



Seat No. \_\_\_\_\_

**H AJ-003-1015005**

**B. Sc. (Sem.-V) (CBCS) (WEF-2016)**

**Examination**

**May - 2023**

**C-501 : Inorganic and Industrial Chemistry (2018)**

*(Old Course)*

**Faculty Code : 003**

**Subject Code : 1015005**

Time :  $2\frac{1}{2}$  Hours / Total Marks : 70

- Instructions :**
- (1) All questions are compulsory.
  - (2) In all questions : b, c, d have internal options.
  - (3) Each section (a, b, c, d) of a question should be written separately in the answer book.
  - (4) Figures to the right indicate full marks of sub questions.

- 1 (a) Answer the following questions : 4
- (1) Write the normalized wave equation for particle moving in one dimensional box.
  - (2) “ $\theta$  equation is useful to know about magnetic quantum number.” True or False.
  - (3) What is linear operator ?
  - (4) Give equation of Normalization condition.
- (b) Answer in brief : (any one out of two) 2
- (1) What is commutator of operator ?
  - (2) Define zero point energy for one and three dimensional systems.
- (c) Answer in detail : (any one out of two) 3
- (1) Explain Hamiltonian operator.
  - (2) Derive relation between cartesian and polar coordinates.

- (d) Write a note on : (any one out of two) 5
- (1) Derive an energy equation for a particle moving in one dimensional box.
  - (2) Calculate the energy of 15 orbital.
- 2 (a) Answer the following questions : 4
- (1) Which orbitals are not much affected by ligands ?
  - (2) Give any two examples of strong ligand.
  - (3) Which three d-orbitals are known as  $t_{2g}$  orbitals ?
  - (4)  $[\text{NiCl}_4]^{2-}$  is paramagnetic - True or False.
- (b) Answer in brief : (any one out of two) 2
- (1) Calculate magnetic moment of  $[\text{Ni}(\text{Br})_4]^{-2}$  complex ion.
  - (2) Explain high spin and low spin complexes.
- (c) Answer in detail : (any one out of two) 3
- (1) Explain the orbital contribution to magnetic momentum in various crystal fields.
  - (2) Explain the splitting of d-orbitals in tetrahedral field.
- (d) Write notes on : (any one out of two) 5
- (1) Discuss splitting of d-orbitals in octahedral field with CFSE.
  - (2) Explain factors affecting splitting energy.
- 3 (a) Answer the following questions : 4
- (1) Define : Metal carbonyls.
  - (2) Draw the structure of  $\text{Fe}_3(\text{CO})_{12}$
  - (3) Give chemical formula of  $\text{C}_4\text{AF}$ .
  - (4) Give the full form of RCC.
- (b) Answer in brief : (any one out of two) 2
- (1) Explain classification of metal carbonyls.
  - (2) Explain setting and hardening of cement.
- (c) Answer in detail : (any one out of two) 3
- (1) Explain metal nitrosyls.
  - (2) Give merits and demerits of wet and dry process of manufacturing cement.
- (d) Write notes on : (any one out of two) 5
- (1) Explain nature of M-CO bond with spectral support.
  - (2) Discuss about types of cement.

- 4 (a) Answer the following questions : 4
- (1) Give the formula of Chile Saltpeter.
  - (2) Write formula of Biuret.
  - (3) Give any two names of micro nutrient elements.
  - (4) Define fertilizers.
- (b) Answer in brief : (any one out of two) 2
- (1) Explain action of urea as fertilizer.
  - (2) Write about essential requirements of fertilizer.
- (c) Answer in detail : (any one out of two) 3
- (1) Explain NPK fertilizer with nomenclature.
  - (2) Explain action of  $\text{CaCN}_2$  as fertilizer.
- (d) Write notes on : (any one out of two) 5
- (1) Discuss the Prilling method to manufacture ammonium nitrate.
  - (2) Describe manufacturing of mono ammonium phosphate and diammonium phosphate.
- 5 (a) Answer the following questions : 4
- (1) Which compounds are used to decolourize glass ?
  - (2) Which substances are used as oxidizing agents in glass?
  - (3) Give formula of Feldspar.
  - (4) Define glass.
- (b) Answer in brief : (any one out of two) 2
- (1) Write the properties of glass.
  - (2) Explain lead glass.
- (c) Answer in detail : (any one out of two) 3
- (1) Write about colouring agents for glass.
  - (2) Explain glass wool.
- (d) Write notes on : (any one out of two) 5
- (1) Discuss the raw materials used in glass manufacturing.
  - (2) Write short notes on :
    - (1) Formation of batch material and
    - (2) Annealing for manufacture of glass.