

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SIXTH SEMESTER EXAMINATION, MAY 2017

THIRD YEAR [BATCH 2014-17]

CHEMISTRY (Honours)

Paper : VIII [Gr.C&D]

Date : 05/05/2017

Time : 11 am – 1 pm

Full Marks : 50

[Use a separate Answer Book for each group]

Group – C

[Attempt one question from each Unit]

Unit – I

1. a) Write down the symbolic names of lanthanides those show oxidation states (i) higher than usual (ii) lower than their usual. [2]
b) Discuss the bonding pattern in $\text{Re}_2\text{Cl}_8^{2-}$. [4]
c) Why experimental magnetic moment of Eu^{3+} and Sn^{3+} are greater than their calculated magnetic moment? [3]
d) Explain why the tendency of M–M bond formation increases from V to Ta. [2]
e) Why a pure solvent is used in blank standard for UV-visible spectroscopy? [2]
2. a) Predict the following as closo, nido or arachno? [3]
i) $\text{Rh}_6(\text{CO})_6$ ii) $[\text{Co}_4\text{Ni}_2(\text{CO})_{14}]^{2-}$ and iii) $[\text{Rh}_9\text{P}(\text{CO})_{12}]^{2-}$
b) The ground state term of a Ln^{+3} ion is $^3\text{H}_6$. Calculate its magnetic moment (μ_1) and write its electronic configuration as $[\text{Xe}]4f^x$. [2+1]
c) Give a short account on the separation of lanthanides employing ion exchange method. [3]
d) Write a short note on Mo–Ta clusters. [3]
e) How $[\text{Mo}_2\text{Cl}_8]^{4-}$ is prepared from $\text{Mo}(\text{CO})_6$? [1]

Unit – II

3. a) What is molecular recognition? Explain with an example. [3]
b) Which is stronger explosive— NaN_3 or PbN_3 ? Explain with proper reason. [1]
c) List and describe two main strategies for the use of Metal-Organic Frameworks (MOFs) in hydrogen adsorption. [3]
d) Give a brief account on “detonation velocity”. [3]
e) Reactivity of nanoparticles is higher than its bulk counter part of any substance— justify the statement. [2]
4. a) Explain the ‘on-off switches’ with an example. [3]
b) What are the advantages of using supramolecular chemistry for the design of “molecular transistor”? [3]
c) Explain the terms : (i) ‘Over oxidised’ explosive and (ii) ‘under oxidised’ explosive. [3]
d) Write a short note on : optical property of gold nanoparticles. [3]

Group – D

[Attempt one question from each Unit]

Unit – III

5. a) What was the amount of $K_2Cr_2O_7$ in a solution if excess KI was added to 30ml of that solution and liberated I_2 consume 45.0ml of 0.1(N) $Na_2S_2O_3$ solution upto end point? [2]
- b) How does the dye fluorescein act as an indicator in the titration of chloride ion with $AgNO_3$ solution? [3]
- c) How you will estimate $Fe^{+3} - Al^{+3}$ in a mixture with the help of Edta titration? [2]
- d) What is meant by co-precipitation or post precipitation? Give differences between them. [3]
- e) Discuss the principle for estimation of $CaCO_3$ and $MgCO_3$ in dolomite. [3]
6. a) Discuss the role of Zimmermann-Reinhardt reagent during permanganometric titration of Fe^{+3} ion. [3]
- b) Using masking-demasking phenomenon how could you estimate Cu^{2+} and Zn^{2+} ions in a mixture complexometrically? [3]
- c) State the principle of estimation of Cr and Mn in a steel sample with required chemical reactions. [3]
- d) Mention the main constituents of Portland cement. [1]
- e) A 0.7120 gm specimen of an ore is brought into solution and all the iron content is reduced to Fe(II). The reduced solution requires 39.2 ml of 0.02M $KMnO_4$ solution for complete titration of Fe(II). Calculate the percentage of iron in the ore. [3]

Unit – IV

7. a) From the given set of weights 28.6 mg, 29.7 mg, 29.8 mgm and 30.2 mgm. Calculate the average deviation and standard deviation of individual values. [2]
- b) Discuss the principles of determination of dissolved oxygen in a given sample of water. [3]
- c) Discuss the principle of determination of NO_x in an air sample. [3]
- d) Discuss column efficiency in a column chromatography. [2]
- e) What do you mean by R_f value in chromatography? Describe factors on which R_f value depends. [2]
8. a) Calculate the error in the result of the following calculation. [2]
- $$\frac{70.00(+0.07)}{14.00(+0.01)}$$
- b) Discuss the principle of estimation of chemical oxygen demand. [2]
- c) Describe the detection and analysis of CO in air sample. [2]
- d) Discuss the principle of estimation of (i) NH_4^+ ions in a soil sample (ii) arsenic in water sample. [2+2]
- e) How will you determine the exchange capacity of an anion exchanger? [2]

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