DBJ-003-1015005 Seat No. _____

B. Sc. (Sem. V) (CBCS) (W.E.F. 2016) Examination

June - 2022

C-501 : Inorganic & Industrial Chemistry (2018)

(Old Course)

Faculty Code : 003

Subject Code : 1015005

Time : **2.30** Hours] [Total Marks : **70**

Instructions:

(1) This question paper contains ten questions. Each of 14 marks.
(2) Figures to the right indicate full marks of sub question.
(3) Write any five questions.

1 (a) Answer the following questions: **4**

(1) What is zero point energy?
(2) Give equation of orthogonality condition.
(3) Define : Operator.
(4) How many nodal points are present inside the box for the state with wave function Ψ_n where n=4?

(b) Define addition of operators. **2**

(c) Explain Hamiltonian operator. **3**

(d) Calculate the energy of 1s orbital. **5**

2 (a) Answer the following questions : **4**

(1) What is the energy for the particle moving in one dimensional box where n = 4?
(2) What is degeneracy of an energy level?
(3) Give the equation of normalization condition.
(4) Define linear operator.

(b) Explain multiplication of operators. **2**

(c) Discuss cumulative property. **3**

(d) Write Schrodinger's equation in polar coordinates and derive R, θ and Φ equations by variable separation. **5**

3 (a) Answer the following questions : **4**

(1) Give the equation for calculate $\mu_{s.o}$.

(2) Give the equation of CFSE for tetrahedral field in term of Δ_t and Δ_o both.

(3) When splitting energy greater than pairing energy, the complex will be high spin complex. (True or False)

(4) Give equation to calculate CFSE for octahedral crystal field.

(b) Calculate magnetic moment $\mu_{s.o}$ pf $[Mn(H_2O)_6]^{2+}$. **2**

(c) Calculate pairing energy for $[Co(NH_3)_6]Cl_3$ where splitting energy is 23000 cm^{-} and CFSE is 6300 cm^{-}. **3**

(d) Discuss splitting of d-orbitals in octahedral ligand field. **5**

4 (a) Answer the following questions : **4**

(1) Which set of orbitals are denoted as t_2g orbital?

(2) From $[Ni(CN)_4)^{2-}$ and $[Ni(Cl)_4]^{2-}$ which one is paramagnetic.

(3) Give the order of strength of Br^-, CN^- and NH_3.

(4) Define : Pairing energy.

(b) List only the factors affecting splitting energy. **2**

(c) Discuss orbital angular momentum contribution in magnetic momentum. **3**

(d) Discuss high spin and low spin complexes with pairing energy. **5**

5 (a) Answer the following questions : **4**

(1) Give the shape and hybridization of $Ni(CO)_4$.

(2) How many terminal and bridge CO groups are present in $Fe_2(CO)_9$ respectively?

(3) How many electrons are donated by NO^+ group?

(4) Define π-acid ligand.

(b) Give any two reactions for preparation of $NI(CO)_4$. **2**

(c) Explain types of CO group in methyl carbonyl. **3**

(d) Explain structure of $Fe(CO)_5$ in detail. **5**

6 (a) Answer the following questions : **4**

(1) Give the chemical formula of C_3S.

(2) Complete the following reaction :

$Ca(OH)_2 + SiO_2 \rightarrow$

(3) Define lime mortar.

(4) Define slag cement.

(b) Give the uses of cement. **2**

(c) What are ISI specifications of cement? **3**

(d) Explain manufacturing process of Portland cement with reaction and diagram. **5**

7 (a) Answer the following questions: **4**

(1) Write the chemical formula of DAP.

(2) Complete the following reaction.

$$H_2NCONH_2 + H_2O \xrightarrow{\text{Hydrolysis}}$$

(3) Write the chemical formula of Ammonium carbonate.

(4) Define Fertilizer.

(b) Give the classification of fertilizers according to its source. **2**

(c) Write a short note on role of micro nutrients in plants growth. **3**

(d) Discuss production of NPK fertilizer with flow diagram. **5**

8 (a) Answer the following questions : **4**

(1) Write the chemical formula of Gypsum.

(2) Complete the following reaction

$$CaC_2 + N_2 \xrightarrow{1000^\circ C}$$

(3) Define complete fertilizers.

(4) Write chemical formula of Chile saltpetre.

(b) Write the role of primary elements in plant growth. **2**

(c) Give the manufacture process with flow diagram of Diammonium phosphate. **3**

(d) Discuss the manufacture of Calcium cyanamide with diagram. **5**

9 (a) Answer the following questions : **4**

(1) Give chemical formula of Dolomiote.

(2) What is Litharge?

(3) What is Cullet?

(4) Define Glass.

(b) List the special types of glass. **2**

(c) Give the physical properties of glass. **3**

(d) Discuss about the manufacturing process of glass. **5**

10 (a) Answer the following questions : **4**

(1) Complete the following reaction :

$Na_2CO_3 + SiO_2 \rightarrow$

(2) Give formula of Feldspar.

(3) Which pigments are used for Amber colour?

(4) Which glass is used in manufacture of electric bulb?

(b) Explain photochemical glass. **2**

(c) Give the chemical reactions involved in glass manufacturing. **3**

(d) Describe the raw materials used for manufacture of glass. **5**
