



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 1st Semester Examination, 2022

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****GROUP-A**

1. Answer any *two* questions from the following: 1×2 = 2
- (a) Which of the following polarizability order is correct?
- (i) $I^- > Br^- > Cl^- > F^-$ (ii) $F^- > Cl^- > Br^- > I^-$
 (iii) $Cl^- > Br^- > I^- > F^-$ (iv) $Cl^- > F^- > Br^- > I^-$
- (b) Nitrogen and oxygen are respectively:
- (i) Paramagnetic and paramagnetic (ii) Diamagnetic and paramagnetic
 (iii) Paramagnetic and diamagnetic (iv) Diamagnetic and diamagnetic
- (c) The state of hybridisation of S in SF₆ is:
- (i) sp³ (ii) sp³d (iii) sp³d² (iv) d²sp³

GROUP-B

2. Answer any *two* questions from the following: 5×2 = 10
- (a) (i) Write Schrödinger wave equation and mention the significance of terms associated in the equation. Give the Schrödinger wave equation for hydrogen atom. 2+1
- (ii) Explain how Heisenberg's Uncertainty Principle goes against the Bohr's theory? 2
- (b) (i) State and explain Fajan's rule to explain covalent character in a compound. 3
- (ii) Explain why PCl₅ is stable but not NCl₅? 2
- (c) (i) CH₄, NH₃ and H₂O have sp³ hybridisation, but their bond angles are quite different. Explain. 3
- (ii) Why NH₃ has higher dipole moment than NF₃? 2

GROUP-C

3. Answer any **one** question from the following: 10×1 = 10
- (a) (i) Write down the limitations of Bohr's theory. 3
- (ii) An electron is present in 4f orbital. Give the possible values for its four quantum numbers. 2
- (iii) Two different bond lengths are observed in PF₅ molecule but only one bond length in SF₆. Explain. 3
- (iv) Draw the resonating structures of nitrate ion. 2
- (b) (i) Discuss in detail the Born-Haber cycle for experimental determination of lattice energy. 3
- (ii) Explain on the basis of molecular orbital theory as to why hydrogen form diatomic molecule while helium remains monoatomic. 2 $\frac{1}{2}$
- (iii) How does solubility of ionic solid depend upon lattice energy? Explain with suitable examples. 3
- (iv) What is the significance of ψ and ψ^2 ? 1 $\frac{1}{2}$

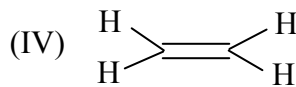
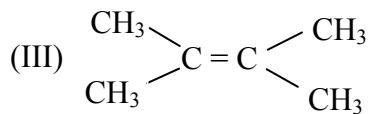
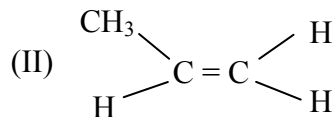
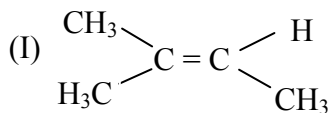
SECTION-B

ORGANIC CHEMISTRY

GROUP-A

4. Answer any **three** questions from the following: 1×3 = 3
- (a) Optically active isomers but not the mirror images are called:
- (i) Mesomers (ii) Tautomers
- (iii) Diastereomers (iv) Enantiomers
- (b) Which one of the following is the strongest acid?
- (i) CH₃COOH (ii) BrCH₂COOH
- (iii) ClCH₂COOH (iv) CH₃CH₂COOH
- (c) A characteristic feature of a free radical is:
- (i) presence of even number of electrons
- (ii) presence of unpaired electron
- (iii) diamagnetic character
- (iv) electric charge
- (d) The halogenation of alkane is:
- (i) addition reaction (ii) combustion reaction
- (iii) elimination reaction (iv) free radical reaction

(e) Arrange the following compound in decreasing order of stability:



(i) III > II > I > IV

(ii) III > I > II > IV

(iii) III > II > IV > I

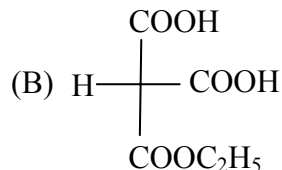
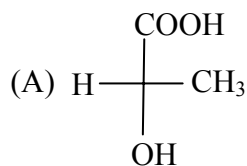
(iv) IV > II > I > III

GROUP-B

5. Answer any **one** question from the following: 5×1 = 5

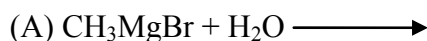
(a) (i) Boat conformation of cyclohexane is less stable than chair conformation. Explain. 3

(ii) Assign R and S configuration to the following 2



(b) (i) Which compound is more acidic in nature, Para-nitrophenol or orthonitrophenol? 3

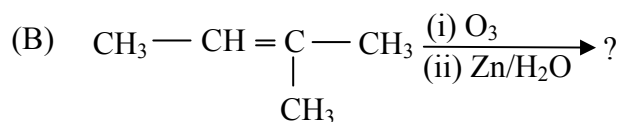
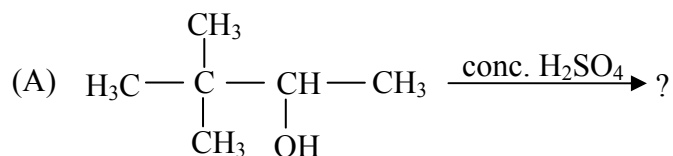
(ii) Identify the products: 1×2 = 2



GROUP-C

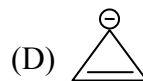
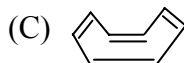
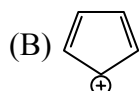
6. Answer any **one** question from the following: 10×1 = 10

(a) (i) Predict the products: 2×2 = 4



(ii) Define Saytzeff elimination with an example. 2

- (iii) What are the differences between homolysis and heterolysis bond cleavage? 2
- (iv) Write down one use of the following reagent: 1×2 = 2
 (A) KMnO_4 (B) Lindler's catalyst
- (b) (i) Write short notes on: $2\frac{1}{2} \times 2 = 5$
 (A) Kolbe's electrolytic reaction
 (B) Anti-Markownikoff's addition reaction
- (ii) What happens when acetylene is treated with Tollen's reagent? Why this reaction occurs? 3
- (iii) Which of the following have aromatic character and why? 2



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