RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. THIRD SEMESTER EXAMINATION, MARCH 2021

SECOND YEAR [BATCH 2019-22]

Date : 18/03/2021 **CHEMISTRY [HONOURS]**

Time : 11.00 am – 1.00 pm **Paper : VII [CC 7]** Full Marks : 50

Answer <u>any one</u> question from <u>each unit</u>

<u>Unit – I</u> [13 marks]

1. a) Discuss the stability of +1 and +3 oxidation states of Group-13 elements suggesting evidence. [3]

   b) What are phosphazenes? Depict chemical principle for the preparation of cyclophosphazenes? Discuss the structure of tri-cyclophosphazene with emphasis to acidic and basic centers. [1+2+3]

   c) When solid B_2O_3 and liquid HF are mixed together and heated gently in presence of pure sulphuric acid, a colourless gas (**P**) evolves. Identify the product **P** and, state the role of sulphuric acid. What will happen when the product **P** reacts separately with (i) $HF_{(l)}$ and (ii) $NH_{3(g)}$ plus heat. [1 +1 + 1 + 1]

2. a) Why are the pentahalides of bismuth unknown except BiF_5? [2]

   b) The bond angles for the hydrides of Group-15 elements are as follows: NH_3, 107.8°: PH_3, 93.6°; AsH_3, 91.8° and SbH_3; 91.3°. Account for this trend [2]

   c) Discuss the formation of 3-cetre 2e-bond in B_2H_6 in the light of molecular orbital concept. [3]

   d) How will you differentiate phosphate from arsenate chemically? Give the required balanced chemical reaction for their difference. [3]

   e) Depict the basic units those found in condensed phosphates. How are they identified? [3]

<u>Unit – II</u> [13 marks]

3. a) What is catenation? Catenation power from carbon to oxygen decreases-why? [3]

   b) Discuss the stability of MCl_4 and MCl_2 for M = Si to Pb. [3]

   c) Give an analytical application of red lead with relevant reaction. [3]

   d) How will you prepare potassium peroxodisulphate? What will happen when potassium peroxodisulphate is treated with chromic sulphate in dilute sulphuric acid medium in the presence of trace silver sulphate? [2 + 2]

4. a) Compare and contrast the properties between graphite and layered boron nitride in the light of slippering and electrical conducting properties. [3]

   b) $N(CH_3)_3$ and $N(SiH_3)_3$ have sharp contrast in the following cases: (i) structure, (ii) Lewis basic property and (iii) reaction products with dilute HCl. Rationalize in the light of the noted parameters. [4]

   c) Why is the O-O bond distance of dioxygen (121 pm) and dioxygen fluoride (121.8pm) almost same- why? [3]

   d) Complete the following reactions in aqueous medium: (i) $[S_2O_3]^{2-} + Fe^{3+} \rightarrow$ (ii)) $[S_2O_3]^{2-} + Ag^+$ (small amount) $\rightarrow$ and (iii)) $[S_2O_3]^{2-} + Ag^+$ (excess)$\rightarrow$ [3]

<u>Unit – III</u> [12 marks]

5. a) Explain the oxidising trend of ClO_3^-, BrO_3^- and IO_3^- [3]

   b) Halogen shows different colour in different solvents, explain with example. [3]

c) How can you prepare XeF_2, XeF_4 and XeF_6? Using molecular orbital concept explain the bonding of XeF_2. [3+3]

6. a) Iodine can form I_3^- but Fluorine cannot form F_3^- explain. [2]

b) State two chemical characteristics to establish that CN^- pseudo halide [2]

c) Comment on the shape of XeO_2F_2. [2]

d) Solubility of I_2 in water increases in presence of KI, comment. [2]

e) During preparation of xenon fluoride complete removal of moister is necessary, explain. [2]

f) How can you prepare xenate and perxenate? [2]

Unit – IV [12 marks]

7. a) What are the basic difference between nuclear Fission and spallation reaction. [2]

b) Explain the concept of magic number. Why it is so called? Explain the significance of magic number. [2+2+2]

c) Explain the nuclear stability on the basis of (i) odd/even nature of neutron and protons (ii) n/p ratio. [2+2]

8. a) $^{232}Th_{90}$ can be used as a source of nuclear energy, explain [2]

b) What is nuclear isomerism? Give examples [2]

c) $^{238}U_{92}$ is not suitable for nuclear fission reaction. Comment. [2]

d) What do you mean by controlled and uncontrolled fission energy? How can you control a nuclear fission reaction? [2+2]

e) Predict the mode of decay of $^{7}Be_4$. (Given the mass of $^{7}Be_4$, $^{7}Li_3$ and electron are 7.01693, 7.01600 and 0.00055 amu respectively. [2]

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