(iv) Solutions of alkali metal in liquid ammonia

(3,3,9)

[This question paper contains 8 printed pages.]

Your Roll No.....

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Sr. No. of Question Paper : 1373

Unique Paper Code : 32171301

Name of the Paper : Inorganic Chemistry II : s- and p-Block Elements

Name of the Course : **B.Sc. (H) Chemistry – CBCS (LOCF)**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all. Question number **1** is compulsory.
3. **All** questions carry equal marks.

1. Explain **any five** of the following, giving suitable reasons :

(a) In spite of the ring strain in P_4 molecule, white phosphorus is stable relative to P_2.

(b) No reductant is required for the extraction of metals from HgO and Ag_2O.

(c) Helium and Neon do not form clathrate compounds.

(d) Carbon shows much greater tendency for catenation in comparison to silicon and nitrogen.

(e) The colour of halogens deepens down the group.

(f) Lithium forms predominantly the monoxide, sodium forms peroxide whereas potassium, rubidium and cesium form superoxides.

(g) Ionisation enthalpies of group 13 elements show irregular trends. (3×5)

(c) Draw the structure of **any three** :

(i) Basic beryllium nitrate

(ii) Mg-EDTA complex

(iii) iodine heptafluoride

(iv) 2,2,2-cryptand (5,4,6)

6. (a) Discuss at least three points of similarities between halogens and pseudohalogens.

(b) Alkaline earth metals are harder, denser and have high melting points as compared to alkali metals. Explain.

(c) Write short notes on : **(any three)**

(i) Cyanide Process

(ii) Zone refining

(iii) Interhalogen compounds

(v) Thallium doesn't exist in (III) oxidation state, yet TlI_3 exists. (4,5,6)

5. (a) Explain the dissimilarities between the two allotropic forms of carbon, namely graphite and diamond.

(b) Complete and balance the following equation : **(any four)**

(i) $H_3PO_3 + HgCl_2 \rightarrow$

(ii) $nPCl_5 + nNH_4Cl \xrightarrow{120\text{–}150\ ^\circ C}$

(iii) $B_3N_3H_6 + H_2O \xrightarrow{\Delta}$

(iv) $BCl_3 + LiAlH_4 \xrightarrow{ether}$

(v) $B_2H_6 + NH_{3(excess)} \xrightarrow{-120\ ^\circ C}$

(vi) $SiH_4 + AgNO_3 + H_2O \rightarrow$

2. (a) Name the hydrides of group 15 elements and discuss the variation in their properties with reference to :

(i) Basic character

(ii) Thermal stability

(iii) Reducing character

(b) Carbon is capable of reducing all metal oxides provided the temperature of reduction is sufficiently high, however the use of carbon as reducing agent becomes impractical for metal oxides towards the bottom of Ellingham diagram. Comment and also explain why most of the lines slope upwards in the Ellingham diagrams.

(c) Draw the structure of diborane and discuss the bonding involved using molecular orbital theory. Also, give experimental evidences in support of the structure. (4,5,6)

P.T.O.

3. (a) What is diagonal relationship? Giving at least three examples explain how boron resembles silicon.

(b) Give the oxidation sates of sulphur in Caro's acid and Marshall's acid. Draw their structures and write one reaction by which both can be differentiated.

(c) Arrange the following in the increasing order of their acidic strength and Justify your answer.

(i) H_3PO_4, H_3PO_3, H_3PO_2

(ii) HBr, HI. HCl, HF

(iii) HClO, $HClO_3$, $HClO_2$, $HClO_4$ (4,5,6)

4. (a) Draw and discuss the structure of P_4O_{10} and write the mechanism for its hydrolysis.

(b) Discuss the structure of 3-dimensional silicates with reference to zeolites and their application as ion exchanger.

(c) Comment on any **three** :

(i) XOX bond angle in Cl_2O is greater than that in F_2O.

(ii) Cesium iodide is much less soluble in water than Cesium fluoride, but Lithium flouride is less soluble than Lithium iodide.

(iii) Solubility of sulphates of alkaline earth metals decreases whereas it increases for their hydroxides on descending the group.

(iv) Chlorine has greater electron gain enthalpy than fluorine, yet fluorine is a stronger oxidizing agent.