

DAY

DS

SEAT NUMBER

2023 III 01

1100

J-252

(E)

**CHEMISTRY (55)**

Time : 3 Hrs.

(7 Pages)

Max. Marks : 70

**General Instructions :**

The question paper is divided into **four** sections.

- (1) **Section A :** Q. No. 1 contains **Ten** multiple choice type of questions carrying **One** mark each.  
Q. No. 2 contains **Eight** very short answer type of questions carrying **One** mark each.
- (2) **Section B :** Q. No. 3 to Q. No. 14 are **Twelve** short answer type of questions carrying **Two** marks each. (Attempt **any Eight**)
- (3) **Section C :** Q. No. 15 to Q. No. 26 are **Twelve** short answer type of questions carrying **Three** marks each. (Attempt **any Eight**)
- (4) **Section D :** Q. No. 27 to Q. No. 31 are **Five** long answer type of questions carrying **Four** marks each. (Attempt **any Three**)
- (5) Use of log table is allowed. Use of calculator is not allowed.
- (6) Figures to the right indicate full marks.
- (7) For each multiple choice type of question, it is mandatory to write the correct answer along with its alphabet e.g. (a)..... / (b)..... / (c)..... / (d)..... etc.

No mark(s) shall be given, if ONLY the correct answer or the alphabet of the correct answer is written.

Only the first attempt will be considered for evaluation.

Given :

$$R = 8.314 \text{ J.K}^{-1} \text{ mol}^{-1}$$

$$N_A = 6.022 \times 10^{23}$$

$$F = 96500 \text{ C}$$

### SECTION - A

Q. 1. Select and write the correct answer for the following multiple choice type of questions : [10]

- (i) The relation between radius of sphere and edge length in body centered cubic lattice is given by formula :

(a)  $\sqrt{3}r = 4a$  (b)  $r = \frac{\sqrt{3}}{a} \times 4$

(c)  $r = \frac{\sqrt{3}}{4} a$  (d)  $r = \frac{\sqrt{2}}{4} \times a$

- (ii) The pH of weak monoacidic base is 11.2, its  $\text{OH}^-$  ion concentration is :

(a)  $1.585 \times 10^{-3} \text{ mol dm}^{-3}$  (b)  $3.010 \times 10^{-11} \text{ mol dm}^{-3}$   
(c)  $3.010 \times 10^{-3} \text{ mol dm}^{-3}$  (d)  $1.585 \times 10^{-11} \text{ mol dm}^{-3}$


- (iii) Which of the following correctly represents integrated rate law equation for a first order reaction in gas phase :

(a)  $k = \frac{2.303}{t} \times \log_{10} \frac{P_i}{P_i - P}$  (b)  $k = \frac{2.303}{t} \times \log_{10} \frac{P_i}{2P_i - P}$

(c)  $k = \frac{2.303}{t} \times \log_{10} \frac{2P_i}{P_i - P}$  (d)  $k = \frac{2.303}{t} \times \log_{10} \frac{P_i - P}{2P_i}$

- (iv) The spin only magnetic moment of  $\text{Mn}^{2+}$  ion is \_\_\_\_\_.

(a) 4.901 BM (b) 5.916 BM  
(c) 3.873 BM (d) 2.846 BM

- (v) The correct formula of a complex having IUPAC name Tetraamminedibromoplatinum (IV) bromide is \_\_\_\_.
- (a)  $[\text{Pt Br}(\text{NH}_3)_4] \text{Br}_2$       (b)  $[\text{Pt Br}_2(\text{NH}_3)_4] \text{Br}$   
 (c)  $[\text{Pt Br}_2(\text{NH}_3)_4] \text{Br}_2$       (d)  $[\text{Pt Br}(\text{NH}_3)_4] \text{Br}$
- (vi) The allylic halide, among the following is \_\_\_\_.
- (a)  $\text{R} - \underset{\substack{| \\ \text{X}}}{\text{CH}} - \text{R}$       (b)  $\text{CH}_2 = \text{CH} - \text{X}$   
 (c)       (d)  $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{X}$
- (vii) The product of following reaction is
- $$\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CHO} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) LiAlH}_4} \text{_____?}$$
- (a)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{OH}$   
 (b)  $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{OH}$   
 (c)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{COOH}$   
 (d)  $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{COOH}$
- (viii) Ozonolysis of 2, 3 dimethyl but-2-ene, followed by decomposition by Zn dust and water gives \_\_\_\_.
- (a) acetaldehyde  
 (b) propionaldehyde and acetone  
 (c) acetone  
 (d) acetaldehyde and butyraldehyde
- (ix) The glycosidic linkage present in maltose is \_\_\_\_.
- (a)  $\alpha, \beta - 1,2$  - glycosidic linkage  
 (b)  $\alpha - 1,4$  - glycosidic linkage  
 (c)  $\beta - 1,4$  - glycosidic linkage  
 (d)  $\alpha - 1,6$  - glycosidic linkage
- (x) The monomer of natural rubber is \_\_\_\_.
- (a) Isoprene      (b) Acrylonitrile  
 (c)  $\epsilon$  -Caprolactam      (d) Tetrafluoroethylene

**Q. 2. Answer the following questions :**

[8]

- (i) Write the name of the technique used to know geometry of nanoparticles.
- (ii) Write the name of the product formed by the action of  $\text{LiAlH}_4$  / ether on acetamide.
- (iii) Write the structure of the product formed when chlorobenzene is treated with sodium metal in the presence of dry ether.
- (iv) Write the chemical composition of cryolite.
- (v) Write the name of platinum complex used in the treatment of cancer.
- (vi) Write the SI unit of cryoscopic constant.
- (vii) Write the correct condition for spontaneity in terms of Gibbs energy.
- (viii) Calculate molar conductivity for 0.5 M  $\text{BaCl}_2$  if its conductivity at 298K is  $0.01 \Omega^{-1} \text{cm}^{-1}$ .

