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Subject Code **J-261**

Seat No.

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DATE : 22/06/2026

SUBJECT : CHEMISTRY (55)

E

Time : 11.00 - 2.00

DURATION : 3 Hours

TOTAL PAGES : 7

TOTAL MARKS : 70

General Instructions :

The question paper is divided into four sections.

- (i) 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.
- (ii) Section B : Q. No. 3 to Q. No. 14 are Twelve short answer type of questions carrying Two marks each. (Attempt any Eight)
- (iii) Section C : Q. No. 15 to Q. No. 26 are Twelve short answer type of questions carrying Three marks each. (Attempt any Eight)
- (iv) Section D : Q. No. 27 to Q. No. 31 are Five long answer type of questions carrying Four marks each. (Attempt any Three)
- (v) Use of log table is allowed. Use of calculator is not allowed.
- (vi) Figures to the right indicate full marks.
- (vii) Physical Constants : (1) Avogadro's Number = $N_A = 6.022 \times 10^{23}$
(2) Gas constant $R = 0.08206 \text{ L-atm K}^{-1} \text{ mol}^{-1} / 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$
(3) 1 Faraday = (F) = 96500 Coulombs

SECTION - A

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

10

- (i) Which of the following is NOT an elastomer?
(a) vulcanized rubber (b) buna-S
(c) neoprene (d) polyethene
- (ii) Anisole reacts with HI at 398K to form –
(a) cyclohexanol (b) benzenol
(c) iodobenzene (d) benzene
- (iii) Unit of Henry's constant is _____.
(a) $\text{mol L}^{-1} \text{bar}^{-1}$ (b) mol L bar
(c) $\text{mol L}^{-1} \text{bar}$ (d) $\text{mol}^{-1} \text{L}^{-1} \text{bar}^{-1}$
- (iv) The shape of bromine penta-fluoride is _____.
(a) Linear (b) Bent - T - Shape
(c) Tetrahedral (d) Square pyramidal
- (v) The relation between edge length and radius for body centered cubic structure is –
(a) $r = \frac{a}{2}$ (b) $r = \sqrt{3} \frac{a}{4}$
(c) $r = \sqrt{2} \frac{a}{4}$ (d) $r = \sqrt{3} \frac{a}{2}$
- (vi) Atomic number of post actinoid element range from–
(a) 58 – 72 (b) 78 – 92
(c) 93 – 103 (d) 104 – 118
- (vii) The pH of buffer solution containing 0.05 mol NaF per litre and 0.01 mol HF per litre ($\text{pK}_a = 3.1427$) is _____.
(a) 3.8417 (b) 3.1427
(c) 0.3841 (d) 0.0384

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- (viii) Preparation of ethanamine from acetonitrile represents –
- (a) Gabriel phthalimide synthesis
 - (b) Mendius reduction
 - (c) Hofmann hypobromite degradation
 - (d) Sandmeyer reaction
- (ix) The source of dichlorocarbene is ____.
- (a) methyl chloride
 - (b) methylene chloride
 - (c) chloroform
 - (d) carbon tetrachloride
- (x) The reagent used to convert acetyl chloride to acetaldehyde is –
- (a) $\text{SnCl}_2 + \text{HCl}$
 - (b) $\text{Zn} \cdot \text{Hg} + \text{Conc. HCl}$
 - (c) $\text{NH}_2 \text{ NH}_2 \text{ KOH} / \begin{array}{c} \text{CH}_2 \text{ OH} \\ | \\ \text{CH}_2 \text{ OH} \end{array}$
 - (d) $\text{H}_2/\text{Pd BaSO}_4$

Q. 2. Answer the following questions :

8

- (i) Write the relation between conductivity and molar conductivity.
- (ii) Write the oxidation state of Nickel in $[\text{Ni}(\text{Cl})_4]^{2\ominus}$ complex ion.
- (iii) Write the name of nanostructured material used in tyres of car to increase their life.
- (iv) Write the glycosidic linkage present in maltose.
- (v) Draw the structure of perchloric acid.
- (vi) Write the trade name of most common thermoplastic polyester.

