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PAP-003-1015005 Seat No. _____

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

October / November - 2018

C-501 : Inorganic & Industrial Chemistry

Faculty Code : 003

Subject Code : 1015005

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

Instructions : (1) This question paper contains five questions, each 14 marks. All are compulsory.
(2) Figures to the right indicate full marks of subquestion.
(3) Write answer of all questions in main answer sheet.

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

(1) If $\hat{A} = \frac{d}{dx}$, $\hat{B} = 2x^2$ and $f(x) = \sin x$, then prove that $\hat{A}$ and $\hat{B}$ are Commute or not?

(2) Write formula for Hamiltonian operator for a particle moving in one dimensional box.

(3) Give formula for zero point energy for a particle moving three dimensional box.

(4) Define : Degeneracy.

(b) Answer any **one** : **2**

(1) What is Commutator of operator?

(2) Give condition for normalization and orthogonal wave functions.

(c) Answer any **one** : **3**

(1) Prove that; wave function $\psi = A\sin\alpha x + B\cos\alpha x$ is a solution of $\frac{d^2\psi}{dx^2} + \alpha^2\psi = 0$.

(2) Explain operators Del and Del square.

(d) Answer any **one** : **5**

(1) Derive normalized wave equation for a particle moving in three dimensional box.

(2) Calculate the energy of 1s orbital.

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

(1) Which two d-orbitals are known as e_g –orbitals ?

(2) Give any two examples of strong ligand.

(3) Write formula of CFSE for octahedral field.

(4) Define : CFSE

(b) Answer any **one** : **2**

(1) Why splitting energy of $\left[Co\left(H_2O\right)_6\right]^{+2}$ is greater than $\left[Ni\left(H_2O\right)_6\right]^{+2}$?

(2) Calculate magnetic moment of $\left[Ni\left(Br\right)_4\right]^{-2}$ complex ion.

(c) Answer any **one** : **3**

(1) Explain High spin and low spin complexes with pairing energy.

(2) Calculate CFSE for $\left[Fe\left(CN\right)_6\right]^{4-}$ where splitting energy of d-orbitals is $33500\,cm^{-1}$ and pairing energy is $17000\,cm^{-1}$.

(d) Answer any **one** : **5**

(1) Explain orbital angular momentum contribution to magnetic momentum of complexes.

(2) Explain splitting of d-orbitals in Td crystal field with CFSE.

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

(1) What is the point group of $Mn_2\left(CO\right)_{10}$ complex?

(2) Define with example : Metal nitrosyls

(3) Which pigment is used for green cement?

(4) Write formula for C_4AF.

(b) Answer any **one** : **2**

(1) Draw structure of $\left[Fe_3(CO)_{12}\right]$ complex

(2) Explain water proof cement.

(c) Answer any **one** : **3**

(1) Give electronic configuration, hybridization and shape of $\left[Fe(CO)_5\right]$ complex.

(2) Explain any three properties of cement.

(d) Answer any **one** : **5**

(1) Explain nature of M-CO bond with spectral support.

(2) Explain manufacture of cement with diagram.

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

(1) Complete the reaction :

Calcium phosphate $+ 4\ H_3PO_4 \rightarrow$ _____

(2) Write formula for biuret.

(3) Write two names of natural inorganic fertilizers.

(4) Give any two names of micro nutrients elements.

(b) Answer any **one** : **2**

(1) Explain primary and secondary nutrients.

(2) Explain action of urea as fertilizer.

(c) Answer any **one** : **3**

(1) Explain NPK fertilizer with nomenclature.

(2) Explain classification of fertilizer according to nutrients present in fertilizers.

(d) Answer any **one** : **5**

(1) Describe manufacturing of mono ammonium phosphate and diammonium phosphate.

(2) Explain with diagram : Manufacture of $CaCN_2$.

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

(1) Define : Glass.

(2) Give formula of Feldspars.

(3) Which substances are used as oxidizing agent in glass?

(4) Which pigment is used as black glass ?

(b) Answer any **one** : **2**

(1) What is Cullet ?

(2) Explain lead glass.

(c) Answer any **one** : **3**

(1) Explain Glass wool.

(2) Explain properties of glass.

(d) Answer any **one** : **5**

(1) Describe raw materials used for manufacturing of glass.

(2) Explain :

(a) Formation of batch material and

(b) Annealing for manufacture of glass.
