

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc
BRANCH: PHYSICS

SEMESTER : III
SESSION : MO/2023

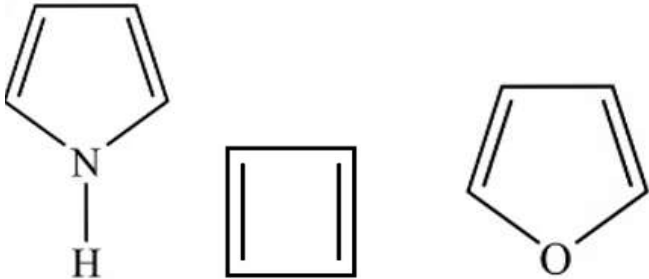
SUBJECT: CH213 GENERAL CHEMISTRY II

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- | | | CO | BL |
|---|-----|----|------------|
| Q.1(a) Prove that excluded volume per molecule is four times the actual volume of gas molecule, considering the two molecules as impenetrable and incompressible. Define interfacial angle. | [5] | 1 | apply |
| Q.1(b) What are law of rational and miller indices? Calculate the miller indices of crystal planes which cut through the crystal axes at (i) $\langle 2a, 3b, c \rangle$ (ii) $\langle 6a, 3b, 3c \rangle$ (iii) $\langle 2a, -3b, -3c \rangle$ | [5] | 4 | apply |
| Q.2(a) Metal - Ligand bond formation is nothing but Lewis acid - base reactions. Elaborate. Give example of an acid-base pair which can be classified by Bronsted - Lowry concept of acids and bases but not by Arrhenius concept. Discuss. | [5] | 3 | Understand |
| Q.2(b) Outline the mathematical relationship between equilibrium constant (K_{eq}), dissociation constant (K_{diss}) and degree of dissociation (α) of an electrolyte. Elaborate the application of HSAB theory in mineralogy. | [5] | 2 | understand |
| Q.3(a) Differentiate between galvanic and electrolytic cell. Write half-cell reaction and overall reaction for Daniel cell showing the cell representation and diagram of this cell. | [5] | 3 | understand |
| Q.3(b) Name the types and principle of potentiometric titration along with its advantage over volumetric titration. Explain acid-base titration potentiometrically with concerned diagram. | [5] | 3 | understand |
| Q.4(a) Compare and contrast Wurtz and Wurtz-fittig reaction with suitable examples. | [5] | 5 | understand |
| Q.4(b) Apply Saytzeff rule to predict the major and minor products of (a) dehydration of 2-Butanol (b) dehydrobromination of 2-bromo-2-methyl butane. | [5] | 5 | apply |
| Q.5(a) Comment on aromaticity of the following compounds: | [5] | 5 | apply |
|  | | | |
| Q.5(b) Nitration of toluene is 23 times faster than that of benzene, whereas that of trifluoromethyl benzene is 40,000 times slower. Explain. | [5] | 5 | apply |