PCl}_5 \longrightarrow \text{CH}_3\text{COCl} + \text{POCl}_3 + \text{HCl}$

d) $\text{PCl}_5 + 2\text{Ag} \longrightarrow 2\text{AgCl} + \text{PCl}_3$

15. Define the following with suitable examples:

(a) Anti-ferromagnetism (b) Frenkel defect

A: (a) **Antiferro magnetism:** It arises when the alignment of magnetic moments is compensatory and the resulting magnetic moment is zero.

Ex: MnO, FeO, Cr₂O₃

(b) **Frenkel Defect:** It is a point defect in which an atom or ion is **displaced, from its normal site** to interstitial site **Ex:** AgCl, AgBr, Zns etc.

16. State Henry's law. Calculate the mass of a nonvolatile solute (molar mass 40g mol⁻¹) which should be dissolved in 114g Octane to reduce its vapour pressure to 80%.

A: (a) **1) Henry's law:** The **partial pressure** of the gas in vapour phase is directly proportional to the mole fraction(X) of the gas in the solution.

2) Thus, $p \propto X \Rightarrow p = K_H X$

(b) Vapour pressure is reduced to 80% means $p^o=100$, $p^s=80$

Weight of Octane solvent is $w_o=114g$,

we know GMW of Octane (M_o)=114

Given GMW of solute (M_s)=40;

Weight of solute (w_s)=?

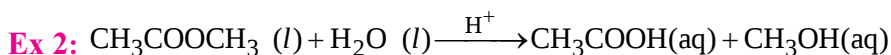
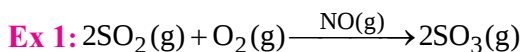
$$\text{We know, } \frac{p^o - p^s}{p^o} = \frac{w_s}{M_s} \times \frac{M_o}{w_o} \Rightarrow \frac{100 - 80}{100} = \frac{w_s}{40} \times \frac{114}{114} \Rightarrow w_s = \frac{20 \times 40}{100} = 8g$$

17. What is catalysis? How is catalysis classified? Give two examples for each type of catalysis.

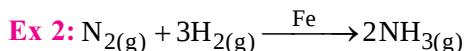
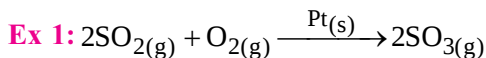
A: 1) Catalysis: It is the process of speeding up of reaction by adding catalyst .

It is classified into two types.

2) Homogeneous catalysis: It is the catalytic process in which the reactants and the catalyst are in the same phase.



3) Heterogeneous catalysis: It is the catalytic process in which the reactants and the catalyst are in different phases.



18. Write any 2 ores with the formulae of the following metals?(a) Al (b) Zn (c) Fe (d) Cu

A: a) Aluminium :	Bauxite		$\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
	Kaolinite		$\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$
b) Zinc :	Zincblende .		ZnS
	Calamine		ZnCO_3
c) Iron :	Haematite		Fe_2O_3
	Siderite		FeCO_3
d) Copper :	Copper pyrites		CuFeS_2
	Malachite		$\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$

SECTION-C

19. (i) Explain the following with suitable examples:

(a) Conversion of alkylhalide to ether.

(b) Conversion of phenol to salicylic acid.

(ii) (a) How do you prepare carboxylic acid and alcohols from Grignard's reagent ?

Give example.

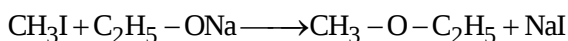
(b) What is carbylamine reaction? Give example.

A: (i) (a) Conversion of alkylhalide to ether:

Williamson's synthesis: When Haloalkanes are heated with sodium (or) potassium alkoxide, they give ether. This reaction is called Williamson's synthesis.

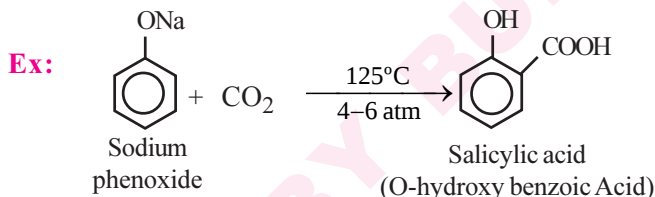


Ex: When methyl iodide reacts with sodium Ethoxide it forms methoxyethane.



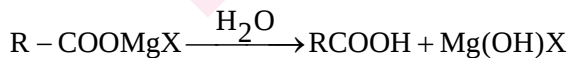
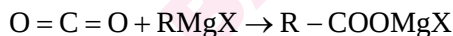
(b) Conversion of phenol to salicylic acid:

Kolbe Reaction: Sodium salt of phenol is heated with carbon dioxide at 125°C and under 4-6 atm pressure to form Salicylic acid.

