

U.G. 3rd Semester Examination-2024**CHEMISTRY****[HONOURS]****Generic Elective Course (GE)****Course Code : CHEM-H-GE-T-01****[CBCS]****Full Marks : 40****Time : $2\frac{1}{2}$ Hours***The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five questions from the following:

 $2 \times 5 = 10$

- What are diastereomers?
- Draw the Newman and Fisher projections of erythro 2,3-dibromo butane.
- What is reference electrode? Give example.
- What is standard electrode potential?
- Write down the ground state electronic configuration of Fe^{2+} ($Z=26$) and Cu^{2+} ($Z=29$).
- Draw D and L configuration of $\text{CH}_3\text{CH}(\text{OH})\text{CHO}$ in Fischer projection.

[Turn over]

g) Toluene is more susceptible than Benzene towards electrophilic substitution reaction. Explain.

h) State Pauli Exclusion Principle.

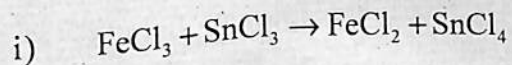
2. Answer any **two** questions: $5 \times 2 = 10$

a) i) How will you distinguish between ethane and ethyne by a chemical test?

ii) Explain the relative order of stabilities of methyl, primary, secondary and tertiary carbanions.

iii) What conformational isomers are possible for $C_2H_4Cl_2$? $2+2+1=5$

b) Balance the following reaction by ion-electron method-



ii) BCl_3 behaves as a Lewis acid whereas PCl_3 behaves as a Lewis base— Explain.

$$3+2=5$$

c) i) Radius of the first Bohr orbit of H atom is 0.529 Å. Find the radii of 1st and 2nd Bohr orbits of Li^{2+} ion.

ii) What is the difference between electron affinity and electronegativity? $3+2=5$

d) Calculate the wavelength of spectral lines when the electron drops from 3rd to 2nd Bohr orbit in H atom [$R = 109677 \text{ cm}^{-1}$]. K^+ ion and Cl^- ion in spite of being iso-electronic, size of K^+ ion is lesser than Cl^- ion. Explain. $3+2=5$

3. Answer any **two** questions: $10 \times 2 = 20$

a) i) What is Aufbau principle?

ii) An electron is present in the 4s sub-shell. Find the possible values of n, l and m.

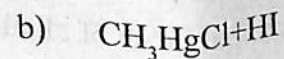
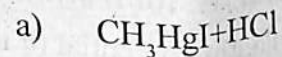
iii) Explain why the first ionization potential of oxygen is lower than that of nitrogen?

iv) Account for the large decrease in electron affinity in going from Li to Be despite the increase in nuclear charge.

v) Which out of Li and Li^+ has smaller size? $2+2+2+3+1=10$

b) i) Why no indicator is used during the redox titration using $KMnO_4$? Why H_3PO_4 is used during the estimation of Fe^{3+} using $K_2Cr_2O_7$?

ii) Explain the direction of the following reaction in the light of HSAB theory -



iii) What is the oxidation state of nitrogen in NH_2OH ?

iv) Arrange F^- , Cl^- , Br^- and I^- in the order of their increasing nucleophilicity with reason. State whether a nucleophile is a Lewis acid or base.

$$(1+2)+(1+2)+1+(2+1)=10$$

c) i) Give the mechanism of *cis*-hydroxylation of an alkene by cold, dilute, alkaline KMnO_4 .

ii) Ozonolysis of an alkene [X] gave a mixture of acetone and acetaldehyde. Give the structure of alkene [X].

iii) Write short notes on Markownikoff's rule.

iv) How would you prepare methane from acetylene?

v) Methane does not react with chlorine in the dark. Explain why?

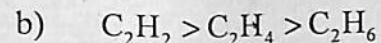
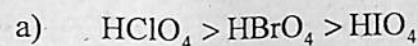
$$2+3+2+2+1=10$$

d) i) Explain the significance of the different m_l values corresponding to $l = 1$.

ii) What is ionization potential? Why ionization potential of inert gases are very high, but those of alkali metals are low?

iii) Electron affinity of sodium is negative but that of magnesium is positive. Explain.

iv) Explain the following orders of acidity —



$$2+(1+2)+2+(1\frac{1}{2}+1\frac{1}{2})=10$$