'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 3rd Semester Examination, 2021

CC5-CHEMISTRY

INORGANIC CHEMISTRY

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
All symbols are of usual significance.

GROUP-A

1. Answer any ***five*** questions from the following: 1×5 = 5

   (a) What is Allotropes? Illustrate with example.

   (b) Give the example of 3-centered-2-electron bond (3c-2e).

   (c) Why does ClF_3 exist but FCl_3 does not?

   (d) $H_2S_2O_7$ is a stronger acid than liquid H_2SO_4. — Explain.

   (e) Write down the name and formula of a paramagnetic halogen oxide.

   (f) What is electrolytic reduction?

   (g) Which Noble gas is forming maximum number of compounds and why?

   (h) What do you mean by diagonal relationship? Give example.

GROUP-B

2. Answer any ***three*** questions from the following: 5×3 = 15

   (a) (i) What do you know about Ellingham diagram? Illustrate with example. 2+(2+1)

   (ii) What is meant by Hydrometallurgy? Give one example where it is used for metal extraction.

   (b) (i) Comment on the relative acid or base strength of the following pair: (2+2)+1

   (A) NH_3 , H_2O (B) H_3PO_2 , H_3PO_4

   (ii) What is meant by Levelling effect?

   (c) (i) Interhalogen compounds are always diamagnetic, covalent and more reactive than the constituent halogens. — Explain. 3+2

   (ii) Draw the structure of XeO_3 and $XeOF_4$ compound on the basis of VSEPR theory.

   (d) (i) Why is boron-nitride called Inorganic Graphite? 3+2

   (ii) Explain — P_4O_6 and P_4O_{10} are related structurally.

(e) (i) What is Borazine? Give its resemblance with benzene. $2\frac{1}{2}+2\frac{1}{2}$

(ii) Mention basic feature of the structures of 'Silicones' and 'Siloxanes'.

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20

(a) (i) How do you prepare diborane? Discuss the nature of bonding in diborane. (2+3)+3+2

(ii) What is inert pair effect? In which group elements it operates? Explain the effect with one example.

(iii) Justify that cyanogens is a Pseudohalogen.

(b) (i) What is meant by Catenation? Catenation power of carbon is higher than boron and nitrogen. — Explain. (1+3)+3+3

(ii) Compare the hydrolytic behaviour of NCl_3, PCl_3 and $AsCl_3$.

(iii) Although the electron affinity of fluorine atom is lower than that of chlorine atom, F_2 is more reactive than Cl_2. Account for the higher reactivity of F_2 with respect to the formation of solid halides MX or MX_2.

(c) (i) Define soft-base and indicate its characteristics. 2+3+2+3

(ii) Using Pearson's HSAB principle select the ions which will interact favourably and predict the product:

$$Ag^{+}\ ,\ Ni^{4+}\ ,\ I^{-}\ ,\ IO_6^{5-}$$

(iii) Classify the following as Lewis acid or bases giving reason.

(A) BF_3 (B) NH_3 (C) Cl^{-} (D) Zn^{2+}

(iv) Compare Lewis acidity of halide of Boron (BF_3, BCl_3, BBr_3 and BI_3) with proper explanation.

(d) Write short notes on any ***four*** of the following: $2\frac{1}{2}\times4=10$

(i) Peroxo acids of sulphur

(ii) Basic beryllium acetate

(iii) Clathrates

(iv) Inorganic polymers

(v) Phosphazenes

(vi) Van-Arkel-de Boer process.

——×——