'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 3rd Semester Examination, 2022

CC5-CHEMISTRY

INORGANIC CHEMISTRY-II

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) Arrange the following in increasing order of oxidation state of P:
   H_3PO_2, H_3PO_3, $H_4P_2O_6$ and $H_4P_2O_7$.

   (b) Why diborane is called electron-deficient compound?

   (c) Give evidence in support of ionic nature of the hydrides.

   (d) What are Silicone rubber?

   (e) Draw the structures of P_4O_6 and P_4O_{10}.

   (f) Give two examples in which interhalogens act as Lewis acids.

   (g) What are carboranes? Give example.

   (h) $(SiH_3)_3N$ is a weaker base than $(CH_3)_3N$ – Explain.

GROUP-B

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

   (a) (i) Explain why trivalent phosphorous compounds can serve both as Lewis acid and also as Lewis base. $2\frac{1}{2}$

   (ii) While hard-hard interactions are generally ionic, soft-soft interactions are generally covalent – Explain. $2\frac{1}{2}$

   (b) (i) Noble gases form compounds with fluorine and oxygen only – Explain. 3

   (ii) Discuss the structure of basic beryllium nitrate. 2

   (c) (i) What are interstitial hydrides? Give examples. 2

   (ii) Borazine is not a perfect analogue of benzene – Justify. 3

   (d) (i) Why is it difficult to store XeF_6 in glass or quartz cell? 2

   (ii) Discuss van Arkle-de Boer process for the purification of metals. 3

   (e) (i) Explain – Why NO_2 readily dimerizes while NO does not. 2

   (ii) What are inorganic polymers and how they differ from organic polymers? 1+2

GROUP-C

3. Answer any ***two*** questions from the following: $10\times2 = 20$

(a) (i) State the principles of refining of metal by zone refining method. $2\frac{1}{2}$

(ii) Lithium resembles magnesium more closely in its behaviour – Explain. $2\frac{1}{2}$

(iii) How and why does fluorine differ from the other members of the group? 3

(iv) Discuss the geometries of XeF_4 and XeO_2F_2 with the help of VSEPR theory. 2

(b) (i) Identify the Bronsted acid and its conjugate base in the following reactions: 2

$$NH_3(aq.) + H_2S(aq.) \rightarrow NH_4^+(aq.) + HS^-(aq.)$$

$$CO_3^{2-}(aq.) + H_2O \rightarrow HCO_3^-(aq.) + OH^-(aq.)$$

(ii) From HSAB concept, explain why LiI hydrolyses rapidly than LiF but HgF_2 hydrolyses quickly than HgI_2. 3

(iii) Nitrogen does not form H_3NO_4 although phosphorous form H_3PO_4 – Explain. 2

(iv) Explain why trisilylamine is weaker base than trimethylamine. 3

(c) (i) Which of the one among four halogens is likely to be the most basic? Provide some evidence in support of the predicted basic character. $1\frac{1}{2}+2\frac{1}{2}$

(ii) Can diborane be methylated beyond $(CH_3)_4B_2H_2$? Explain. 2

(iii) What are Clathrate compounds? Give example. 2

(iv) How do boric acid and borates detect qualitatively? 2

(d) (i) What are phosphazenes? How are they prepared? 1+2

(ii) Classify silicates on the basis of mode of linking of $(SiO_4)^{4-}$ units. 2

(iii) Discuss the molecular orbital treatment of XeF_2. 3

(iv) Write down the structures of peroxomonosulphuric acid and peroxodisulphuric acid. 2

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