

M. SC. CHEMISTRY EXAMINATION, 2017

(2nd Semester)

INORGANIC CHEMISTRY

PAPER - VII

Time : Two hours

Full Marks : 50

(12½ marks for each unit)

Use a separate answerscript for each unit.

UNIT - 2071A

Answer *any one* question

1. a) Derive ground state electronic configuration and ground term of Eu^{3+} . Calculate its magnetic moment and comment on the observed data. 3½
- b) How do the colour of Ln^{3+} ions in aqueous solution related to their electronic configurations ? What are the characteristics of absorption spectra of Ln^{3+} in aqueous media compared with 3d transition metal ions ? Explain Hypersensitivity in the electronic transitions of Ln^{3+} complexes. 6
- c) “Pro-Americium actinides are transition metal-like and post-Americium elements are lanthanide-like.” Explain. 3
2. a) Difference in radius between La^{3+} and Lu^{3+} is 0.17 \AA , although they appear in a single position in Periodic Table. Explain. 2

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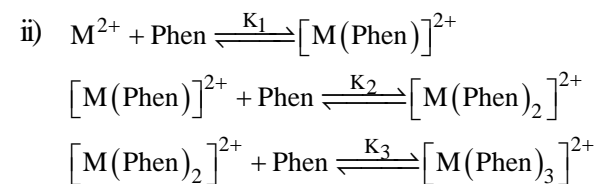
[2]

- b) Account on the luminescence properties of lanthanide-acetylacetonato complexes and their mixed ligand complexes. 3
- c) Write notes on organometallic complexes of f-block elements. 3
- d) Give detail synthesis and applications of Ammonium Ceric (IV) nitrate. 2
- e) Comment on the high temperature superconductivity of lanthanide barium copper oxides. $2\frac{1}{2}$

UNIT - 2071BAnswer **any one** question

3. a) Compute total valence electron count (TEC) and assign probable structural category to $4\frac{1}{2}$
- i) $[\text{Os}_8(\text{CO})_{22}]^{2-}$ ii) $\text{Fe}_5\text{C}(\text{CO})_5$
- iii) $[\text{Os}_{10}\text{C}(\text{CO})_{24}]^{2-}$
- b) Ethylene gas is passed through OsO_4 suspension in dry benzene. Write down the reaction and draw the structure of the product(s). Establish the plausible mechanism of the reaction. 3

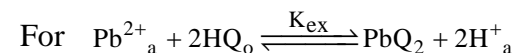
[5]



When $\text{M} = \text{Co}$, the order of formation constants is $K_1 > K_2 < K_3$ but for $\text{M} = \text{Fe}$ this order is $K_1 > K_2 < K_3$ – explain.

- c) What is $\text{pH}_{1/2}$? How is it related to % E? $3\frac{1}{2}$
- d) How would you separate and estimate Cd^{2+} and Hg^{2+} in a mixture by ion exchange chromatography? 3

OR



K_{ex} for distribution of PbQ_2 between water and CCl_4 is 2.0×10^4 . A 25 ml aliquot of an aqueous solution that is 5.0×10^{-4} M in Pb^{2+} and 0.50 M HClO_4 is extracted with two 10 ml portions of CCl_4 that are 0.025 M in HQ. Calculate % of unextracted Pb^{2+} in aqueous solution.

[4]

UNIT - 2072A

5. Deduce the equation

$$h\nu = g\beta H$$

taking an electron as the paramagnetic sample. 2

6. Comment on the expected esr spectral features of the following:

i) $\dot{\text{N}}\text{H}_2$

ii) benzene anion radical $1\frac{1}{2} \times 3$

iii) $[\text{VO}(\text{acac})_2]$

7. What is dpph? Why is it used as a standard in esr studies? 2

8. What is zero-field splitting? Explain its impact on the esr activity of a paramagnetic sample containing two unpaired electrons. 4

UNIT - 2072B

9. a) What do you mean by Plate Height (H) and Plate Number (N)? How would you experimentally determine N? 3

b) i) "Irving William series of stability constants is a consequence of enthalpy effect" – explain. 3

[3]

c) What happens when CO (Carbon monoxide) is passed through strongly alkaline solution of $[\text{Rh}(\text{CO})_2\text{I}_2]^-$ followed by the slow addition of CH_3I at low temperature; the solution is then acidified? Write down the reactions. Give plausible mechanism of the reaction. 5

4. a) What happens when pyrazine is added to refluxing alcoholic solution of RuCl_3 followed by the addition of excess of ammonia? Comment on the structure, spectra and magnetic property of the complex. What is Robin-Day classification of mixed valence complexes? 4

b) Hydrogen gas is passed through 6N HCl solution of RuCl_3 in inert environment. An inky blue solution is formed. Comment on the colour and the structure of the complex. $2\frac{1}{2}$

c) Write a short note on Dihydrogen complexes of Ruthenium. 2

d) How do you synthesise *cis* platin from K_2PtCl_4 ? How does *cis* platin serve as an anticancer drug? Write notes on toxicity of *cis* platin during medication. 4

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