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SEAT No. \_\_\_\_\_

No. of Printed Pages 2

[77 & A-53]

SARDAR PATEL UNIVERSITY  
B. Sc. (SEMESTER-V) EXAMINATION

Wednesday, 11<sup>th</sup> April - 2018

Subject: Inorganic Chemistry (US05CCHE03)

Time: 2.00 p.m. to 5.00 p.m.

Total Marks: 70

Q.1 Answer the following multiple choice questions.

[10]

- i. Which plane of symmetry plane present in  $H_2O$  ?  
a)  $\sigma_h$       b)  $\sigma_v$       c)  $\sigma_d$       d) none of these
- ii. Point group of  $CH_4$  molecule is .....  
a)  $O_h$       b)  $T_d$       c)  $D_{3h}$       d)  $D_{6h}$
- iii. Infinite fold axis of symmetry present in which type of molecule ?  
a) Linear      b) Pyramidal      c) Octahedral      d) Tetrahedral
- iv.  $CN^-$  is a ..... Field ligand.  
a) bidentate      b) strong      c) weak      d) octahedral
- v. How many bands are observed in the spectra of  $[Ti(H_2O)_6]^{+3}$ ?  
a) 2      b) 3      c) 1      d) 4
- vi. The colouration of metal complex depends on .....  
a) ligand field strength      b) metal ion      c) magnetic strength      d) number of ligand
- vii. The electronic degeneracy is reduced on slight ..... of a system.  
a) vibration      b) distortion      c) both (a) & (b)      d) none of these
- viii. Which of the following values of  $\lambda$  does not give a well behaved wave function ?  
a) Positive      b) Negative      c) Zero      d) Real
- ix. The difference of energy between reactants and products is called .....  
a) reaction energy      b) activation energy      c) potential energy      d) none of these
- x.  $S_N1$  is also known as ..... mechanism.  
a) association      b) dissociation      c) both (a) & (b)      d) none of these

Q.2 Short Questions(Any Ten):

[20]

- i. Distinguish between  $\sigma_v$  and  $\sigma_h$ .
- ii. Identify the symmetry element and detect the point group of Acetylene and  $CH_4$ .
- iii. Construct the multiplication table for  $C_{2v}$  point group.
- iv. Explain the microstates of  $t_{2g}^2$  configuration.
- v. Give the characteristics of transition metal ion.
- vi. Explain: "d-orbitals are five fold degenerate".
- vii. Define vector operator.
- viii. Give the second postulate of quantum mechanics.
- ix. Give the characteristics of well behaved wave function.
- x. Mention all the factors affecting the stability of complexes.
- xi. Distinguish between  $S_N1$  and  $S_N2$  mechanism.
- xii. Explain trans effect giving suitable example.

CP.T.O.)

- Q.3 Prove with proper example: [10]  
(i)  $S_n^n = E$  for  $n =$  even number  
(ii)  $S_n^{2n} = E$  for  $n =$  odd number

OR

- Q.3 Write short note on : (i) cubic point group (ii) reflection [10]

Q.4

- a) Explain : " $[V(H_2O)_6]^{+3}$  is green in colour". [05]  
b) Distinguish between : [05]  
(i) Diamagnetism and Paramagnetism  
(ii) High spin complex and Low spin complex

OR

Q.4

- a) Discuss the tetragonal distortion in octahedral complexes. [05]  
b) Calculate the LFSE for  $Co^{+2}$  ( $Z=27$ ) in high spin and low spin state in octahedral complex. Which is more stable and why ? Given :  $\Delta_o = 22500 \text{ cm}^{-1}$  ;  $P = 9300 \text{ cm}^{-1}$  [05]

Q.5

- a) Derive a three dimensional wave equation for a wave travelling in y-direction and described as  $y(x,t) = f(x) \cdot \phi(t)$ . [05]  
b) An electron moves in a cubic box which has an edge of 1.00 cm. Calculate the energy required in ergs to raise the electron from its lowest level to the state where  $n_x = 2$ ,  $n_y = 1$  and  $n_z = 1$ . Given :  $6.625 \times 10^{-27} \text{ erg.sec}$ ;  $m = 9.108 \times 10^{-28} \text{ gm}$  [05]

OR

Q.5

- a) Discuss the electron in one dimensional box. [05]  
b) Discuss the fourth postulate of quantum mechanics. [05]

Q.6

- a) Discuss the factors affecting lability of complexes. [05]  
b) Discuss the base hydrolysis reaction of six coordinated  $Co(III)$  ammine complexes. [05]

OR

Q.6

- a) Discuss the Spectrophotometric method for the determination of composition of a complex. [05]  
b) Discuss  $S_N2$  mechanism in ligand substitution reaction in octahedral complex. [05]

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