

## U.G. 5th Semester Examination - 2025

## CHEMISTRY

[MAJOR-VI]

Course Code : CHEM-MAT-6

(Inorganic-2)

[NEP-2020]

Full Marks : 40

Time : 2½ 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:

2×5=10

- Draw Lewis Structure of  $S_2O_3^{2-}$  ion.
- What is meant by packing efficiency?
- Write name and chemical formula of Uranium and Titanium ores. 1+1
- Write two properties of silicones. How they are prepared? 1+1
- 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  $\text{PCl}_3\text{F}_2$  and  $\text{OSF}_4$ .  $2+1\frac{1}{2}+1\frac{1}{2}$
- b) i)  $\text{CsF}$  is more soluble in water than  $\text{CsI}$  but  $\text{LiF}$  is less soluble than  $\text{LiI}$ : 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  $\text{NH}_4\text{F}$  exhibit that it should possess the structure similar to  $\text{CsCl}$  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:  
 $\text{CH}_3\text{Cl}$  (1.87D) >  $\text{CH}_2\text{Cl}_2$  (1.55D) >  $\text{CHCl}_3$  (1.02D) >  $\text{CCl}_4$  (0D). (1+1)+3

3. Answer any two from the following questions:

10×2=20

- a) i) Determine bond order of  $\text{O}_2^+$  and  $\text{O}_2^-$  using Molecular Orbital Theory.
- ii) How do you synthesize  $\text{B}_2\text{H}_6$ ? Discuss its structure.
- iii) What is Berry Pseudorotation? Give an example.
- iv) Explain why  $\text{K}^+$  is more reactive than  $\text{Ag}^+$  with the help of Born-Haber cycle.  $2+(2+2)+2+2$
- b) i) Draw Molecular Orbital energy level diagram of  $\text{CO}$  molecule. Show HOMO and LUMO in it. Why  $\text{CO}$  reacts with metal via the C-terminal only not O-terminal for  $\text{CO}$ ? Explain using MO diagram.
- ii) What type of crystal defect is observed in  $\text{AgCl}$ ? Do density of  $\text{AgCl}$  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  $\text{HClO}$ ,  $\text{HClO}_2$ ,  $\text{HClO}_3$  and  $\text{HClO}_4$  in the increasing order of acidity. Give reason.  $(1+3+1)+3+2$
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