

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

M.A./M.Sc. FIRST SEMESTER EXAMINATION, JANUARY 2015

FIRST YEAR

APPLIED CHEMISTRY

Date : 10/01/2015

Time : 11 am – 1 pm

Paper : I

Full Marks : 50

[Use a separate Answer Book for each Unit]

[Answer one question from each Unit]

Unit - I

1. a) Show the variation of hydration energy graphically among bivalent 3d metal ions and explain using Crystal field theory. [2+2]
b) Aqueous solution of cobaltous chloride is pale pink in colour. But the solution becomes intense blue on acidification with concentrated HCl. Explain. [3]
c) Some of the spin forbidden bands in the electronic spectrum of high spin d^5 octahedral complexes are very sharp. Explain. [3]
d) Tetrahedral and octahedral Ni(II) complexes both have observed magnetic moment higher than the spin only value. Explain. [3]
2. a) Absorption band in the electronic spectrum of $Ti(H_2O)_6^{3+}$ is asymmetric in nature. Explain. [2]
b) Phosphine is a neutral molecule; yet it is a very strong field ligand. Justify. [3]
c) Permanganate ion is intensely coloured though it is a d^0 system. Explain. [2]
d) Explain how a bridged octahedral complex may exhibit ferromagnetism. [3]
e) State the important aspects of BCS theory. [3]

Unit - II

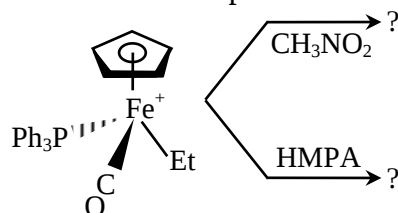
3. a) What do you mean by: (any two) [2×2]
i) Overoxidised and underoxidised explosives
ii) C – 4 explosives
iii) Detonation Velocity
iv) R.D.X
b) Write notes on: (any two) [2×2]
i) Molecular Recognition ii) Molecular Sensors
iii) Molecular Switch iv) Phase transfer catalyst
c) What do you mean by Nanochemistry? How Gold nano particles can be synthesised. [2]
d) What do you mean by : (i) Quantum dot, (ii) Damascus Steel [2]
4. a) Write notes on different types of explosives with proper examples and suitable reactions. [4]
b) What do you mean by: (any two) [2×2]
i) Alkalides and electrides.
ii) Lock and Key principle in Supramolecular Chemistry
iii) Cryptands, spherands and seculchates
iv) Supermolecules and Supramolecules
c) Write notes on: (any two) [2×2]
i) Carbon nanotubes
ii) Fullerene and Graphene
iii) Hypsochemical shift in nanochemistry

Unit - III

5. a) Name one zinc containing enzyme and state its biofunction. [3]
b) What do you mean by: (any two) [2×2]
i) Alzheimer's disease ii) Itai-Itai disease
iii) Parkinsons syndromes
c) Write notes on: (any one) [4]
i) Chlorophyll
ii) Basic chemical reactions in bio-irorganic chemistry
d) What do you mean by : Photosystem I and Photosystem II [2]
6. a) Write notes on: (any two) [2×2]
i) Gold drugs ii) Platinum drugs
iii) Toxic effects of Mercury and Arsenic
b) Explain the biological functions of Hemoglobin and Myoglobin; Stating the role of the metal ions present at their active sites. [5]
c) What do you mean by: (any two) [2×2]
i) Ionophores
ii) Disease due to copper deficiency and copper excess
iii) Metalloenzymes and apoenzymes

Unit - IV

7. a) What is oxidative addition? Give the structure of the addition product between Vaska's complex and oxygen. Give an example of oxidative coupling reaction. [1+1+1]
b) Give the products in each case with plausible intermediates. [1.5+1.5]



- c) How is Zeise's salt prepared? Write down its structure and discuss the bondings. [1+1+2]
d) Comment of the CO stretching frequencies (cm^{-1}) given below: [2]
Free CO, $[\text{Mn}(\text{CO})_6]^+$, $\text{Cr}(\text{CO})_6$, $[\text{V}(\text{CO})_6]^-$
2143 2090 2000 1860
8. a) Draw the structures of following carbonyls: [1+1+1]
(i) $\text{Fe}_2(\text{CO})_9$ (ii) $\text{Co}_2(\text{CO})_9$ (iii) $\text{Rh}_4(\text{CO})_{12}$
b) Write down the differences between Fischer and Schrock Carbene. [3]
c) How will you prepare ferrocene? Give equation. Give one example of aromatic reaction of ferrocene. [1+1+2]
d) Give the reaction products of the following: [1+1]

