



‘समानो मन्त्रः समितिः समानी’

**UNIVERSITY OF NORTH BENGAL**  
B.Sc. Honours 3rd Semester Examination, 2023

**CC5-CHEMISTRY**

**INORGANIC CHEMISTRY-II**

**NEW AND OLD SYLLABUS**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.*

**GROUP-A**

1. Answer any **five** questions from the following: 1×5 = 5
- (a)  $\text{H}_3\text{PO}_3$  is a dibasic acid — Explain.
  - (b)  $\text{I}_2$  is insoluble in water but readily dissolves in aqueous KI solution — Explain.
  - (c) Symmetrical interhalogen anions are more stable than unsymmetrical anions — Explain.
  - (d) What is Müller-Rochow process?
  - (e) What are super acids? Give an example.
  - (f) What are phosphazenes? Give an example.
  - (g) Give an example of three dimensional polymeric allotrope of carbon.
  - (h) Even a strong acid like  $\text{HNO}_3$  behaves like a base (rather a weak one) when dissolved in HF — Explain.

**GROUP-B**

2. Answer any **three** questions from the following: 5×3 = 15
- (a) (i) Write down the differences between hard bases and soft bases with example. 2½
  - (ii) ‘Hard acids prefer to bind hard bases and soft acids prefer to bind soft bases’ — Explain. 2½
  - (b) (i) Why do most of the metals exist in combined state in the earth’s crust? 2
  - (ii) What is Ellingham diagram? Briefly discuss its applications. 1+2
  - (c) (i) What are pseudohalogens? Why are they called so? 1+1
  - (ii) How does delocalization of the  $\pi$ -systems in cyclic triphosphazenes differ from the  $\pi$ -system in benzene? 3
  - (d) (i) What is meant by diagonal relationship? Highlight this aspect for boron and silicon. 1+2
  - (ii) Comment on catenation efficacy of carbon and boron. 2

- (e) (i) What is glass transition temperature? 1  
 (ii) Complete the following reactions: 1+1  

$$\text{XeF}_6 + \text{SiO}_2 \longrightarrow$$

$$\text{XeF}_4 + \text{H}_2\text{O} \longrightarrow$$
  
 (iii) Write down the structure of basic beryllium acetate. 2

## GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) (i) Based on the HSAB principle justify the following reactions: 2  

$$\text{Ag}^{\oplus} + 2\text{F}^{\ominus} \longrightarrow \text{AgF}_2^{\ominus}$$

$$\text{HgF}_2 + \text{BeI}_2 \longrightarrow \text{HgI}_2 + \text{BeF}_2$$
- (ii) Give reasons for the following: 2  
 (A)  $\text{AgI}_2^{\ominus}$  is stable but  $\text{AgF}_2^{\ominus}$  is not  
 (B) CsF reacts with LiI even though both are ionic.
- (iii) Describe the clathrate compounds of noble gases with quinol. 3  
 (iv) Based on VSEPR theory, elucidate the structures of  $\text{XeOF}_2$ ,  $\text{XeO}_2\text{F}_2$  and  $\text{XeO}_3\text{F}_2$ . 3
- (b) (i) Briefly discuss the structure of diborane. 3  
 (ii) Compare the hydrolysis of  $\text{NCl}_3$ ,  $\text{PCl}_3$  and  $\text{AsCl}_3$ . 3  
 (iii) Briefly discuss the preparations of Caro's acid and Nitrolim. 2+2
- (c) (i)  $\text{PbI}_4$  is unstable but  $\text{SnI}_4$  is quite stable — Explain. 2  
 (ii) Boron nitride is called Inorganic graphite — Comment on this statement. 2  
 (iii) Explain the anomalous behaviour of Lithium citing suitable examples. 3  
 (iv) How is  $\text{XeF}_4$  prepared? Describe its reaction with: 1  $\frac{1}{2}$  + 1  $\frac{1}{2}$   

$$\text{BCl}_3 \text{ and Hg}$$
- (d) Write short notes on any **four** of the following: 2  $\frac{1}{2}$  × 4 = 10  
 (i) Soft-soft interaction  
 (ii) Cationic compounds of iodine  
 (iii) Mond's process  
 (iv) Kroll process  
 (v) Interstitial hydride  
 (vi) Interhalogen compounds.

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