

Previous IPE
SOLVED PAPERS

MARCH -2019 (TS)

PREVIOUS PAPERS

IPE: MARCH-2019(TS)

Time : 3 Hours

SR.CHEMISTRY

Max.Marks : 60

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

1. What are isotonic solutions?
2. What is a galvanic cell ? Give one example.
3. Give the composition of the following alloys : i) Brass ii) Bronze
4. What is Lanthanide contraction ?
5. What is Ziegler - Natta catalyst ?
6. What is vulcanization or rubber ?
7. How Grignard reagent is prepared ?
8. Write equation for carbylamine reaction.
9. What are Enantiomers ?
10. Arrange the following in decreasing order of their basic strength :
 $C_6H_5NH_2$, $C_2H_5NH_2$, $(C_2H_5)_2NH$, NH_3

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

11. Calculate the molarity of a solution containing 5g of Sodium Hydroxide (NaOH) in 450 ml solution.
12. Derive Bragg's equation.
13. Write any four differences between physisorption and chemisorption.
14. Explain roasting and calcination.
15. How is nitric acid manufactured by Ostwald's process ?
16. Write the IUPAC names of the following coordination compounds :
 a) $[Co(NH_3)_4(H_2O)Cl]Cl_2$ b) $[Ni(CO)_4]$
 c) $K_3[Fe(CN)_6]$ d) $[Cr(NH_3)_3(H_2O)_3]Cl_3$
17. What are hormones ? Give one example for steroid hormones and polypeptide hormones.
18. Write notes on Antiseptics and Antibiotics

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

19. How is chlorine prepared by Deacon's process ? Explain its reaction with Hot Conc. NaOH, H_2S and $Na_2S_2O_3$.
20. Give a detailed account of the collision theory of reaction rates of bimolecular reaction.
21. With a suitable example write equations for the following :
 i) Kolbe's reaction ii) Reimer - Tiemann reaction
 iii) Williamson's ether synthesis iv) Cannizzaro reaction

ipe TS MARCH-2019

SOLUTIONS

SECTION-A

1. What are isotonic solutions ?

A: 1) **Isotonic solutions:** These are the solutions having the same osmotic pressure at a given temperature .

2) **Ex:** Blood is isotonic with saline .(0.9% w/v of NaCl)

2. What is a galvanic cell. Give one example.

A: 1) **Galvanic cell:** It is an **electrochemical cell** which converts **chemical energy** into **electrical energy** by redox reactions.

2) **Ex:** Daniel cell

3. Give the composition of the following alloys. i) Brass ii) Bronze

A: (i) **Brass:** 60–80% Cu; 20–40% Zn

(ii) **German silver:** 50–60% Cu; 10–30% Ni, 20–30% Zn

4. What is lanthanide contraction?

A: **Lanthanide Contraction:** It is the steady decrease in the atomic and ionic radii with increase in atomic numbers from Lanthanum to Lutetium.

5. 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.

6. What is vulcanization of rubber?

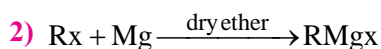
A: 1) Vulcanization: It is the process of 'heating raw rubber with sulphur' at 373-415K to improve its physical properties .

2) Addition of sulphur introduces 'sulphur bridges' between polymer chains.

This causes more tensile strength, elasticity and resistance to **abrasive nature**.

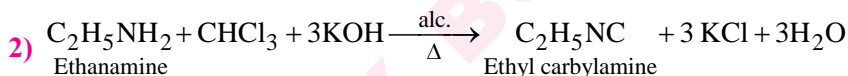
7. How Grignard reagent is prepared ?

A: 1) Preparation of Grignard Reagent: Alkyl or Aryl halides react with Magnesium in dry ether to form Alkyl Magnesium halide called Grignard Reagent.



8. Write equation for carbylamine reaction.

A: 1) Carbylamine Test: Aniline when heated with alcoholic potash and chloroform, gives Ethyl carbylamine with offensive smelling.



9. What are Enantiomers ?

A: 1) Enantiomers: These are a 'pair of stereo isomers' which are mirror images to each other.

These are 'non-super imposable' compounds.

2) Ex: d-Lactic acid & l-Lactic acid

10. Arrange the following in decreasing order of their basic strength :



A: The decreasing order of basic strengths of the given compounds is



SECTION-B

11. Calculate the molarity of a solution containing 5 g of Sodium Hydroxide (NaOH) in 450 ml solution.

A: Molarity (M): It is the number of moles of the solute dissolved in one litre of the solution.

1) Given weight of NaOH solute $w = 5\text{g}$

2) GMW of NaOH = $23 + 16 + 1 = 40$

3) Given Volume of the solution $V = 450\text{ mL}$

$$4) \text{ Molarity } M = \frac{w}{\text{GMW}} \times \frac{1000}{V(\text{mL})} = \frac{5}{40} \times \frac{1000}{450} = \frac{5}{18} = 0.278\text{ M}$$

12. Derive Bragg's equation.

A: 1) Suppose two X-rays of wavelength λ are incident on **two parallel planes** of a crystal surface.

