



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 1st Semester Examination, 2023

GE1-P1-CHEMISTRY
NEW AND OLD SYLLABUS

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.***Use separate answer scripts for SECTION-A (Inorganic) and SECTION-B (Organic)****SECTION-A****INORGANIC CHEMISTRY****[MARKS-22]****GROUP-A**

1. Answer any *two* questions from the following: 1×2 = 2
- (a) An electron is present in $5d$ orbital. Give the Possible values for its four quantum numbers. 1
- (b) Which among the following molecule is paramagnetic? 1
- (i) C_2H_2 (ii) O_2 (iii) N_2 (iv) F_2
- (c) Why does He_2 not exist? 1

GROUP-B

2. Answer any *two* questions from the following: 5×2 = 10
- (a) (i) Draw the shapes of five d -orbitals. $2\frac{1}{2}$
- (ii) Explain the Pauli's Exclusion Principle. $2\frac{1}{2}$
- (b) (i) What are the limitations of valence bond theory? 2
- (ii) Predict the shape of $BeCl_2$ on the basis of valence bond theory. 2
- (iii) What is Lattice energy? 1
- (c) (i) Calculate the de-Broglie wavelength of a body of mass 1 kg moving with a velocity of 2000 ms^{-1} . 2
- (ii) Explain the radial probability distribution for $1s, 2p, 3d$ electrons. 3

GROUP-C

3. Answer any *one* question from the following: 10×1 = 10
- (a) (i) Deduce de-Broglie equation. 3
- (ii) What is Hund's rule of maximum multiplicity? 2

- (iii) Which has the greater bond dissociation energy N_2 or N_2^+ ? 2
- (iv) Distinguish between Pi and Sigma bonds. 2
- (v) Which of the following is not possible? 1
- (i) $n = 4, l = 3, m = -3$ (ii) $n = 3, l = 3, m = 2$
- (iii) $n = 1, l = 0, m = 0$ (iv) $n = 2, l = 1, m = 0$
- (b) (i) Draw the MO diagram of O_2 molecule. 3
- (ii) Discuss sp^3d^3 hybridisation with example. 3
- (iii) Discuss about the decrease in the bond angles of the following hydrides. 2
- $H_2O > H_2S > H_2Se > H_2Te$
- (iv) What is the dipole moment of CCl_4 ? 1
- (v) What is the geometry of $[ICl_2]^-$ anion? 1

SECTION-B

ORGANIC CHEMISTRY

[MARKS-18]

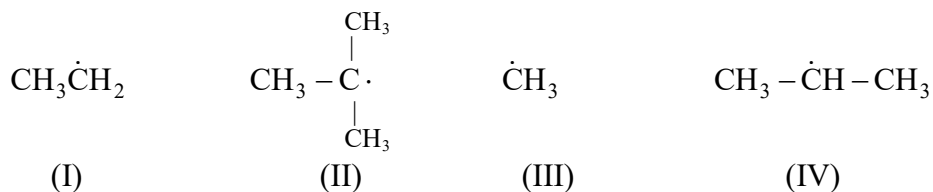
GROUP-A

4. Answer any **three** questions from the following: 1×3 = 3

(a) Geometrical isomerism is exhibited by

- (i) *n*-propanol (ii) 2-butene (iii) alanine (iv) benzene

(b) Arrange the following free radical of their increasing order of stability



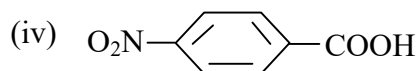
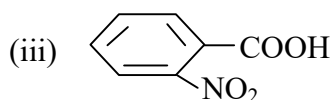
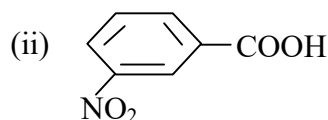
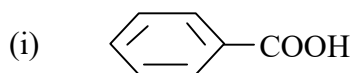
(i) III < I < IV < II

(ii) I < IV < III < II

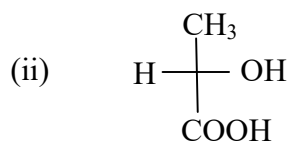
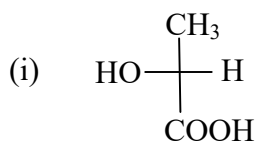
(iii) II < IV < I < III

(iv) II < III < I < IV

(c) Which of the following compound have highest pKa value?



(d) The Fischer projection formula of is



(iii) Both of the above

(iv) None of the above

- (e) Product that is formed after bromination of But-2-ene is
- (i) Antibrominated product (ii) Syn brominated product
- (iii) Mixture of (i) and (ii) (iv) None of these

GROUP-B

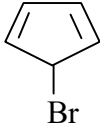
5. Answer any **one** question from the following: 5×1 = 5
- (a) (i) Draw the energy profile diagram of *n*-butane in Newman projection formula. 2+1
Which conformation is least stable and why?
- (ii) Assign R-S notation to the chiral carbon in the following: 2
- $$\begin{array}{c} \text{OH} \\ | \\ \text{HC} \equiv \text{C} - \text{C} - \text{CH} = \text{CH}_2 \\ | \\ \text{H} \end{array}$$

(A)

$$\begin{array}{c} \text{CH}_2\text{OH} \\ | \\ \text{H}_3\text{C}_2 - \text{C} - \text{H} \\ | \\ \text{CH}_3 \end{array}$$

(B)
- (b) (i) Define homolytic and heterolytic bond fission with example. 1+1
- (ii) Comment on the marked stability of acyl cation. 1
- (iii) Using Kolbe electrolytic method synthesized acetylene. 2

GROUP-C

6. Answer any **one** question from the following: 10×1 = 10
- (a) (i) What is Markownikov's rule? Cite one example. 1+1
- (ii) Provide a reaction to distinguish between acetylene and ethylene. 2
- (iii) Perform the following transformation: 2×3 = 6
- (1) $\text{CH}_3 - \text{CH}_2 - \text{Br} \longrightarrow \text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
- (2) $\text{H}_3\text{C} - \text{C} \equiv \text{C} - \text{CH}_3 \longrightarrow \text{H}_3\text{C} - \underset{\text{O}}{\text{C}} - \text{CH}_2 - \text{CH}_3$
- (3) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3 \longrightarrow \text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$
- (b) (i) Define Huckel's rule of aromaticity. Explain why the following compound easily eliminate bromine cation. 1+2
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- (ii) An organic compound having chemical formula C_7H_9 produce 1 mole acetone, 1 mole acetaldehyde and one mole ethanedial ($\text{CHO} - \text{CHO}$) on ozonolysis reaction. Find out the structure of the compound. 3
- (iii) Write down short notes of any **two**: 2×2 = 4
- (1) Oxymercuration-demercuration
- (2) Hydroboration-oxidation
- (3) Enantiomerism and Diastereomerism.

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