(iv) Lithium nitrate is heated. (3×5)

[This question paper contains 8 printed pages.]

28.12.2023 (M)

Your Roll No.....

Sr. No. of Question Paper : 4342 **G**

Unique Paper Code : 32171301

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

Name of the Course : **B.Sc. (Hons) Chemistry (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 No. **1** is compulsory.
3. **All** Questions carry equal marks.

1. Explain the following giving reasons : **(any five)**

(a) CCl_4 does not act as a Lewis acid while $SiCl_4$ does.

(b) Borazine is more reactive than Benzene.

(c) Amongst the alkali metals Lithium has got the highest ionisation enthalpy, despite this it is as good a reducing agent as cesium in aqueous solution.

(d) Carbon is a versatile reducing agent used in the extraction of metals, but it is unsuitable sometimes as a reducing agent.

(e) Phosphorus, arsenic and antimony form pentahalides, but nitrogen and bismuth do not.

(f) B^{3+} ion doesn't exist in solid or solution state.

(g) Zeolites are used as water softeners. (3×5)

2. (a) Select the correct answer in each category given below and justify your answer. **(any four)**

(b) Which is oxidising in nature and why? PbO or PbO_2

(c) Discuss the structure of XeF_2 using Molecular orbital theory.

(d) Justify the statement: Unlike ethane, diborane is an electron deficient compound. How do you explain the structure of diborane then?

(e) Write balanced chemical reactions for **any three** of the following :

(i) Diborane reacts with ammonia in the ratio 1:2 at 200°C.

(ii) Borazine reacts with methanol.

(iii) Sulpur dioxide reacts with acidified solution of potassium dichromate.

P.T.O.

(c) A group 2 metal (M) occurs naturally in great abundance as carbonate. Metal (M) reacts with cold water forming compound (A), which is a strong base. Aqueous solution of (A) is used in the qualitative test for carbonate ion. Metal (M) combines with H_2 to give a saline hydride (B), which behaves as a drying agent. Identify (M), (A) and (B) giving balanced chemical reactions.

(d) Write short notes on **any two** of the following :

(i) van Arkel de Boer Method

(ii) Clathrate compounds

(iii) Phosphonitrilic halides (3,3,3,6)

6. (a) Potassium permanganate which is insoluble in benzene, dissolves readily in it in the presence of 18-crown-6-ether. Explain giving reason.

(i) A halogen which does not exhibit positive oxidation state: Flourine or chlorine

(ii) Better lewis base: Trimethylamine or trisilylamine

(iii) Stronger reducing agent: CH_4 or SiH_4

(iv) Hydride having higher thermal stability: NH_3 or PH_3

(v) Stronger oxidising agent: HOCl or $HClO_4$

(b) Explain with the help of Ellingham diagram, the reducing nature of carbon and carbon monoxide.

(c) Graphite is soft, has low density and is a good conductor of electricity but diamond is extremely hard, has high density and is a non-conductor of electricity. Explain why? (6,4,5)

P.T.O.

3. Justify the following statements, giving reason :

(a) Methane, ammonia and water have same hybridisation but different structures.

(b) Nitrogen is an inert gas while phosphorous is a highly reactive solid.

(c) CO_2 is a gas while SiO_2 is a high melting solid.

(d) Rubidium as compared to sodium has greater electrical conductivity in aqueous solution.

(e) Dilute solution of sodium in liquid ammonia is blue coloured, paramagnetic in nature and behaves as a true solution. (3×5)

4. (a) What is Inert pair effect? How does it vary down the group 14 elements? Explain.

(b) Draw the structure of S_8 molecule and explain the effect of heating on Sulphur.

(c) Discuss the structures of **any two** of the following :

(i) Phosphorous pentoxide

(ii) Basic beryllium acetate

(iii) Xenon hexaflouride

(d) Silicon analogues of alkene and alkyne are not known. Give reason. (4,4,4,3)

5. (a) Which has greater bond angle and why? NH_3 or NF_3.

(b) Which will have greater ionic radius and why? Gallium or Aluminium.

P.T.O.