DAY — 06 SEAT NUMBER | | | | | | |

2025	VII	01	1100	J-371	(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.*

(7) Given data :

(i) $R = 8.314\ J\ K^{-1}\ mol^{-1}$

(ii) At. Wt. of Oxygen = 16

(iii) $N_A = 6.022 \times 10^{23}$

(iv) $1F = 96500^{o}C$

SECTION - A

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

(i) Coordination number of atoms in bcc crystal lattice is _____.

(a) 2 (b) 4

(c) 6 (d) 8

(ii) The unit of Henry's Law constant is _____.

(a) $mol\ L^{-1}\ bar^{-1}$

(b) $mol^{-1}\ L\ bar^{-1}$

(c) $mol\ L^{-1}\ bar$

(d) $mol^{-1}\ L^{-1}\ bar^{-1}$

(iii) pH of human blood is _____.

(a) 6.9 (b) 7.0

(c) 7.4 (d) 8.1

(iv) Ideal gas expands isothermally from $20dm^3$ to $25dm^3$ at constant pressure of 1.5 bar ; then work done in dm^3 bar will be _____.

(a) –1.5 (b) –5

(c) –7.00 (d) –7.5

(v) Correct statement about electrolysis of aqueous NaCl is _____.

(a) H_2 gas liberated at cathode

(b) Cl_2 gas liberated at cathode

(c) H_2 gas liberated at anode

(d) O_2 gas liberated at anode

(vi) Rate constant of reaction is mole dm^{-3} sec^{-1}, the order of reaction will be _____.

(a) Zero (b) One

(c) 1.5 (d) 2

(vii) The correct possible general formula for interhalogen compound in the following is –

(a) XX'_2 (b) XX'_3

(c) XX'_4 (d) XX'_6

(viii) All radioactive elements are present in which of the following _____.

(a) 3d series (b) 4d series

(c) Actinoid series (d) Lanthanoid series

(ix) The metal used in preparation of Grignard reagent is _____.

(a) Al (b) Mg

(c) Na (d) Fe

(x) Which among the following is dicarboxylic acid –

(a) Acetic acid

(b) Phthalic acid

(c) Caproic acid

(d) Citric acid

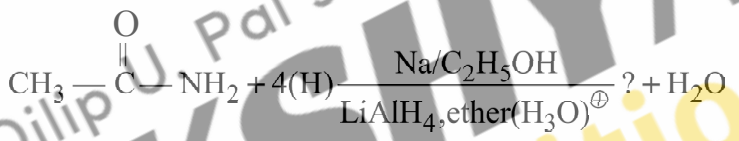
Q. 2. Answer the following questions : **[8]**

(i) Write formula to calculate percent (%) atom economy of particular reaction.

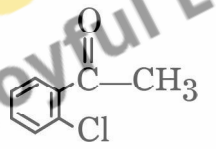
(ii) Write name of monomer used to form nylon-6 polymer.

(iii) Write the total number of chiral carbon atoms present in glucose.

(iv) Complete the following reaction



(v) Write name of reagent used to convert phenol to Benzene.

(vi) Write IUPAC name for 

(vii) Write oxidation state of 'Fe' in $[Fe(CN)_6]^{4\ominus}$ complex ion.

(viii) When 6.0g of O_2 reacts with ClF as per

$$2ClF_{(g)} + O_{2(g)} \longrightarrow Cl_2O_{(g)} + OF_{2(g)}$$

The enthalpy change is 38.55 kJ. Calculate the standard enthalpy of the reaction.

SECTION - B

Attempt any EIGHT of the following questions : **[16]**

Q. 3. When gold crystallizes, it forms face-centered cubic cells. The unit cell edge length is 4×10^{-8} cm. Calculate the density of gold. Molar mass of gold is 197g mol^{-1}.

