



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 4th Semester Examination, 2024

GE2-P2-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 (Physical)

SECTION-A (Marks: 18)

INORGANIC CHEMISTRY

1. Answer any **three** questions from the following: 1×3 = 3
 - (a) Write down the electronic configuration of Cr and Cu.
 - (b) What is the hybridisation of nickel in $[\text{Ni}(\text{CN})_4]^{2-}$?
 - (c) Write the formula of ‘Prussian blue’.
 - (d) Write the relation between Δ_t and Δ_o .
 - (e) Give example of an ambidentate ligand.

2. Answer any **one** question from the following: 5×1 = 5
 - (a) (i) Explain why transition elements show variable oxidation states. 2
 - (ii) Discuss the splitting of *d*-orbitals in tetrahedral field according to crystal field theory. 3
 - (b) (i) What are Latimer diagrams? Explain taking the case of iron. 3
 - (ii) What do you mean by lanthanide contraction? 2

3. Answer any **one** question from the following: 10×1 = 10
 - (a) (i) What are ‘chelates’? Draw the structure of the chelate of Ni-DMG complex. 1+2
 - (ii) Discuss the following with examples. 3
 - (A) Ionisation isomerism
 - (B) Linkage isomerism.
 - (iii) $[\text{CoF}_6]^{3-}$ is paramagnetic but $[\text{Co}(\text{CN})_6]^{3-}$ is diamagnetic. — Explain. 2
 - (iv) Why transition elements form coloured compounds? 2
 - (b) (i) Compute CFSE (in Δ_o units) for d^7 (octahedral) and d^7 (tetrahedral) in a strong ligand field. 3

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| (ii) Describe the separation of lanthanides by ion-exchange method. | 3 |
| (iii) What do you mean by spectrochemical series? | 2 |
| (iv) Write down the optically active isomers of $[\text{Co(en)}_2\text{Cl}_2]\text{Cl}$. | 2 |

SECTION-B (Marks: 22)**PHYSICAL CHEMISTRY**

4. Answer any *two* questions from the following: 1×2 = 2
- What is inversion temperature?
 - What is the unit of surface tension?
 - What is Miller indices?
 - What is most probable velocity?
5. Answer any *two* questions from the following: 5×2 = 10
- Derive the integrated rate equation for a second order reaction involving a single reactant: 3

$$\text{A} + \text{A} \rightarrow \text{Products}$$
 - How does surface tension of a liquid vary with temperature? Write down the relation correlating γ and T (γ = Surface tension and T = temperature). 2
 - Derive the Kinetic gas equation: $PV = \frac{1}{3}mN\bar{C}^2$ 5
 - Derive van der Waals equation. 5
6. Answer any *one* question from the following: 10×1 = 10
- Derive the reduced equation of state. 3
 - Distinguish between order and molecularity of chemical reactions. 3
 - What is Boyle temperature? Derive the relationship between Boyle temperature (T_B) and van der Waals constants (a, b). 1+3
 - Write short notes on any *four*: 2 $\frac{1}{2}$ × 4 = 10
 - Pseudounimolecular reactions
 - Mean free path
 - Half-life period of chemical reactions
 - Bragg's law
 - Root mean square velocity and average velocity
 - Arrhenius equation and activation energy.

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