2) They both undergo **diffraction**.

3) First x-ray is diffracted from point 'A' in the first plane.

Second ray is diffracted from 'B' in the second plane.

4) Here, the second X-ray travels some **extra distance** than the first X-ray.

The extra distance (path difference) travelled by the second X-ray = $CB + BD$

5) When two waves undergo constructive interference then according to Bragg, the path difference must be an **integral multiple of the wave length**(λ).

$\therefore CB + BD = n\lambda$ (i). Here $n = 1, 2, 3, \dots$ is known as order of diffraction.

6) If θ is the angle of incidence and 'd' be the distance between the parallel planes then

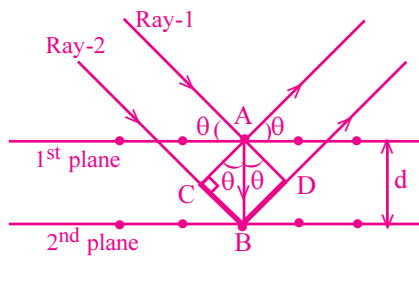
$$\text{from } \triangle ABC, \sin \theta = \frac{CB}{AB} = \frac{CB}{d} \Rightarrow CB = d \sin \theta \dots \text{(ii)}$$

$$\text{In } \triangle ABD, \sin \theta = \frac{BD}{AB} = \frac{BD}{d} \Rightarrow BD = d \sin \theta \dots \text{(iii)}$$

$$\therefore \text{from (ii) \& (iii), } CB + BD = d \sin \theta + d \sin \theta = 2d \sin \theta$$

$$\therefore \text{from (i), } n\lambda = 2d \sin \theta$$

This is known as Bragg's equation.



13. Write any four differences between physisorption and chemisorption.

A: I) Adsorption: It is the accumulation of gas or liquid molecules on solid or liquid surface.

Ex: Paints on various surfaces, Corrosion of metals, Adsorption of H_2 on charcoal.

II) Physical Adsorption Vs Chemical Adsorption:

Physical adsorption	Chemical adsorption
1) It is due to weak vander Waals forces.	1) It is due to strong chemical bonds.
2) It is reversible	2) It is irreversible
3) It occurs at low temperature	3) It occurs at high temperature
4) It decreases with rise in temperature.	4) It increases with rise in temperature.
5) Enthalpy of adsorption is low.	5) Enthalpy of adsorption is high.
Ex 1: Paints on various surfaces.	Ex 1: Corrosion of Metals.
Ex 2: Adsorption of H_2 on charcoal.	Ex 2: Adsorption of H_2 on Nickel

14. Explain roasting and calcination.

A:

Roasting

- 1) In this process, ore is heated in the presence of air (or) oxygen.
- 2) This method is used for sulphide ores.
- 3) Sulphide ores are roasted to get oxides.
- 4) **Ex:** $2ZnS + 3O_2 \xrightarrow{\text{Heat}} 2ZnO + 2SO_{2(g)}$

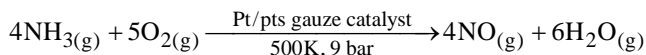
Calcination

- 1) In this process, ore is heated in the absence of air (or) oxygen.
- 2) This method is used for carbonate ores.
- 3) Carbonate ores are calcined to get oxides.
- 4) **Ex:** $CaCO_3 \longrightarrow CaO + CO_2$

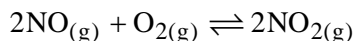
15. How is nitric acid manufactured by Ostwald's process ?

A: Manufacture of Nitric acid by Ostwald's process :

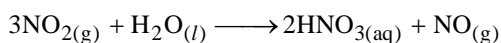
1) Step-1: Ammonia on oxidation gives Nitric oxide



2) Step-2: NO on oxidation gives NO_2



3) Step-3: NO_2 on hydrolysis gives dil. HNO_3



4) Concentration of Nitric acid in three stages:

(i) **Stage 1:** The diluted HNO_3 is concentrated by distillation to give 68% HNO_3 .

(ii) **Stage 2:** 68% HNO_3 is dehydrated with pure conc. H_2SO_4 to give 98% HNO_3 .

(iii) **Stage 3:** 98% HNO_3 on cooling in a freezing mixture gives 100% HNO_3 in crystal form.

16. Write the IUPAC names of the following coordination compounds :



A: (a) Tetraammineaquochlorocobalt(III)chloride

(b) Tetracarbonylnickel (0)

(c) Potassiumhexacyanoferrate (III)

(d) Triaminetriaquochromium(III) chloride

17. What are hormones? Give an example for each of the following:

a) Steroid hormones b) Polypeptide hormones c) Amino acid derivatives

A: **1) Hormones :** These are the molecules which act as intracellular messengers . They transfer biological information from one group of cells to distant tissues (or) target organs. These are produced by Endocrine glands. They are directly released into blood.

