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[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 41 **I**

Unique Paper Code : 32171301

Name of the Paper : C-5; Inorganic Chemistry-II; s and p block elements

Name of the Course : **B.Sc. (Hons) Chemistry**

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 any **five** questions.
3. **All** questions carry equal marks.

1. Explain any **five** giving suitable reasons :

   (a) Phosphorus forms pentahalides whereas nitrogen and bismuth do not.

   (b) The boiling points of hydrides of group 16 follow the given trend :

$$H_2O > H_2S < H_2Se < H_2Te$$

P.T.O.

(c) Ionization enthalpy of Li is very high and formation of N^{3-} requires ~2165 KJ/mole, still it forms Li_3N.

(d) Dilute solutions of alkali metals in liquid ammonia are paramagnetic and highly conducting.

(e) IF_7 is known while ICl_7 is not.

(f) $BeCO_3$ decomposes at about 100°C while the other group 2 carbonates require higher temperatures for decomposition.

(3×5)

2. (a) Draw and explain the structure of diborane with special reference to molecular orbital energy level diagram for the formation of B-H-B bonds.

(b) Magnesium metal burns in air to give an ash containing A and B. The ash on reaction with water gives an alkaline solution with smell of ammonia. Identify A and B with equations for the reactions.

(c) Explain the trend in solubility of hydroxides of alkali metals.

(d) The alkene and alkyne analogues of silicon are not known. Why? (5,4,3,3)

3. (a) Complete and balance any **four** of the following reactions :

(i) $nPCl_5 + nNH_4Cl \xrightarrow{\text{heat, } C_2H_2Cl_4}$

(ii) $SiCl_4 + Li[AlH_4] \xrightarrow{\text{ether}}$

(iii) $XeF_2 + H_2O \longrightarrow$

(iv) $NaNO_3 \xrightarrow{\sim 500\ ^oC}$

(v) $BrF_5 + H_2O \longrightarrow$

(b) Which is stronger oxidizing agent in aqueous solution, fluorine or chlorine? Give suitable reasons.

(c) $SO_2(g)$ and $SO_3(g)$ have same hybridization but different structures. Explain.

(d) Mention the oxidation state of thallium in TlI_3 and name the compound. Justify the same. (6,3,3,3)

P.T.O.

4. (a) Carbon monoxide is a better reducing agent for metal oxides than carbon below 983K but above this temperature, the reverse is true. Discuss with the help of Ellingham diagram and also mention the drawbacks of carbon as a reducing agent at high temperatures.

(b) Though ClO_2 is an odd electron molecule, it shows little tendency to dimerize. Why?

(c) Why do clay minerals cleave easily into thin sheets?

(d) HF is more ionic than HCl, but a weaker acid than HCl in aqueous solution. Why? (6,3,3,3)

5. (a) Write any one method of preparation of borazine. Though it is called inorganic benzene, it readily undergoes addition reactions unlike benzene. Explain with examples.

(b) $SnCl_2$ is a high melting solid whereas $SnCl_4$ is a liquid. Comment.

(c) Why does the first member of each group show anomalous behavior? Explain by taking Lithium as an example.

(d) Arrange the following oxoacids in the increasing order of their oxidizing power and justify the order :

$HClO$, $HClO_2$, $HClO_3$, $HClO_4$ (6,3,3,3)

6. (a) Draw and discuss structures of any **three** :

(i) Basic beryllium acteate.

(ii) Dibenzo-18-crown-6.

(iii) P_4O_{10}

(iv) $[Li(acac)_2]$

(b) Select the correct answer in each category with appropriate justification :

(i) Highest solubility in water: He, Ne, Xe

(ii) No flame coloration: Rb, Be, Cs

(iii) Paramagnetic species: O^{2-}, O_2^{2-}, O_2^-

(c) SiF_4 is readily hydrolyzed while CF_4 is not. Why? (6,6,3)

7. Write short notes on any **three** :

(a) Peroxoacids of sulphur

(b) Vapour phase refining

(c) Clathrate compounds of noble gases

(d) Allotropes of phosporus (5×3)