

SARDAR PATEL UNIVERSITY

Semester –V Examination

2013

18 November, 2013

Course Code : US05CCHE03

(Inorganic Chemistry)

Time : 10:30 a.m. to 1:30 p.m.

Marks: 70

Q.1. Multiple Choice questions.**[10]**

- 1) If Δo between t_{2g} and e_g is $10 Dq$ then energies of t_{2g} and e_g are _____
a) $4Dq$ & $6Dq$ b) $6Dq$ each c) $6 Dq$ & $4 Dq$ d) $4 Dq$ each.
- 2) Which type of substance or metals has higher susceptibility to magnetism?
a) Metal ions b) Ferromagnetic c) Diamagnetic d) Anti - ferromagnetic
- 3) Point group of CH_4 molecule is _____.
a) O_h b) T_d c) D_{3h} d) D_{6h}
- 4) Which plane of symmetry plane present in H_2O ?
a) σ_h b) σ_v c) σ_d d) none of these.
- 5) Identity element is denoted by _____.
a) Sn b) i c) E d) σ
- 6) The wave equation has the general form _____.
a) $\frac{d^2 x}{dy^2} = c^2 \frac{d^2 y}{dt^2}$ b) $\frac{d^2 y}{dx^2} = c^2 \frac{d^2 t}{dy^2}$ c) $\frac{d^2 y}{dx^2} = \frac{1}{c^2} \frac{d^2 y}{dt^2}$ d) $\frac{d^2 x}{dt^2} = \frac{1}{c^2} \frac{d^2 t}{dy^2}$
- 7) What will be the degeneracy of the ground state for a particle in 3-d box?
a) 1.5 b) 1 c) 3 d) 2
- 8) SN^2 mechanism is known as _____.
a) substitution mechanism b) Association mechanism c) Dissociation mechanism d) Formation mechanism
- 9) In aqueous solution, the concentration of water is _____.
a) [5.55 M] b) [0.55 M] c) [555M] d) [55.5M]
- 10) The Anation reaction is the reverse of _____.
a) Acid hydrolysis b) Base hydrolysis c)Hydrolysis d) none of these

Q.2. Short Type Questions (Attempt any Ten)**[20]**

- 1) Construct the multiplication table for C_{2v} point group.
- 2) Identify the symmetry elements and detect the point group of F_2 & NH_3 .
- 3) Define: (a) Symmetry element (b) Symmetry Operation.
- 4) Sketch the diagram showing splitting of Octahedral complex.
- 5) Give microstate of t_{2g}^2 configuration.
- 6) Write the Spectrochemical series.
- 7) Define: (a) Operator (b) Operand.
- 8) Discuss the linear operator.
- 9) Define turn over rule.
- 10) Mention all factors affecting the stability of complexes.
- 11) Define : (a) Labile complexes (b) Inert Complexes.

- 12) Distinguish between S_N1 and S_N2 mechanism.
Q.3. Prove with proper example $S_n^{2n} = E$ for $n = \text{odd number}$ [10]
and
 $S_n^n = E$ for $n = \text{even number}$.

OR

- Q.3. Give an account of C_n , C_{nv} and D_{nh} groups. [10]

Q.4.(a) Explain " $[Ti(H_2O)_6]^{+3}$ is purple or violet in color". [5]

(b) Calculate in the unit of Δ_o the LFSE of Cr^{+2} ($Z = 24$) high spin and low spin ion in octahedral complex. Which state is more stable. Why? [5]

Given $\Delta_o = 13,900 \text{ cm}^{-1}$, $P = 23500 \text{ cm}^{-1}$.

OR

Q.4.(a) Write note on Jahn-Teller effect. [5]

(b) Distinguish between Paramagnetism and diamagnetism. [5]

Q.5.(a) Discuss fourth Postulate of Quantum mechanics. [5]

(b) Calculate the energies of the lowest two quantum states for an electron confined to one dimensional box of $5A^0$ length and hence calculate the wave length of a radiation emitted in transition of electron from the excited state to ground state. [5]

Given : $h = 6.625 \times 10^{-27} \text{ erg} \cdot \text{sec}$

$m = 9.108 \times 10^{-28} \text{ gm}$.

OR

Q.5.(a) State the second postulate of Quantum mechanics. Explain the Hermitian operator and Unitary operator. [5]

(b) Write a short note on: Normalization and orthogonality. [5]

Q.6.(a) Discuss the acid hydrolysis reaction of six-co-ordinated $Co(III)$ amine complexes. [5]

(b) Write a note on: substitution reactions without breaking metal ligand bond. [5]

OR

Q.6.(a) Discuss the S_N1 mechanism in ligand substitution reaction in octahedral complexes. [5]

(b) Discuss the continuous variation (Job's) method for the determination of composition of the complex. [5]