Q. 4. Define the following terms :

(a) Isotonic solution

(b) Colligative properties

Q. 5. A solution has hydrogen ion concentration 0.01M. Calculate pOH of the same solution.

Q. 6. Derive the relation between ΔH and ΔU for gaseous phase reaction.

Q. 7. What is Salt bridge? Write the functions of salt bridge.

Q. 8. Distinguish between order and molecularity of a reaction.

Q. 9. Explain anomalous behaviour of Fluorine with respect to

(i) Oxyacid (ii) Nature of hydrides

(iii) Electronegativity (iv) Electron gain enthalpy

Q. 10. Balance the following chemical reactions.

(i) $K_2Cr_2O_7 + KI + H_2SO_4 \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + H_2O + I_2$

(ii) $K_2Cr_2O_7 + H_2SO_4 + H_2S \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + H_2O + 3S$

Q. 11. Write IUPAC names of following co-ordination ion / compound.

(i) $[Cu(NH_3)_4]^{2\oplus}$

(ii) $Na_3[AlF_6]$

Q. 12. Complete the following reactions –

(i) $CH_3 - CH = CH_2 + HBr \longrightarrow ?$

(ii) $C_2H_5OH + SOCl_2 \xrightarrow{\Delta} ?$

Q. 13. Write chemical reactions for the preparation of phenol from isopropyl benzene.

Q. 14. Write a note on Haloform reaction.

SECTION - C

Attempt any EIGHT of the following questions : **[24]**

Q. 15. A mixture of benzene and toluene contains 30% by mass of toluene. At 30°C, vapour pressure of pure toluene is 36.7 mmHg and that of pure benzene is 118.2 mmHg. Assuming that the two liquids form ideal solution, calculate partial pressure of each constituent in the above solution at 30°C.

Q. 16. Define :

(i) Buffer solution

(ii) Solubility product

(iii) Common ion effect

Q. 17. Calculate maximum work done when 32 g of oxygen expanded isothermally and reversibly from pressure 2 bar to 1 bar at 298 K.

Q. 18. What is zero order reaction? Derive integrated rate law equation for zero order reaction.

Q. 19. (a) Write structures of :

(i) Chlorous acid

(ii) Perchloric acid

(b) Write uses of Helium

Q. 20. (a) What is Lanthanoid contraction?

(b) Compounds of 'd' block elements are coloured in solid state as well as in an aqueous state. Explain.

Q. 21. (a) Write the representation of sodium hexacyanoferrate (III)

(b) Write type of hybridization and magnetic behaviour of the following –

(i) $[Co(NH_3)_6]^{3\oplus}$

(ii) $[NiCl_4]^{2\ominus}$

Q. 22. Convert – (Indicate by reaction)

(a) Acetic acid to ethyl acetate

(b) Acetaldehyde to acetaldoxime

(c) Acetone to propane

Q. 23. (a) What is the action of following on ethylamine –

(i) Hinsberg reagent

(ii) Nitrous acid

(b) Write increasing order of basicity for CH_3NH_2, $(CH_3)_2NH$ and $(CH_3)_3N$

Q. 24. (a) What are monosaccharides?

(b) Draw Zwitter ion structure of α amino acid.

(c) Write name of components of the nucleotide monomers.

Q. 25. (a) Write chemical reaction for preparation of Teflon.

(b) Write structure of monomer of natural rubber.

(c) Give two uses of high density polyethene [HDP].

Q. 26. Explain the following terms :

(a) Sustainable development

(b) Nanomaterial

(c) Name the gamma isomer of BHC.

SECTION - D

Attempt any THREE of the following questions : **[12]**

Q. 27. (a) Distinguish between crystalline and amorphous solids.

(b) Explain bleaching action of chlorine in the presence of moisture.

Q. 28. (a) Draw neat and labelled diagram of standard hydrogen electrode.

(b) Calculate e.m.f. of the following cell.

$$Mg\left|Mg^{++}_{(aq)}\right|\left|Ag^{+}_{(aq)}\right|Ag$$

If $E^0_{Mg} = -2.37$Volt and $E^0_{Ag} = 0.8$Volt.

Q. 29. (a) State whether the following reaction is spontaneous or non spontaneous if $\Delta H = 50$ kJ and $\Delta S = -130 JK^{-1}$ at 250K.

(b) Explain optical activity in 2-chlorobutane.

(c) Write full name of DDT.

Q. 30. (a) Define Co-ordination number.

(b) Write note on Reimer-Tieman reaction.

(c) Write structural formula for methyl vinyl ether.

Q. 31. (a) Explain Aldol condensation reaction of ethanal.

(b) Write four properties of interstitial compounds of transition elements.

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