

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2014

SECOND YEAR

CHEMISTRY (General)

Date : 29/05/2014

Time : 11 am – 2 pm

Paper : IV

Full Marks : 75

(Use a separate Answer Book for each group)

Group – A

(Answer one question from each Unit)

Unit - I

1. a) How does gold occur in nature? Write the name and formula of two important natural source of gold. [3]
b) Give a comparative account of Cu, Ag and Au with particular reference to their electronic configurations, oxidation states and one chemical property. [6]
c) Write short notes on : Prussian blue, Galvanising and anodising [4]
2. a) Write the name and formula of two important source of cobalt in nature. [2]
b) How manganese is extracted from pyrolusite? (with equations) [4]
c) Write the preparation and two uses of the following (any one) : [4]
(i) $K_2Cr_2O_7$ (ii) $K_4[Fe(CN)_6]$
d) How is mercury extracted from the principal ore of mercury? [3]

Unit - II

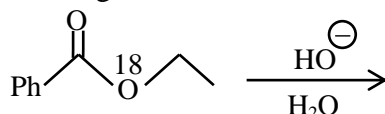
3. a) Define 'absolute error' and 'relative error'. [2]
b) Discuss the principle for the gravimetric estimation of barium indicating the reaction involved. [2]
c) What do you mean by common ion effect? Explain the principle of common ion effect in the group II and group IIIB precipitation. [5]
d) Write down the conditions on which the success of complexometric titration depends. [3]
4. a) What is dichromatometry? Discuss how Fe^{+2} is estimated with standard $K_2Cr_2O_7$ solution indicating principle, reaction, method and calculation. Mention the role of H_3PO_4 in this estimation. [6]
b) The solubility of silver chloride is 0.0015 g.dm^{-3} . Calculate its solubility product. [M.W of $AgCl = 143.5 \text{ gm}$] [3]
c) What do you mean by precision and accuracy? Result is accurate but the data of the analysis is not precise. Comment. [3]

Group – B

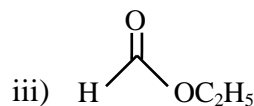
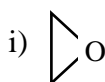
Unit – I

(Answer any three questions)

5. a) How will you distinguish the 1° , 2° and 3° aliphatic amines by chemical means? [3]
b) Predict the product of the following reaction. Give mechanism. [2]



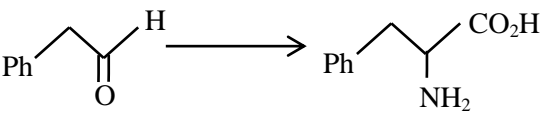
6. Predict the products when $PhMgBr$ is treated with the following compounds : [5]



7. Write short notes on **any two** : [2×2·5]
- i) Claisen rearrangement
 - ii) Kolbe reaction
- i) Reimer-Tiemann reaction
 - ii) Hofmann degradation method
8. a) Predict the products when *p*-toluidine is treated with NaNO_2/HCl and the resultant solution is added to cold alkaline β -naphthol solution. Give mechanism in each steps. [4]
- b) Convert $\text{PhNH}_2 \rightarrow \text{Ph}-\text{F}$ [1]
9. a) How will you convert benzene diazonium chloride to benzoic acid? [3]
- b) Outline the synthesis of pure methylamine by Gabriel's method. [2]

Unit – II

(Answer **any two** questions)

10. a) How would you convert an aldohexose to an aldopentose? [3]
- b) Write the Haworth structure of α -D-glucopyranose what happens when it is heated with one equivalent CH_3OH in presence of 0.5% HCl ? [2]
11. a) Glucose and fructose form the same osazone —explain with reason. [3]
- b) Convert :  [2]
12. Write short notes on the following : [2×2·5]
- Mutarotation, Isoelectric point

Group – C

(Answer **one question** from each Unit)

Unit - I

13. a) Indicate if the following statements are true or false : [4]
- Entropy is an intensive property
 - Entropy is a state function
 - Net entropy change in an reversible cyclic process is always non-zero
 - In all natural, cyclic processes there would occur a net increase in entropy
- b) What will be the temperature of the source when 50% efficient Carnot engine is working with a sink at 127°C ? [2]
- c) Give an example of a spontaneous process. State how Gibbs free energy at constant pressure and temperature is related to it. [2]
- d) Calculate the net entropy change when 1gm of neon is heated from 27°C to 127°C at a constant pressure Given molecular weight of neon = 20 and $C_V = 3\text{cal/mole}$. [4]
14. a) State Le-Chatelier's principle of dynamic equilibrium and apply the principle to the following reaction : $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g}), \Delta H = +59 \text{ KJ}$ [4]
- b) Show that the reaction $2\text{H}_2\text{S}(\text{g}) \rightleftharpoons 2\text{H}_2(\text{g}) + \text{S}_2(\text{g})$, The equilibrium constant $K_p = \frac{\alpha^3 P}{(2 + \alpha)(1 - \alpha)}$. [4]
- c) Indicate the following statements are true or false : [4]
- All spontaneous processes are reversible
 - If heat is extracted from a systems, its entropy increases
 - Condition of a spontaneous process is $\Delta G =$ a negative quantity
 - Entropy is a measure of randomness

Unit - II

15. a) i) What do you mean by the words “Component”, “phase” and “Degree of freedom” in a heterogenous equilibrium? [3]
ii) State phase rule and explain with examples. [2]
iii) Show with phase diagram that the eutectic point in a solid solution alloy has zero degree freedom. [2]
- b) When 0.5390 gm of a solute was dissolved in 40 gms of water, the depression of freezing point of water is 0.81°C. Calculate the molecular weight of the solute. (Given K_f for 1000 gms of water is 1.85°C) [3]
- c) A solution contains 0.6gm of urea in 100 c.c of water at 27°C. Calculate the osmotic pressure of the solution. [3]
16. a) What is Van't Hoff factor? Calculate the osmotic pressure of a 0.01(M) KCl solution at 27°C. [4]
b) State and explain ‘Schulze-Hardy rule’ for the coagulation of colloids. [3]
c) What are lyophobic sols? Mention two properties exhibited exclusively by lyophobic sols. [4]
d) How a ferric hydroxide sol can be prepared? [2]