2) On the basis of their chemical nature, hormones are classified into three types.

i) Steroid hormones. Ex: Estrogens, androgens.

ii) Protein hormones. Ex: Insulin, endorphins

iii) Amino acid derivatives.

Ex: Thyroxine, epinephrine, norepinephrine

18. Write notes on Antiseptics and Antibiotics

A: **1) Antiseptics:** These are the drugs applied on living tissues to kill (or) prevent the growth of micro organism.

2) Ex: Dettol, Furacine, Soframicine, Bithionol are antiseptics.

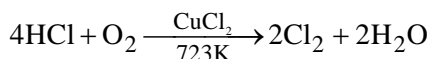
3) Antibiotics: These are the drugs used 'to inhibit the growth or destroy micro organisms' and are produced by micro organisms.

4) Ex: Penicillin, Chloramphenicol, Sulphadiazine.

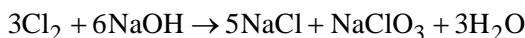
SECTION-C

19. How is chlorine prepared by Deacon's process ? Explain its reaction with Hot Conc. NaOH, H₂S and Na₂S₂O₃.

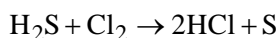
A: I) Deacon's process: Chlorine is prepared by the Oxidation of hydrogen chloride gas by atmospheric oxygen in the presence of CuCl₂ catalyst at 723K produces chlorine

**II) Reactions of Chlorine:**

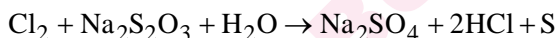
i) **Chlorine** reacts with **hot and conc. NaOH** to form **NaCl and NaClO₃**.



ii) It reacts with H₂S and sulphur is precipitated.



iii) **Cl₂** reacts with Hypo to form **Na₂SO₄**



Hypo

20. Give a detailed account of Collision theory of reaction rates of bimolecular gaseous reactions.

A: Collision Theory:

- 1) It is based on **kinetic theory** of gases.
- 2) All collisions do not lead to the formation of products.
- 3) A reaction takes place only when **reactant molecules collide with 'proper orientation'**.
- 4) The colliding molecules should possess a **minimum energy** to produce products. Such minimum energy is called '**Threshold energy**' (E_T)
- 5) Molecules having threshold energy are called **activated molecules**.
- 6) The difference between the threshold energy (E_T) and the energy of the molecules in the normal state (E_R) is called '**activation energy**' (E_a). E_a = E_T - E_R.
- 7) **Activated collisions only** lead to the formation of products.

8) Collision frequency $Z = \pi \sigma_{AB}^2 \sqrt{\frac{8KT}{\pi\mu}} n_A n_B$, σ_{AB} = Collision diameter, μ = reduced mass

9) Specific rate $k = A \cdot e^{-E_a/RT}$

21. With a suitable example write equations for the following :

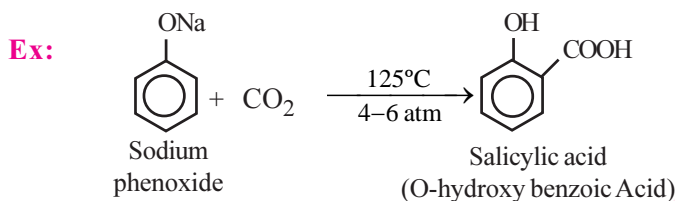
i) Kolbe's reaction

ii) Reimer - Tiemann reaction

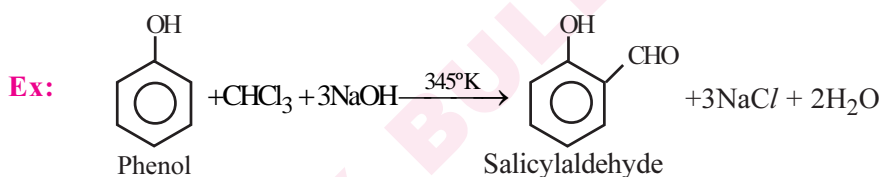
iii) Williamson's ether synthesis

iv) Cannizzaro reaction

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

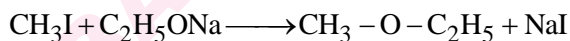


(ii) Reimer-Tiemann reaction: Phenol is treated with CHCl_3 in the presence of sodium hydroxide to give salicylaldehyde.



iii) Williamson's synthesis: Alkyl halides react with sodium alkoxide to give ether.

Ex: Methyl iodide reacts with sodium Ethoxide to give methoxyethane.



iv) Cannizzaro Reaction: Aldehydes without having ' α ' hydrogen in the presence of conc. NaOH undergo self oxidation and reduction to form a mixture of alcohol and salt of acid.

