

CHEMISTRY – II
(CHM2201)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

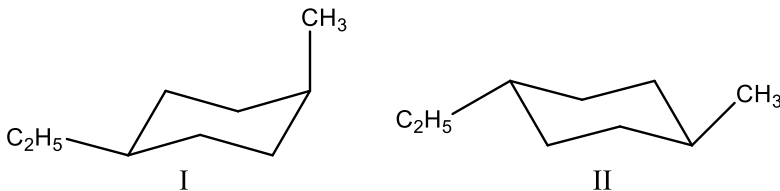
Group - A

1. Answer any twelve:

$$12 \times 1 = 12$$

Choose the correct alternative for the following

- (i) Consider two ideal gases A and B with molar mass M_A and $4 M_A$ respectively. The rms speed of B is 400 ms^{-1} at 27°C . The rms speed of A will be
(a) 50 ms^{-1} (b) 100 ms^{-1} (c) 400 ms^{-1} (d) 800 ms^{-1}
- (ii) Thiocyanate (SCN) ligand can coordinate through either S or N, so it is called
(a) Chelating ligand (b) Ambidentate ligand
(c) Flexidentate ligand (d) Bridging ligand
- (iii) What is the relation between I and II? Discuss your answer.



- (a) Enantiomer
(b) Diastereomer
(c) Identical structure
(d) They are not stereoisomer
- (iv) The coagulating power of the effective ions for coagulation of a negatively charged colloidal particles will follow the order
(a) $\text{Al}^{3+} > \text{Mg}^{2+} > \text{SO}_4^{2-} > \text{Cl}^-$
(b) $\text{Mg}^{2+} > \text{Al}^{3+} > \text{SO}_4^{2-} > \text{Cl}^-$
(c) $\text{SO}_4^{2-} > \text{Mg}^{2+} > \text{Al}^{3+} > \text{Cl}^-$
(d) $\text{Cl}^- > \text{Al}^{3+} > \text{Mg}^{2+} > \text{SO}_4^{2-}$
- (v) Bakelite is
(a) Elastomer
(b) Fibre
(c) Thermoplastic polymer
(d) Thermosetting polymer
- (vi) The organic moiety present in Zeise's salt is
(a) Ethane
(b) Ethene
(c) Ethyne
(d) None of these
- (vii) Which ring sized cycloalkanes, Bayer's strain theory is not valid?
(a) 3 Carbon
(b) 4 Carbon
(c) 5 Carbon
(d) ≥ 6 Carbon

- (viii) The formula of cis-platin (most widely used complex in cancer chemotherapy) is
 (a) $[\text{Pt}(\text{C}_2\text{H}_4)\text{Cl}_3]$ (b) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
 (c) $[\text{PtCl}_4]$ (d) $[\text{Pt}(\text{C}_2\text{H}_4)(\text{NH}_3)\text{Cl}_2]$
- (ix) The 18-electron rule is not satisfied by the complex is
 (a) $\text{Ni}(\text{CO})_4$ (b) $\text{Fe}(\text{CO})_5$ (c) $\text{Mn}(\text{CO})_5$ (d) $\text{Cr}(\text{CO})_6$
- (x) The magnitude of
 (a) Chemisorption decreases with rise of temperature and that of physisorption increases with temperature
 (b) Chemisorption increases with rise of temperature and that of physisorption decreases with temperature
 (c) Both decrease with rise of temperature
 (d) Both increases with rise of temperature.

Fill in the blanks with the correct word

- (xi) A Hermitian Operator has _____ eigenvalue.
- (xii) Tetrahedral complexes are always _____ spin.
- (xiii) The final product obtained when Trans 1, 2 dibromo-cyclohexane is undergoing through E2 reaction _____.
- (xiv) Myoglobin is a monomeric protein while haemoglobin is a _____ protein.
- (xv) The temperature at which rms speed of CO_2 (molar mass=44) will be double of its value at 27°C is _____.

Group - B

2. (a) Write without derivation the expression for Maxwell's distribution of molecular speed and explain the general feature of the distribution curve. Using this, obtain the expression for the most probable speed. [[CO1](Remember)/(LOCQ)]
- (b) What are protective colloids? What is meant by the term gold number? Describe any one optical property of colloidal particles. [[CO1](Remember)/(LOCQ)]
- (2 + 4) + (2 + 2 + 2) = 12**
3. (a) With the help of the appropriate postulate, obtain the Schrodinger wave equation. [[CO1](Apply)/(IOCQ)]
- (b) Describe two methods of preparation of colloidal particles. What is meant by Zeta potential [[CO2](Remember)/(LOCQ)]
- 6 + (4 + 2) = 12**

