

DAY — **08**

SEAT NUMBER

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2025 | II | 20

1100

**J-302**

(E)

## **CHEMISTRY (55)**

Time : 3 Hrs.

(8 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. Only the first attempt will be considered for evaluation.  
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 -I questions carrying **Two** marks each.  
(Attempt any **Eight**)
- (3) **Section C :** Q. No. 15 to Q. No. 26 are **Twelve** short answer type -II 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.

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Page 1

P.T.O

(7) *Given data :*

- (i)  $R = 8.314 \text{ J/K/mol}$
- (ii) Atomic mass Na = 23
- (iii)  $K_f$  for water =  $1.86 \text{ K kg mol}^{-1}$
- (iv)  $1F = 96500 \text{ C}$
- (v)  $N_A = 6.022 \times 10^{23}$

## SECTION - A

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

**[10]**

- (i) Schottky defect is NOT observed in \_\_\_\_.
  - (a) NaCl
  - (b) KCl
  - (c) AgBr
  - (d) NiO
- (ii) The freezing point of 0.1m aqueous solution of urea, if  $K_f$  for water is  $1.86 \text{ K kg mol}^{-1}$  is \_\_\_\_.
  - (a)  $1.86 \text{ }^{\circ}\text{C}$
  - (b)  $-1.86 \text{ }^{\circ}\text{C}$
  - (c)  $0.186 \text{ }^{\circ}\text{C}$
  - (d)  $-0.186 \text{ }^{\circ}\text{C}$
- (iii) Ozone layer is depleted by \_\_\_\_.
  - (a) NO
  - (b)  $\text{NO}_2$
  - (c)  $\text{NO}_3$
  - (d)  $\text{N}_2\text{O}_5$
- (iv) When excess of  $\text{AgNO}_3$  is added to a complex, one mole of  $\text{AgCl}$  is precipitated. The formula of complex is \_\_\_\_.
  - (a)  $[\text{CoCl}_2(\text{NH}_3)_4]\text{Cl}$
  - (b)  $[\text{CoCl}(\text{NH}_3)_5]\text{Cl}_2$
  - (c)  $[\text{CoCl}_3(\text{NH}_3)_3]$
  - (d)  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
- (v) The value of  $\Delta n_g$  for the oxidation of 4 mole of sulphur dioxide to sulphur trioxide is \_\_\_\_.
  - (a) - 2
  - (b) 2
  - (c) - 4
  - (d) 4

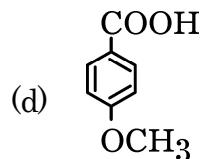
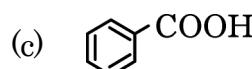
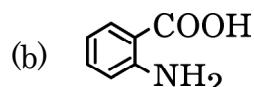
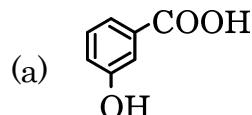
(vi) One dimensional nanostructure amongst the following is \_\_\_\_.

(a) Nanoparticles      (b) Nanotubes  
(c) Nanofilms      (d) Nanorods

(vii) Which formula correlates degree of dissociation and concentration of electrolyte?

(a)  $c = \sqrt{\frac{K_a}{\alpha}}$       (b)  $\alpha = \sqrt{\frac{K_a}{c}}$   
 (c)  $c = \sqrt{K_a \alpha}$       (d)  $c = \sqrt{\frac{\alpha}{K_a}}$

(viii) The highest acidic compound among the following is \_\_\_\_\_.



(ix) The formula used to calculate molar conductivity of an electrolyte is \_\_\_\_.

(a)  $\Lambda = \frac{1000c}{k}$       (b)  $c = \frac{1000\Lambda}{k}$   
 (c)  $\Lambda = \frac{1000k}{c}$       (d)  $k = \frac{1000}{\Lambda c}$

(x) Which of the following is a secondary amine?

- (a) Cyclohexylamine
- (b) Isopropylamine
- (c) Diphenylamine
- (d) N, N-Dimethylaniline

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

**[8]**

- (i) Write the structural formula of N, N-dimethylethanol-amine.
- (ii) Write the reagents used for the reduction of carbonyl group in Clemmensen's reduction.
- (iii) Write the IUPAC name of isoprene.
- (iv) The rate law equation for  $A \rightarrow \text{Product}$ , is  $\text{rate} = k[A]^x$   
What is the effect of increase in concentration of 'A' on rate of reaction, if  $x < 0$ ?
- (v) What is the molality of an aqueous solution of KBr having freezing point  $-3.72^\circ\text{C}$  ( $K_f$  for water is  $1.86 \text{ K kg mol}^{-1}$ )?
- (vi) Write the balanced chemical equation, when excess of ammonia is treated with chlorine.
- (vii) Write the number of donor atoms present in EDTA, during formation of complex.
- (viii) Write the names of the metal elements in brass alloy.

## **SECTION - B**

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

**[16]**

- Q. 3.** Derive the relation between half life and rate constant for a first order reaction.
- Q. 4.**
  - (a) State Henry's law.
  - (b) Define : Osmotic pressure
- Q. 5.** Write the differences between lanthanoids and actinoids.