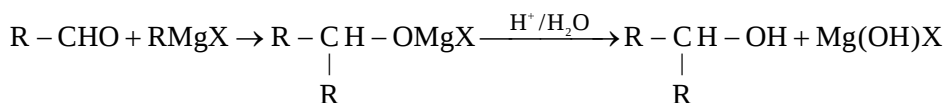


(ii) Carboxylic acid and alcohols from Grignard's reagent :

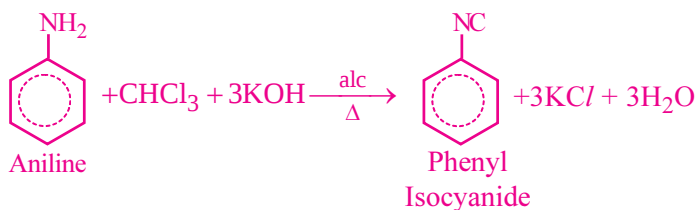
a) CO₂ on reaction with RMgX followed by hydrolysis gives carboxylic acids.



b) Aldehydes on reaction with RMgX followed by hydrolysis gives 2° alcohols.



Carbylamine reaction: Aniline when heated with alcoholic potash and chloroform, gives offensive smelling compound. This is called Carbylamine reaction.



20. (i) State Faraday's first and second laws of electrolysis.

A solution of CuSO_4 is electrolysed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at the cathode?

(ii) What is 'molecularity' of a reaction? How is it different from 'order' of a reaction? Name one bimolecular and one trimolecular gaseous reactions.

A: (i) 1) Faraday's first law: "The 'amount of substance deposited or liberated' at the electrode is directly proportional to the 'quantity of current' passing through the electrolyte".

2) Faraday's second law of electrolysis: "When same quantity of current is passed through different electrolytes, the amount of substances deposited at the electrodes is directly proportional to their equivalent weights".

3) Thus, $\frac{W_1}{W_2} = \frac{E_1}{E_2}$

4) Given $c = 1.5$ amp, $t = 10$ min $= 10 \times 60$ sec, $E = \frac{63.5}{2} = 31.75$, $m = ?$

5) We know $m = \frac{Ect}{96500} = \frac{31.75 \times 1.5 \times 10 \times 60}{96500} = 0.2938\text{g}$

(ii)

1) Molecularity: The 'number of atoms, ions or molecules' participating in the 'rate determining step' of a chemical reaction is called molecularity of that reaction.

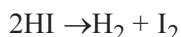
2) Order of a reaction: The 'sum of powers of concentration terms' of the reactants in the 'rate equation' is called order of reaction.

3) Differences between Molecularity and Order :

Molecularity	Order
i) It is determined theoretically .	i) It is determined experimentally .
ii) It can have integral values only.	ii) It can have fractional values also.
iii) It can be unimolecular, bimolecular....	iii) It can be zero order, first order....
iv) It is applicable only to elementary reactions .	iv) It is applicable to elementary and complex reactions .

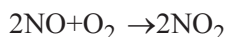
4) Bimolecular reaction:

Dissociation of hydrogen iodide into H_2 and I_2 .



5) Trimolecular reaction:

Formation of NO_2 from NO and O_2

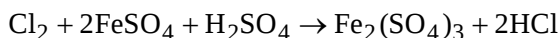


21. (i) How does chlorine react with

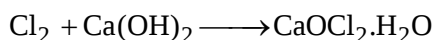
(a) acidified FeSO_4 ? (b) dry slaked lime?

(ii) Describe the manufacture of H_2SO_4 by contact process.

a) (i) (a) Cl_2 oxidises **ferrous sulphate** to **ferric sulphate** in the presence of H_2SO_4 .



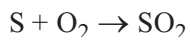
b) **Chlorine** reacts with dry **slaked lime** to form **Bleaching powder**.



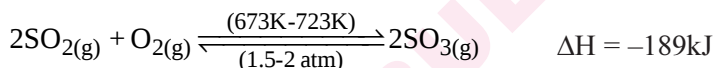
slaked lime Bleaching powder.

(ii) **Manufacture of Sulphuric acid by Contact process :**

1) **Formation of SO_2 : Sulphur is burnt in air** to form SO_2 .



2) **Formation of SO_3 : SO_2 is oxidised in air** to form SO_3 .



3) The above reaction is reversible, exothermic and it leads to a **decrease in volume**.

So, **Le-Chatelier principle** is applicable.

4) **Effect of Temperature:** As the reaction is exothermic, low temperature is favoured.

5) **Effect of Pressure:** As the reaction leads to decrease in volume, high pressure is favoured.

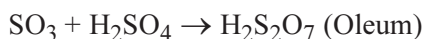
6) **Optimum Conditions:**

(a) Low Temperature: 673K-723K

(b) High Pressure: 1.5 to 2 atm

7) **Catalyst:** V_2O_5 (or) Pt

8) **Formation of Oleum: SO_3 is absorbed** in 98% conc. H_2SO_4 to form **Oleum**.



9) **Formation of H_2SO_4 : Oleum is diluted** with water to form conc. H_2SO_4

