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End Semester Examination, December 2024
B.Sc. (H) FS/Dual Degree B.Sc. - M.Sc. (Forensic Science) Integrated – I Semester
Inorganic and Organic chemistry-I (UCH101)

Time: 2.5 hrs.

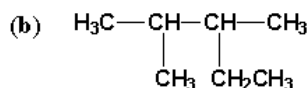
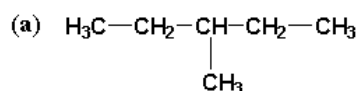
Max Marks: **50**

Note: **All Questions are compulsory.** Marks are indicated against each question.

PART-A

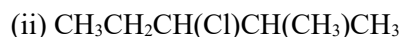
Q.1 *Attempt any five questions:*

- (a) Define the following terms: normality and molarity. 2x5
[CO-1] [L-1] **2**
(b) What do you understand by conjugate acid-base pairs? [CO-1] [L-2] **2**
(c) Give the IUPAC name for each compound:



[CO-1] [L-3] **2**

- (d) In the following compound, indicate the stereogenic (or) chiral center by putting an asterisk mark over it.



[CO-1] [L-3] **2**

- (e) Fill in the blanks:

(i) The shape of p-orbitals is

(ii) The hybridization of alkanes is

[CO-1] [L-2] **2**

- (f) True or False

(i) $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$ is the correct order of halogen acids.

(ii) Cyclopropane is stable in nature.

[CO-1] [L-2] **2**

- (g) Match the following:

[CO-1] [L-1] **2**

Hard base	(n - 1)
Electrophile	2^n
No. of nodes	NH_3
No. of stereoisomers	NO_3^+

PART-B

- Q.2 (a) Explain why orbitals like 1p, 2d and 3f are not possible. [CO-2] [L-2]
(b) Calculate Z_{eff} faced by a 3s or 3p electron in phosphorous atom ($Z = 15$). [CO-2] [L-3] **10**

OR

- (a) What do you understand by Pauli's exclusion principle. [CO-2] [L-2]
- (b) Arrange the following orbitals in order of increasing energy for a multielectron atom 1s, 3s, 5s, 2p, 4p, 3d, 4d, and 4f. [CO-2] [L-3]
- (c) Draw the shapes of each of the following orbitals $2p_y$, $3d_z^2$, $3d_{x^2-y^2}$, $3d_{xy}$. [CO-2] [L-6] **10**

- Q.3 (a) Explain clearly why hard acids coordinate with hard bases and soft acids coordinate with soft bases. [CO-3] [L-2]
- (b) Give reason for the following:
- (i) $[\text{Co}(\text{NH}_3)_5\text{F}]^{2+}$ complex is stable while $[\text{Co}(\text{NH}_3)_5\text{I}]^{2+}$ complex is unstable.
- (ii) CH_3F and CHF_3 react to form CH_4 and CF_4 . [CO-3] [L-3] **10**

OR

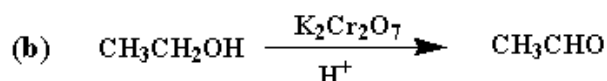
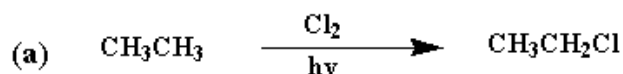
- (a) What are characteristics of a hard acid, soft base, hard base, and soft base? [CO-3] [L-2]
- (b) What is meant by leveling effect? Explain this effect based on solvent-system concept of acids and bases. [CO-3] [L-3] **10**

Q.4 Write a short note on:

- (a) Homolytic and heterolytic cleavage of bond.
- (b) Type of organic reaction [CO-4] [L-2] **10**

OR

- (a) Name the category (type) of reaction to which following belong: [CO-4] [L-1]



- (b) Draw the resonating structures for chlorobenzene. [CO-4] [L-3]
- (c) Select the electrophiles and nucleophiles from the following:
 AlCl_3 , CN^- , NH_2^- , NO_3^+ , Cl^- [CO-4] [L-3] **10**

- Q.5 (a) Draw the Newman projection for different conformations possible for butane. Give the conformational analysis for butane. [CO-5] [L-4]
- (b) In cyclohexane-1, 3-diol, the (a, a) conformation is more stable compared to (e, e) conformation. Explain. [CO-5] [L-5] **10**

OR

- (a) What do you understand by following terms:
- (i) Torsional Strain
- (ii) Ring Strain
- (ii) Angle Strain [CO-5] [L-2]
- (b) What do you mean by 'skew' conformation? Can all the skew conformations be termed as gauche conformation? [CO-5] [L-4]

(c) Draw the Fischer projection for all possible stereoisomer of $\text{HOOC-CH}(\text{CH}_3)\text{-CH}(\text{CH}_3)\text{-CH}_2\text{OH}$.

[CO- 5] [L-4] **10**