**SECTION - B**

**Attempt any EIGHT of the following questions :**

[16]

- Q. 3. Distinguish between lanthanides and actinides.
- Q. 4. Calculate the mole fraction of solute, if the vapour pressure of pure benzene at certain temperature is 640 mmHg and vapour pressure of solution of a solute in benzene is 600 mmHg.
- Q. 5. Define : Green chemistry. Write two advantages of nanoparticle and nanotechnology.
- Q. 6. Explain the following terms :
  - (a) Substitutional impurity defect
  - (b) Interstitial impurity defect

- Q. 7. Write the chemical reactions for the following:
- Chlorobenzene is heated with fuming  $\text{H}_2\text{SO}_4$
  - Ethyl bromide is heated with silver acetate
- Q. 8. Define : Acidic buffer solution. Write the relationship between solubility and solubility product for  $\text{PbI}_2$ .
- Q. 9. What is the action of the following reagents on ethyl amine
- Chloroform and caustic potash
  - Nitrous acid
- Q. 10. Calculate standard Gibbs energy change at  $25^\circ\text{C}$  for the cell reaction
- $$\text{Cd (s)} + \text{Sn}^{2+}(\text{aq}) \longrightarrow \text{Cd}^{2+}(\text{aq}) + \text{Sn (s)}$$
- $$E^\circ_{\text{Cd}} = -0.403\text{V}, E^\circ_{\text{Sn}} = -0.136\text{V}$$
- Q. 11. Write chemical reaction for the preparation of glucose from sucrose. Write structure of D-ribose.
- Q. 12. Define Extensive property. Calculate the work done during the expansion of 2 moles of an ideal gas from  $10\text{ dm}^3$  to  $20\text{ dm}^3$  at  $298\text{ K}$  in vacuum.
- Q. 13. Write the reactions for the formation of nylon 6,6 polymer.
- Q. 14. Draw structures of the following compounds:
- chloric acid
  - peroxy disulphuric acid

### SECTION - C

Attempt any **EIGHT** of the following questions :

[24]

Q. 15. Define Osmosis.

How will you determine molar mass of non volatile solute by elevation of boiling point?

- Q. 16.** Convert the following :
- Ethyl alcohol into ethyl acetate
  - Phenol into benzene
  - Diethyl ether into ethyl chloride
- Q. 17.** A weak monobasic acid is 10% dissociated in 0.05 M solution. What is percent dissociation in 0.15 M solution?
- Q. 18.** Explain dehydrohalogenation reaction of 2-chlorobutane. Write use and environmental effect of CFC.
- Q. 19.** 2000 mmol of an ideal gas expanded isothermally and reversibly from 20 L to 30 L at 300 K, calculate the work done in the process ( $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ).  $W = -nRT \ln \frac{V_2}{V_1}$
- Q. 20.** What are interstitial compounds? Give the classification of alloys with examples.
- Q. 21.** Draw labelled diagram of  $\text{H}_2 - \text{O}_2$  fuel cell. Write two applications of fuel cell.
- Q. 22.** Explain formation of  $[\text{CoF}_6]^{3-}$  complex with respect to
- Hybridisation
  - Magnetic properties
  - Inner / outer complex
  - Geometry
- Q. 23.** What is Pseudo first order reaction? Derive integrated rate law equation for zero order reaction.
- Q. 24.** Explain Aldol condensation of ethanal.
- Q. 25.** Explain anomalous behaviour of oxygen in group 16 with respect to :
- Atomicity
  - Magnetic property
  - Oxidation state

- Q. 26.** Write chemical reactions for the following conversions :
- (a) Acetic acid into acetic anhydride
  - (b) Acetic acid into ethyl alcohol
- Write IUPAC name and structure of methylphenylamine.

### SECTION - D

**Attempt any THREE of the following questions :**

**[12]**

- Q. 27.** Show that, time required for 99.9% completion of a first order reaction is three times the time required for 90% completion. Give electronic configuration of Gd ( $Z=64$ ). Write the name of nano structured material used in car tyres to increase the life of tyres.
- Q. 28.** Derive relationship between  $\Delta H$  and  $\Delta U$  for gaseous reaction. Define : Vulcanization  
What is peptide bond?
- Q. 29.** Silver crystallizes in fcc structure. If edge length of unit cell is 400 pm, calculate density of silver (Atomic mass of Ag = 108). Write a note on Haloform reaction.
- Q. 30.** Define : Distereoisomers.  
Give cis and trans isomers of  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^{\oplus}$ .  
What is reference electrode?  
Give reason : Bleaching action of ozone is also called dry bleach.
- Q. 31.** Write Dow process for preparation of Phenol. What is the action of bromine water on phenol?  
Give reason: Group 16th elements have lower ionisation enthalpy compared to group 15th elements.  
Write two uses of dioxygen.