RN-003-1015005 Seat No. _____

B. Sc. (Sem. V) (CBCS) (WEF 2016) Examination

February - 2019

Chemistry - C-501

(Inorganic Chemistry & Industrial Chemistry)

(New 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.

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

(1) What is linear operator ?

(2) What is degeneracy of an energy level ?

(3) Write down ∇ and ∇^2.

(4) What is the relation between energy and mass of a moving particle ?

(b) Answer in brief : (any one out of two) **2**

(1) Define zero point energy for one and three dimensional systems.

(2) Define addition of operators.

(c) Answer in detail : (any one out of two) **3**

(1) Calculate C–C bond length in 1,3 butadiene where absorption band is observed at $1200\,\mathring{A}$ (m = 9.1×10^{-28} gm, C=3×10^{10} cm).

(2) Derive relation between cartesian and polar coordinates.

(d) Write a note on : (any one out of two) **5**

(1) Give Schrodinger equation in polar coordinates and prove that the solution of $\Phi_{(\phi)}$ equation gives magnetic quantum number.

(2) Derive energy equation for a particle moving in one dimensional box of length 'a' and explain the terms involved in it.

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

(1) Give equation of CFSE for tetrahedral field in terms of Δ_t and Δ_0 both.

(2) Calculate CFSE for d^4 in strong octahedral field.

(3) Give equation to calculate $\mu_{s.0}$ for the system having n-unpaired electrons.

(4) Give figure of splitting of *d*-orbitals in tetrahedral field.

(b) Answer in brief : (any **one** out of two) **2**

(1) Calculate CFSE for $K_4[Fe(CN)_6]$, where splitting energy is 33000 cm^{-1} and pairing energy is 17500 cm^{-1}.

(2) List the factors affecting splitting energy Δ.

(c) Answer in detail : (any **one** out of two) **3**

(1) CFSE for $[NiCl_4)^{2-}$ is –4000 cm^{-1}. Calculate splitting energy in terms of both Δ_t and Δ_0.

(2) What is the effect of strength of ligand field on Δ ?

(d) Write a note on : (any **one** out of two) **5**

(1) Discuss splitting of d-orbitals in octahedral field with CFSE.

(2) Discuss about the contribution of orbital angular momentum towards the magnetic momentum of 3d-metal complexes.

3 (a) Answer the following : 4

(1) Define metal carbonyls.

(2) Define metal nitrosyls.

(3) Give chemical formula of C_4AF.

(4) What is slag cement ?

(b) Answer in brief : (any one out of two) 2

(1) Give synthesis of metal carbonyls which involves Grignard reagent.

(2) What is RCC ? Give its advantages over plain concrete.

(c) Answer in detail : (any one out of two) 3

(1) List the properties of $Fe(CO)_5$.

(2) Give merits and demerits of wet and dry process of manufacturing cement.

(d) Write a note on : (any one out of two) 5

(1) Discuss about types of cement.

(2) Discuss about the preparation, properties and structure of $Mn_2(CO)_{10}$.

4 (a) Answer the following : 4

(1) Define fertilizer.

(2) What is complete and incomplete fertilizer ?

(3) Give general properties of fertilizer.

(4) Define plant nutrients.

(b) Answer in brief : (any one out of two) 2

(1) What is the effect of deficiency of N and P on plant growth ?

(2) Give classification of fertilizers according to its sources.

(c) Answer in detail : (any one out of two) **3**

(1) Describe action of urea as fertilizer.

(2) List potassium fertilizers and give chemical reactions involved in manufacturing of KNO_3.

(d) Write a note on : (any one out of two) **4**

(1) What is phosphate fertilizer ? List their names and describe manufacturing of any one of them.

(2) List nitrogenous fertilizers and discuss production method of ammonium sulphate by Sindri process with its action as fertilizer.

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

(1) What is role of fluxes in glass making ?

(2) Which compounds are used to decolourize glass ?

(3) What is cullet ?

(4) What is role of P_2O_5 in glass industry ?

(b) Answer in brief : (any one out of two) **2**

(1) List the special types of glass.

(2) Give properties of Borosilicate glass.

(c) Answer in detail : (any one out of two) **3**

(1) Describe photochemical glass.

(2) Give chemical reactions involved in glass manufacturing.

(d) Write a note on : (any one out of two) **5**

(1) Discuss about the manufacturing process of glass.

(2) Define glass. List the raw materials for glass with their functioning and importance.
