

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2017

SECOND YEAR [BATCH 2015-18]

CHEMISTRY (Honours)

Paper : IV [Gr-C]

Date : 20/05/2017

Time : 11 am – 1 pm

Full Marks : 25

(Attempt one question from each Unit)

Unit I

[13 marks]

1. a) Give reasonable explanations to the following facts : [2+2]
- PCl_5 is well known but PH_5 cannot be prepared.
 - Tetracoordinated boron compounds are always tetrahedral in structure and never square planar.
- b) Why does sulfur form catenated polysulfides of formula $[\text{S}-\text{S}-\text{S}]^{2-}$ and $[\text{S}-\text{S}-\text{S}-\text{S}]^{2-}$ whereas polyoxygen anions beyond O_3^- are unknown? [2]
- c) Identify the compound A to F : [3]
- $$\begin{array}{ccccccc} & & \text{F} & & & & \\ & & \uparrow & & & & \\ & & \text{H}_2\text{O} & & & & \\ \text{Si} & \xrightarrow{\text{Cl}_2} & \text{A} & \xrightarrow{\text{RLi}} & \text{B} & \xrightarrow{\text{H}_2\text{O}} & \text{C} \longrightarrow \text{D} \\ & & \downarrow & & & & \\ & & \text{RMgBr} & & & & \\ & & \text{E} & & & & \end{array}$$
- d) How will you prove that GaCl_2 exists as $\text{Ga}^+[\text{GaCl}_4]^-$. [2]
- e) Explain why CsI_3 is stable with respect to decomposition but NaI_3 is not. [2]
2. a) Discuss the role of Ag^+ ion in the oxidation of Mn(II) by perdisulfate ion. [2]
- b) How is perdisulfuric acid prepared? Give its structure. [2+1]
- c) Aqueous solution of borax behaves as a buffer. Explain. [2]
- d) Discuss the diagonal relationship between Be and Al. [2]
- e) Discuss the structure of phosphorus trioxide. [2]
- f) From trends in the periodic table, decide whether phosphorus or sulfur is likely to be the stronger oxidizing agent. [2]

Unit II

[12 marks]

3. a) State the precursors of the silicone synthesis, mentioning their speciality. [2]
- b) Use the VSEPR model to predict the probable shapes of (i) FCIO_3 , (ii) $[\text{ClF}_6]^+$. [2]
- c) How will you detect the presence of trace amounts of CO in CO_2 ? Give necessary equations. [2]
- d) Discuss the structure of borazine. Give two chemical reactions to show it is more reactive than benzene. [2+2]
- e) Borane exists as the molecule B_2H_6 but triethylborane exists as monomer $\text{B}(\text{C}_2\text{H}_5)_3$. Explain. [2]
4. a) Write a short note on phosphazines. [3]
- b) Assuming that each sulfur and nitrogen atom carries a lone pair, predict whether S_2N_2 could be described as aromatic. [1]
- c) State two chemical characteristics to establish that CN^- is a pseudohalide. [2]
- d) How are freons prepared? [2]
- e) Arrange the following in increasing order of their acidic strength with reasons. XeF_6 , XeF_4 , XeOF_4 , XeO_4 , XeF_2 . [2]
- f) Discuss the structure of S_4N_4 . [2]