JV-003-001505 Seat No. _____

Third Year B. Sc. Examination

September / October - 2019

Chemistry : C-501

(Inorganic & Industrial Chemistry)

Faculty Code : 003

Subject Code : 001505

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

Instructions :

(1) Question one contains 20 short questions of one mark each. All are compulsory.

(2) Question 2 and 3 carries 25 marks each with internal options.

(3) Write answers of all questions in answer book.

1 Answer the following questions : **20**

(1) Which orbitals are denoted as t_{2g} orbitals ?

(2) Which are the essential raw materials for the manufacturing of cement ?

(3) For diamagnetic substances, value of magnetic moment is _____.

(4) Which oxide is responsible for the greenish-grey colour of ordinay portland cement ?

(5) By which equation CFSE for octahedral complexes is calculated ?

(6) At which IR range terminal CO group absorbs the radiation ?

(7) What is meant by 'g' in e_g and t_{2g} ?

(8) Laplacian operator is denoted as _____.

(9) According to boundary conditions for the system, ψ must be _____.

(10) Write the Schrodinger's equation for a particle moving in one dimensional box.

(11) What is lime mortar ?

(12) Write the formula of tricalcium aluminate.

(13) Write the structure of epichlorohydrin.

(14) Complete the reaction : $HC \equiv CH + H_2O \rightarrow$

(15) What is the symbol of crystal field splitting energy ?

(16) Write the structure of biuret.

(17) What is point group of Fe $(CO)_5$?

(18) Which type of geometry $Ni(CO)_5$ has ?

(19) Write the structure of Glycerine.

(20) Which metal carbonyl can be prepared by direct method ?

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

(1) Define the term 'Zero Point Energy' for particle in one dimensional box.

(2) Write any two preparations of metal carbonyls by reduction method.

(3) Define : Pairing energy.

(4) Explain : Linear Operator.

(5) Differentiate between terminal CO and bridging CO by IR.

(6) Calculate magnetic moment for $[NiCl_4]^{2-}$.

(b) Answer any three : 9

(1) Write a short note : Metal nitrosyls.

(2) Explain strong and weak field ligands.

(3) Write the formation of Carbonyl hydride.

(4) Write the factors affecting splitting energy.

(5) Write short note on Laplacian operator.

(6) Normalize the wave function $\psi = Ne^{-r/a_0}$.

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

(1) Explain the utility of magnetic properties to determine the structure of complexes.

(2) Write Schrodinger's equation in polar coordinate and derive R, θ, Φ equations by variable separation method.

(3) Discuss the structure of $Fe(CO)_5$.

(4) Discuss splitting of d-orbitals in octahedral complexes.

(5) Calculate the energy 1s orbital where

$$Q_{1s} = \frac{1}{\sqrt{\pi a_0^3}} e^{-r/a_0} .$$

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

(1) Explain the soundness of cement.

(2) Name any two phosphatic fertilizers.

(3) Write the reactions for manufacturing glycerol via acrolein.

(4) Write advantages of artificial fertilizers.

(5) Write the uses of trichloro methane.

(6) What is Sorel's cement ? Write formula of Sorel's cement.

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

(1) Write the difference between dry and wet process of cement.

(2) Explain the action of urea as fertilizer.

(3) Write short note : Concrete and RCC.

(4) Write the equations for the manufacturing of ethanol by catalytic hydration process.

(5) Write the properties and uses of trichloromethane.

(6) Explain : Cement rock benefication.

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

(1) Describe prilling method for the production of ammonium nitrate with process flow diagram.

(2) What are C_2 petrochemicals ? Explain production of ethylene glycol from ethylene.

(3) Explain in detail the manufacturing process of portland cement with reaction.

(4) Discuss manufacturing of calcium cynamide and explain action of calcium cynamide as fertilizer.

(5) Explain the manufacture of glycerol via allyl chloride with necessary reactions and diagram.