

U.G. 5th Semester Examination - 2025**CHEMISTRY****[MAJOR-VI]****Course Code : CHEM-MAT-6****(Inorganic-2)****[NEP-2020]**

Full Marks : 40

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five from the following questions:

 $2 \times 5 = 10$

- a) Draw Lewis Structure of $S_2O_3^{2-}$ ion.
- b) What is meant by packing efficiency?
- c) Write name and chemical formula of Uranium and Titanium ores. 1+1
- d) Write two properties of silicones. How they are prepared? 1+1
- e) Which of the given salts $BaCl_2$, $Ba(NO_3)_2$, $MgSO_4$ and $BaSO_4$ is least soluble in water and why?

[Turn Over]

- f) What is inorganic graphite? Write two similarities of it with graphite. 1+1
- g) Why hydrogen bonding has importance in biology? State with an example. 1+1
- h) What are pseudohalogens? Give two examples. 1+1

2. Answer any two from the following questions:

5×2=10

- a) State Bent's rule and applying the same predict the shapes of PCl_3F_2 and OSF_4 . $2+1\frac{1}{2}+1\frac{1}{2}$
- b) i) CsF is more soluble in water than CsI but LiF is less soluble than LiI . Explain your answer.
- ii) How to get pure Titanium from impure Titanium? Describe the process with chemical reaction involved in it. 2+3
- c) Calculate the limiting radius ratio for planar trigonal lattice. The radius ratio value of NH_4F exhibit that it should possess the structure similar to CsCl but it possess the Wurtzite structure – explain. 2+3
- d) i) What are fluorocarbons? Why chlorofluorocarbons are widely used as refrigerants?

- ii) Rationalise the dipole moment order:
 CH_3Cl (1.87D) > CH_2Cl_2 (1.55D) > CHCl_3 (1.02D) > CCl_4 (0D). (1+1)+3

3. Answer any two from the following questions:

10×2=20

- a) i) Determine bond order of O_2^+ and O_2^- using Molecular Orbital Theory.
- ii) How do you synthesize B_2H_6 ? Discuss its structure.
- iii) What is Berry Pseudorotation? Give an example.
- iv) Explain why K^+ is more reactive than Ag^+ with the help of Born-Haber cycle. $2+(2+2)+2+2$
- b) i) Draw Molecular Orbital energy level diagram of CO molecule. Show HOMO and LUMO in it. Why CO reacts with metal via the C-terminal only not O-terminal for CO? Explain using MO diagram.
- ii) What type of crystal defect is observed in AgCl ? Do density of AgCl changes due to this defect? Explain with reasons. $(4+2+2)+(1+1)$

- c) i) What is Marshall's Acid? Draw its structure.
- ii) Give example of a compound with octahedral geometry and square pyramidal shape. Determine its hybridization.
- iii) Write a short note on phosphazene.
- iv) Calculate the fraction occupied and number of spheres per unit cell of a simple cubic lattice. $(1+1)+2+3+3$
- d) i) Name two ores of Ni. Draw the flow-chart of Ni extraction from its ore. Discuss Mond's process.
- ii) Boric acid is a weak acid but it behaves like strong acid in presence of poly hydroxy alcohol. – Explain.
- iii) Arrange HClO , HClO_2 , HClO_3 and HClO_4 in the increasing order of acidity. Give reason. $(1+3+1)+3+2$
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