- (vii) Calculate change over temperature for a certain reaction, whose ΔH° is -60kJ and ΔS° is -150 JK^{-1} .
- (viii) Write the unit of rate constant of zero order reaction.
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SECTION - B

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

16

- Q. 3.** Write reactions involved during preparation of Nylon 6, 6 fibre.
- Q. 4.** Derive Ostwald's dilution law equation for a weak acid.
- Q. 5.** Draw the structures of two forms of alanine having $\text{pH} \leq 2$ and $\text{pH} \geq 10$.
- Q. 6.** Define the following terms :
- (a) Intensive property
 - (b) Standard enthalpy of combustion
- Q. 7.** What is the action of following reagents on ethyl amine?
(Indicate by reaction)
- (a) Nitrous acid
 - (b) Chloroform and KOH
- Q. 8.**
- (a) State Kohlrausch law of independent migration of ions.
 - (b) Write Nernst equation to calculate electrode potential.
- Q. 9.**
- (a) Write general electronic configuration of 3d series elements.
 - (b) Write any two points which explain about the colour of a transition metal ion.
- Q. 10.** Explain aldol condensation reaction with respect to ethanal.

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- Q. 11.** Write a note on Kolbe reaction.
- Q. 12.** (a) Write the relation between standard cell potential and equilibrium constant.
- (b) Write the representation of sodium hexacyanoferrate (III) complex.
- Q. 13.** In first order reaction 60% of reactant decomposes in 40 min. Calculate the rate constant of the reaction.
- Q. 14.** Explain optical activity of 2-chlorobutane.
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SECTION - C

Attempt any EIGHT of the following questions :

24

- Q. 15.** (a) Derive a relationship between molar mass, density of the substance and unit cell edge length.
- (b) Define - paramagnetic solids.
- Q. 16.** (a) Mention the names of four principles of green chemistry.
- (b) Write advantages of nanoparticles and nanotechnology in the field of energy sector.
- Q. 17.** (a) State second law of thermodynamics.
- (b) Define - Nucleotides.
- (c) Write chemical reaction for conversion of benzene diazonium chloride into benzene.
- Q. 18.** The solubility product of AgBr is 5.2×10^{-13} . Calculate its solubility in mol dm^{-3} and g dm^{-3} .
- (Molar mass of AgBr = 187.8 g mol^{-1})

- Q. 19.** Convert the following :
- (a) Ethanol to ethoxyethane.
 - (b) Phenol to p-benzoquinone
 - (c) Salicylic acid to aspirin
- Q. 20.**
- (a) State Raoult's law.
 - (b) Derive the relationship to determine molar mass of non volatile solute by depression of freezing point.
- Q. 21.**
- (a) Explain the formation of $[\text{CoF}_6]^{3-}$ complex ion with respect to
 - (i) Oxidation State of Cobalt
 - (ii) Type of hybridisation
 - (iii) Magnetic property
 - (iv) Geometrical shape
 - (b) Write the name of ligand used to estimate hardness of water.
- Q. 22.**
- (a) Write cell reactions of hydrogen-oxygen fuel cell at anode and cathode.
 - (b) Write an application of electrochemical series.
- Q. 23.**
- (a) Explain anomalous behaviour of oxygen with respect to
 - (i) Atomicity
 - (ii) Magnetic property
 - (iii) Oxidation state
 - (iv) Nature of hydride
 - (b) Write any two uses of helium.
- Q. 24.** What is the energy of activation of a reaction whose rate constant doubles when the temperature changes from 303 K to 313 K?
- Q. 25.**
- (a) Write chemical reactions taking place during extraction of iron in zone of reduction of the blast furnace.
 - (b) Write observed electronic configuration of gadolinium. (Z=64)

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Q. 26. Convert the following :

- (a) Acetic acid to ethyl alcohol
- (b) Acetic acid to acetic anhydride
- (c) Acetyl chloride to acetamide

SECTION - D

Attempt any THREE of the following questions :

12

- Q. 27.** (a) Define : (i) Co-ordination numbers
(ii) Ambidentate ligand
(b) Write a note on Clemmensen reduction of propanone.
- Q. 28.** (a) Derive relationship between ΔH and ΔU for a gaseous chemical reaction.
(b) Give reason – Ozone is a good bleaching agent.
(c) Write any two uses of SO_2 .
- Q. 29.** (a) Define - Polymorphism.
(b) State and explain Hess's law of constant summation. Write its one application.
- Q. 30.** (a) 0.01 m aqueous formic acid solution freezes at $-0.021^\circ C$. Calculate its degree of dissociation. ($K_f = 1.86 \text{ K. kg.mol}^{-1}$)
(b) Write properties of interstitial compounds.
- Q. 31.** (a) What is the action of following reagents on Bromoethane?
(i) KNO_2
(ii) 'Mg' metal
(iii) Silver acetate
(b) Draw structure - DDT insecticide.

