Vitthalbhai Patel & Rajratna P. T. Patel Science College, Vallabh Vidyanagar
B. Sc. (Semester-V)
Subject : INORGANIC CHEMISTRY (US05CCHE03)

Date : 03-10-2018   Internal Test   Marks : 50
Day : Wednesday   Time : 10.00 A.M. to 12.00 Noon

Note: (i) All questions are to be attempted.
      (ii) Figures to the right indicate marks.

Q.1   Choose the **correct option** for the following :   [08]
(i)   Which of the following molecule contain infinite fold axis of rotation ?
       (a) Water   (b) Ammonia   (c) Methane   (d) Acetylene
(ii)   Which of the following is the principle axis of rotation in benzene molecule ?
       (a) C_2 (b) C_3 (c) C_4 (d) C_6
(iii) The electronic distribution in $[Co(NO_2)_6]^{-3}$ complex is ....
       (a) $t_{2g}^6 e_g^0$ (b) $t_{2g}^6 e_g^2$ (c) $t_{2g}^4 e_g^2$ (d) $t_{2g}^{63} e_g^3$
(iv)   How many bands are observed in the spectra of $[V(H_2O)_6]^{+3}$?
       (a) 5   (b) 2   (c) 3   (d) 1
(v)   What will be the value of potential energy in a one dimensional Schrodinger wave
       equation ?
       (a) variable   (b) constant   (c) low   (d) high
(vi)   Which of the following values of λ does not give a well behaved wave function ?
       (a) zero   (b) positive   (c) negative   (d) real
(vii) Which of the ligand have strongest trans effect?
       (a) CO   (b) PR_3 (c) NH_3 (d) H_2O
(viii) The reaction between the .... at a particular wavelength and concentration is
       expressed by Beer's law.
       (a) absorption   (b) sorption   (c) chemisorption   (d) absorbance

Q.2   Answer the following (Attempt any Five) :   [10]
(i)   Give the difference between C_{3v} and C_{3h} point group.
(ii)   Identify symmetry elements and detect the point group of (i) CO_2 (ii) Methane
(iii) Explain microstates of e_g^2 configuration.
(iv)   Give difference between high spin complex and low spin complex.
(v)   State first postulate of quantum mechanics.
(vi)   Give the characteristics of well-behaved wave function.
(vii) Explain trans effect giving suitable example.
(viii) Define: (i) Substrate   (ii) Activation energy

Q.3 Answer the following: [08]
[a] Prove that $Sn^{2n} = E$ for n = odd number, with proper example.
[b] Write short note on : Cubic point group

OR

Q.3 Answer the following: [08]
[a] Prove that $C_3^1 \times \sigma_{vb} \neq \sigma_{vb} \times C_3^1$ for C_{3v} point group, with proper example.
[b] Write short note on D_n point group.

Q.4 Answer the following : [08]
[a] Discuss the splitting of d-orbital in tetrahedral field.
[b] Write note on John-Teller effect.

OR

Q.4 Answer the following: [08]
[a] Explain : $[Ti(H_2O)_6]^{+3}$ is violet in colour.
[b] Calculate the LFSE of $[Co(H_2O)_6]^{+2}$ complex which is a high spin complex. The value of pairing energy (P) is 22,500 cm^{-1} and Δ_o = 9,300 cm^{-1}.

Q.5 Answer the following : [08]
[a] Explain: Hermitian operator and Unitary operator
[b] Write a note on Normalization and Orthogonality.

OR

Q.5 Answer the following : [08]
[a] Discuss the Fourth postulate of quantum mechanics.
[b] Calculate the wavelength of photon emitted when the electron confined to a box of 5Å width moves from n=3 to n=1.
(Given: h = 6.625 x 10^{-27} erg.sec, c = 3.0 x 10^{10} cm.sec^{-1} , m_e = 9.1 x 10^{-28} gm)

Q.6 Answer the following : [08]
[a] Discuss the factors affecting stability of complexes depends on nature of central metal ion.
[b] Explain electrostatic polarization theory of trans effect.

OR

Q.6 Answer the following : [08]
[a] Discuss S_N2 mechanism in ligand field substitution reaction in octahedral complex.
[b] Discuss the base hydrolysis reaction of six coordinated Co(III) ammine complexes.

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