Group - C

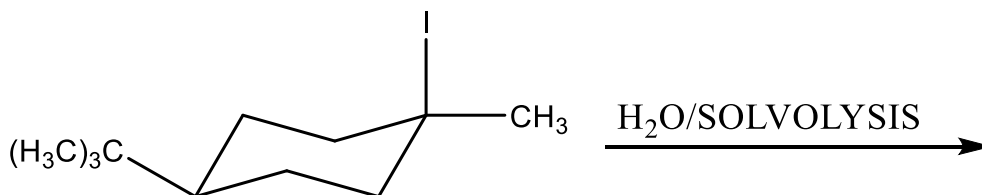
4. (a) Draw the possible geometrical isomers of $[\text{Co}(\text{en})_2\text{Cl}_2]^+$. Which one among them is optically active and why? [[CO1](Remember)/(LOCQ)]
- (b) Calculate Crystal Field Stabilization Energy (CFSE) for a d^6 system in low spin and high spin octahedral crystal field. [[CO3](Apply)/(IOCQ)]

- (c) What is effective atomic number rule for stability of metal complexes? Using this rule compare the stability of $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{CN})_6]^{3-}$. [[CO1](Remember)/(LOCQ)]
- (d) Carbon monoxide is a σ -donor and π -acceptor ligand— explain in the light of MOT. [[CO3](Apply)/(IOCQ)]
- $(2 + 1) + (2 + 2) + (1 + 2) + 2 = 12$**

5. (a) Write the IUPAC names of the following complex compounds: $[\text{Co}(\text{N}_3)(\text{NH}_3)_5]\text{SO}_4$ and $\text{K}_4[\text{Ni}(\text{CN})_4]$. By taking a suitable example explain chelating ligand. [[CO3](Remember)/(LOCQ)]
- (b) State Jahn-Teller theorem. In CrF_2 crystal lattice four of the Cr-F bonds are shorter than the other two Cr-F bonds—explain using Jahn-Teller theorem. [[CO3](Remember)/(LOCQ)]
- (c) Give reason of the following- maximum absorption in the d-d peak of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ occurs at 20300 cm^{-1} while that of $[\text{Ti}(\text{bpy})_3]^{3+}$ occurs at 25000 cm^{-1} . [[CO3](Apply)/(IOCQ)]
- (d) Show that the metal carbonyl $\text{Fe}(\text{CO})_5$ obeys 18-electron rule. [[CO3](Apply)/(IOCQ)]
- $(2 + 2) + 4 + 2 + 2 = 12$**

Group - D

6. (a) Compare dipole moment of cis and trans 1, 2 dibromo cyclohexane. [[CO1](Remember)/(LOCQ)]
- (b) Explain why only the trans-isomer of 2-bromocyclohexanol reacts with NaOH to give epoxide whereas cis isomer doesn't? [[CO5](Apply)/(IOCQ)]
- (c) Explain with mechanism why the solvolysis of cis 4-tert butylcyclohexyl tosylate reacts faster than its trans isomer although both of them involved the same transition state. [[CO5](Apply)/(IOCQ)]
- (d) Draw the conformational isomers of ethane 1, 2 diol in Newman projection formula. Identify the most stable conformer. [[CO1](Remember)/(LOCQ)]
- $3 + 3 + 3 + (2 + 1) = 12$**
7. (a) Write the structure of 18-crown-6 and its role in the reaction of $\text{CH}_3(\text{CH}_2)_6\text{CH}_2\text{Br}$ with KF in warm benzene. [[CO1](Remember)/(LOCQ)]
- (b) Write the structure for the alcohol (alcohols) that you would expect from the following reaction indicating intermediate state and analyse the fact:



- [[CO5](Apply)/(IOCQ)]
- (c) Trans-2-aminocyclohexanol on treatment with aqueous NaNO_2 and dil HCl gives cyclopentane carboxaldehyde while its cis-isomer gives mixture of two products— Explain. [[CO5](Apply)/(IOCQ)]
- (d) Cis form of 1, 2 dimethyl cyclohexane exists as a pair of conformational enantiomers and it is difficult to separate them---explain. Under what condition can their interconversion are stopped? [[CO5](Remember)/(LOCQ)]
- $(1 + 1) + 3 + 3 + (3 + 1) = 12$**

Group - E

8. (a) Give a brief account of Cis-platin as anticancer drug providing suitable schematic diagram. [[C04](Remember)/(LOCQ)]
- (b) What is the basic difference between thermoplastic and thermosetting polymers? How does the Novolac form? [[C01](Remember)/(LOCQ)]
- (c) Stating the important assumptions, derive Langmuir Adsorption Isotherm in experimentally verifiable form. [[C06](Apply)/(IOCQ)]
- 4 + (2 + 2) + 4 = 12**
9. (a) Mention the disease caused by deficiency and excess of any one ultra-trace element. [[C04](Remember)/(LOCQ)]
- (b) Give example of a gold drugs mentioning its use. [[C04](Remember)/(LOCQ)]
- (c) Write a note on conducting polymer and their importance. [[C01](Remember)/(LOCQ)]
- (d) Derive the two dimensional analogue of the ideal gas for the surface film pressure of a fatty acid on water. [[C06](Remember)/(LOCQ)]
- 2 + 2 + (2 + 2) + 4 = 12**
-

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	66.66	33.33	0