**Q. 6.** Write anomalous behaviour of oxygen with respect to :

- (i) Atomicity
- (ii) Oxidation state
- (iii) Magnetic property
- (iv) Nature of hydrides.

**Q. 7.** What is the action of :

- (i) Liquid bromine in acetic acid on anisole.
- (ii) Soda-lime on sodium acetate?

**Q. 8.** Calculate the work done in kJ in a reaction, if volume of the reactant decreases from  $8 \text{ dm}^3$  to  $4 \text{ dm}^3$  against 43 bar pressure.

[  $1 \text{ dm}^3 \cdot \text{bar} = 100 \text{ J}$  ]

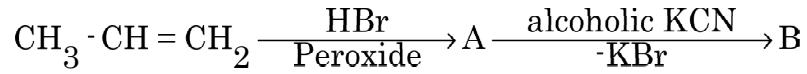
**Q. 9.** Explain ionization isomers with suitable example in complexes.

**Q. 10.** Write preparation of glucose from sucrose.

**Q. 11.** How many coulombs of electricity is required to produce 1g of sodium metal by reduction of sodium ion?

**Q. 12.** Write the structural formula and IUPAC name of the alcohol having molecular formula  $\text{C}_4\text{H}_{10}\text{O}$  which does not undergo oxidation under normal condition.

**Q. 13.** Identify 'A' and 'B' in the following reaction and rewrite the complete reaction :



**Q. 14.** Write the reaction for the preparation of :

- (i) acetaldehyde by Rosenmund reaction.
- (ii) benzaldehyde by Gatterman-Koch formylation.

## SECTION - C

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

**[24]**

**Q. 15.** Write the general electronic configuration of 3d series. Draw the structures of sulphuric acid and thiosulphuric acid.

**Q. 16.** Define conjugate acid-base pair. The hydroxyl ion concentration in aqueous solution of NaOH is  $2 \times 10^{-4}$  mol dm<sup>-3</sup>. Calculate pH of the solution.

**Q. 17.** What is atom economy? Explain any two applications of nanomaterials.

**Q. 18.** What is peptide bond? How is it formed? Write the name and formula of the reagent used to convert alkylhalide to nitroalkane.

**Q. 19.**

- (a) Write the reactions for the action of following reagents on phenol :
  - (i) Nitrating mixture
  - (ii) Zinc dust
- (b) What is the action of phosphorous pentachloride on ethyl methyl ether?

**Q. 20.**

- (a) Write the formula to calculate EAN.
- (b) Explain formation of  $[\text{CO}(\text{NH}_3)_6]^{3+}$  complex ion with respect to :
  - (i) Type of hybridisation
  - (ii) Magnetic property

**Q. 21.**

- (a) Calculate spin only magnetic moment of  $\text{M}^{2+}$  ion.  
[ atomic number of M = 26 ]
- (b) Write condensed electronic configuration of Gadolinium  
[ Z = 64 ].

**Q. 22.** (a) Write the reducing agents used to convert  $\text{Fe}_2\text{O}_3$  to 'Fe' in the reduction zone of blast furnace.

(b) Write chemical equations involved in :

(i) Carbylamine reaction for ethylamine.

(ii) Hoffmann Bromamide degradation for acetamide.

**Q. 23.** (a) Explain Cannizzaro's reaction with the help of benzaldehyde.

(b) Write the reaction for the conversion of cyclohexene to adipic acid.

**Q. 24.** Define zero order reaction.

A reaction takes place in two steps :



Write the overall reaction and identify the reaction intermediate.

**Q. 25.**  $\Delta H$  for formation of ethane gas is  $-84.4 \text{ kJ}$  at  $300 \text{ K}$ . Calculate  $\Delta U$  for the reaction.

**Q. 26.** Mention the types of polymers formed on the basis of intermolecular forces. Write any two uses of low density polyethylene.

## SECTION - D

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

**[12]**

**Q. 27.** (a) An element with molar mass  $27 \text{ g/mol}$  forms a cubic unit cell with edge length  $405 \text{ pm}$ . If density of the crystal is  $2.7 \text{ g cm}^{-3}$ , identify the type of unit cell.

(b) Derive the equation of Raoult's law for binary solution containing non-volatile solute.

**Q. 28.** (a) State whether entropy change is positive or negative in the following examples :

- (i) Melting of ice
- (ii) Vaporisation of a liquid

(b) Explain 'common ion effect' with example.

**Q. 29.** Draw a neat and labelled diagram of a lead accumulator cell. Write the overall reactions taking place at cathode and anode during discharging of the cell.

**Q. 30.** (a) Define a unit cell.

Which colour is shown by NaCl crystal due to formation of F-centre?

(b) Why does fluorine show anomalous behaviour in '17 group' elements?

**Q. 31.** (a) Write salient features of  $SN^2$  mechanism.

(b) What is the action of following reagents on bromomethane :

- (i) bromobenzene
- (ii) mercurous fluoride

