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MCP-003-001505

Seat No. _____

Third Year B. Sc. (Sem. V) (CBCS) Examination

May / June - 2018

Chemistry - 501

(Inorganic & Industrial) (New Course)

Faculty Code : 003
Subject Code : 001505

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Answer all the questions.
(2) Q. 1 carries 20 marks, Q. 2 and Q. 3 carries 25 marks each.

1 Answer the following : **20**

(1) For particle in potential well, the potential energy is _____ inside the box and _____ outside the box.

(2) What is condition for Normalisation ?

(3) The solution of θ equation is obtained in _____ polynomial.

(4) What is the equation for the energy of particle moving in one dimensional box ?

(5) Which type of bonding between metal and ligand in complexes ?

(6) What is CFSE of an octahedral complex ?

(7) Which orbitals are less affected by ligand ?

(8) What are point group in $Fe_3(CO)_{12}$ molecule ?

(9) NO^+ ligand is a _____ electron donor.

(10) The IR frequency of NO^+ in metal nytrosyl compounds falls between _____.

(11) Lime mortar are mixture of _____.

(12) Which type of reactions are occur during setting of cement ?

(13) Which is main component of acid resisting cement ?

(14) The lower part of kiln, where the temperature is around 1500° - 1600°C is called _____.

(15) Give manufacture reaction of calcium cyamide from lime.

(16) How many % of available P_2O_5 in superphosphate ?

(17) Which element is necessary for plant in protein synthesis ?

(18) Give uses of Glycerol.

(19) Which is used for silicon polymer in rubber industry ?

(20) In manufacture of acrylonitrile, propylene react with the _____ and _____.

2 (a) Answer any **three** : **6**

(1) Define and explain Multiplication of operator.

(2) Explain Linear operator.

(3) Why splitting of d-orbitals in tetrahedral ligand field is less than that in octahedral field ?

(4) Define high spin and low spin complexes.

(5) Write a note on metal complexes with neutral NO.

(6) Give two methods for preparation of metal carbonyls.

(b) Answer any **three** : **9**

(1) Explain the term Hemiltonian operator.

(2) Discuss the commutative property.

(3) Calculate CFSE and magnetic moment for $\left[Fe\left(H_2O\right)_6\right]^{2+}$. Where $\Delta_0 = 13700\ cm^{-1}$ and pairing energy is 30000 cm^{-1}.

(4) Discuss utility of magnetic properties to determine the structure of a complex.

(5) Give electron configuration with hybridisation for $Mn_2(CO)_{10}$ and draw its molecular structure.

(6) Give physical evidances for multiple nature of M-CO bond.

(c) Answer any **two** : **10**

(1) Derive equation of energy for a particle moving in cubic box and explain degeneracy of energy level.

(2) (i) Normalize the wave function $\psi = N \cdot e^{-r/aO}$.

(ii) Calculate the lowest energy of a particle moving in one dimensional box of length $12\ \mathring{A}$. (Where $m = 9.1 \times 10^{-28} gm$, $h = 6.62 \times 10^{-2}\ erg.\sec$ and $C = 3 \times 10^{10}\ \text{cm}.\sec^{-1}$.

(3) Explain the factors affecting splitting energy.

(4) Discuss splitting of d-orbitals in tetrahedral field.

(5) Describe classification of metal-carbonyls with types of CO groups.

3 (a) Answer any **three** : **6**

(1) Define cement and give name of C_2S, C_3S, C_3A and C_4AF.

(2) Give types of cement and uses of it.

(3) Classify fertilizers according to method of use.

(4) Give characteristics of plant nutrients used as fertilizers.

(5) Give only reaction of glycerol from allylchloride.

(6) Name the compounds obtained from ethylene.

(b) Answer any **three** : **9**

(1) Explain concrete and RCC.

(2) Explain cement rock beneficiation

(3) Explain production of murate of potash from karnelite.

(4) Discuss natural organic fertilizers.

(5) Give manufacture of ethylene glycol from ethylene.

(6) Describe manufacture of synthesis gas from methane.

(c) Answer any **two** : **10**

(1) Discuss production of ammonium sulphate from gypsum.

(2) Explain manufacturing method of portland cement.

(3) Describe manufacture of acrylonitrile from propylene.

(4) Discuss properties of cement in detail.

(5) Explain synthesis of ethanol from ethylene by sulphuric acid process.
