



**DAA-003-001505**

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

**April / May – 2015**

**C-501 : Inorganic & Industrial Chemistry**

**Faculty Code : 003**

**Subject Code : 001505**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions : (1) All the questions are compulsory.  
(2) Answer of Q.1 (M.C.Q) should be written in the main answer book.

1 Answer the following : 20

(1) In the multiplication of two operators, operation should be

- (A) Right of left  
(B) Left to right  
(C) Any  
(D) None

(2) Zero point energy for particle moving in three dimensional box is shown as

(A)  $\frac{n^2 h^2}{8ma^2}$

(B)  $\frac{3h^2}{8ma^2}$

(C)  $\frac{h^2}{8ma^2}$

(D) None

- (3) Particle in one dimensional box suggests that atomic spectra are \_\_\_\_\_ spectra.
- (A) Sharp
  - (B) Broad
  - (C) Line
  - (D) None
- (4) Generally electron shows \_\_\_\_\_ motions in atom.
- (A) Rotational
  - (B) Vibrational
  - (C) Translational
  - (D) All
- (5) An energy state having more than one wave functions for the same value of energy is called
- (A) Degenerated
  - (B) Generated
  - (C) Regenerated
  - (D) None
- (6) \_\_\_\_\_ explained magnetic properties of complexes using crystal field theory.
- (A) Bethe
  - (B) van Vleck
  - (C) Hitler
  - (D) London

- (7) P symbol in crystal field theory is related to -
- (A) Potential energy
  - (B) Zero point energy
  - (C) Pairing energy
  - (D) Polarisation energy
- (8)  $\text{Fe}_3(\text{CO})_{12}$  can be studied by \_\_\_\_\_
- (A) X-rays
  - (B) I.R.
  - (C) Mossbauer
  - (D) All
- (9) Shape and symmetry of \_\_\_\_\_ orbital is not equal
- (A)  $e_g$
  - (B)  $t_{2g}$
  - (C) Both
  - (D) Unpredicted
- (10) In metal carbonyls, when  $\sigma$  bond formation strengthens  $\pi$  bond formation and vice versa, is called
- (A) Energy effect
  - (B) Synergic effect
  - (C) Syneric effect
  - (D) None

- (11) Which elements are useful as primary nutrients for plants ?
- (A) C, H, O
  - (B) Ca, Mg, Zn
  - (C) N, P, K
  - (D) B, S, Cl
- (12) Formula of murate of potash is \_\_\_\_\_
- (A)  $K_2SO_4$
  - (B)  $K_2CO_3$
  - (C)  $KNO_3$
  - (D) KCl
- (13)  $C_2S$  code means
- (A) Dicalcium Silicate
  - (B) Calcium disilicate
  - (C) Calcium disulphide
  - (D) Carbon disulphide
- (14) \_\_\_\_\_ is main raw material for cement manufacturing.
- (A)  $MgCO_3$
  - (B)  $CaCO_3$
  - (C)  $Na_2CO_3$
  - (D)  $Al_2 (CO_3)_3$
- (15) Who discovered portland cement ?
- (A) Joseph Lister
  - (B) Joseph Warner
  - (C) Joseph Aspedine
  - (D) Joseph Alexine

- (16) \_\_\_\_\_ is not present in white cement.
- (A) Na
  - (B) Ca
  - (C) Al
  - (D) Fe
- (17) Formula of synthetic gas is \_\_\_\_\_
- (A)  $\text{CO} + \text{H}_2$
  - (B)  $\text{CO}_2 + \text{H}_2$
  - (C)  $\text{CO} + \text{N}_2$
  - (D)  $\text{CO} + \text{S}_2$
- (18) \_\_\_\_\_ is present in fire extinguisher.
- (A)  $\text{CHCl}_3$
  - (B)  $\text{CCl}_4$
  - (C)  $\text{CH}_3\text{Cl}$
  - (D)  $\text{CH}_2\text{Cl}_2$
- (19) \_\_\_\_\_ is example of  $\text{C}_1$  petrochemical.
- (A) Ethylene
  - (B) Acrylonitrile
  - (C) Methanol
  - (D) None
- (20) \_\_\_\_\_ is obtained as by product during the ethanol synthesis.
- (A) Ethylmethyl ether
  - (B) Ethoxy ether
  - (C) Dimethyl ether
  - (D) Diethyl ether

- 2 (a) Answer following : (any three) 6
- (i) Explain addition of operator
  - (ii) Normalise;  $\psi = A \sin \frac{n\pi}{a} \cdot x$   $0 \leq x \leq a$
  - (iii) Explain weak ligand field and strong ligand field.
  - (iv) Give the conditions to be obeyed by electron for orbital rotation in compound.
  - (v) Mention the physical properties of metal carbonyls.
  - (vi) Explain terminal CO group and doubly bridging CO group.
- (b) Answer following : (any three) 9
- (i) Calculate the lowest energy for particle moving in one dimensional box.
  - (ii) Write about Hamiltonian operator.
  - (iii) Explain the structure of Ni (CO)<sub>4</sub>
  - (iv) Enlist the factors affecting the splitting energy.
  - (v) Write short note : Metal nitrosyl compounds.
  - (vi) How magnetic momentum is useful to determine the structure of ML<sub>4</sub> type complexes ?
- (c) Answer the following : (any two) 10
- (i) Discuss – I.R. spectroscopy and metal carbonyls.
  - (ii) Discuss in detail particle moving in three dimensional box.
  - (iii) Give the Schrodinger equation in polar coordinates and derive R,  $\theta$ ,  $\phi$  equation with variable separation.
  - (iv) Explain the Crystal Field Theory.
  - (v) Compare the splitting of d-orbitals in octahedral and tetrahedral fields.

- 3 (a) Answer the following : (any three) 6
- (i) Enlist the raw material used in cement manufacturing.
  - (ii) What is concrete and mortar ?
  - (iii) Explain the importance of minor nutrients for plants.
  - (iv) Give the classification of fertilizers with example.
  - (v) Give the use of chloromethane.
  - (vi) Enlist the chemicals obtained as  $C_3$  chemicals from petroleum.
- (b) Answer the following : (any three) 9
- (i) Explain the setting of cement
  - (ii) Explain ISI specification of cement.
  - (iii) Give essential properties of fertilizers.
  - (iv) Write short note – NPK fertilizers.
  - (v) Explain petrochemicals and chemical composition of petroleum.
  - (vi) Give the synthesis of ethylene glycol.
- (c) Answer the following : (any two) 10
- (i) Discuss the manufacturing of portland cement by dry process.
  - (ii) Discuss the properties of cement
  - (iii) Discuss the synthesis of ethanol by sulphuric acid method.
  - (iv) What are  $C_1$  chemicals ? Give the preparation of synthetic gas.
  - (v) Discuss the manufacturing of urea and superphosphate.