

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2019

SECOND YEAR (BATCH 2017-20)

CHEMISTRY (General)

Date : 22/05/2019

Time : 11.00 am – 2.00 pm

Paper : IV

Full Marks : 75

[Use one Answer Book for each Group]

Group-A

Unit I

Answer **any one** question:

[1×15]

1. a) Mention the electronic configuration of Gold in the ground state. [1]
b) Give evidences for the dimeric ion Hg_2^{+2} . [3]
c) State and explain the reaction of gold with a mixture of conc. HNO_3 and conc. HCl . [3]
d) What happens when KCN is added into $CuSO_4$ solution? [2]
e) What happens when Stannous Chloride is added to an acidic solution of Mercuric Chloride. [2]
f) Construct a cell using a Zinc and a Copper rod. What is the E.M.F of the Cell? [2]
$$E^o_{Zn^{+2}/Zn} = -0.763V : E^o_{Cu^{+2}/Cu} = +0.337V$$

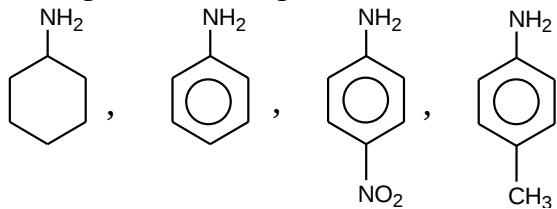
g) What is white vitreol? How it is prepared? [2]
2. a) 1 gm Brass is dissolved in acid and is then neutralised with NH_4OH . Addition of Na_2HPO_4 gives white ppt which is filtered, dried and ignited and a residue of 0.325 gm is produced. Mention the products formed in different steps and calculate the percentage of Zinc in brass. [4]
b) (i) Why are bivalent copper salts more stable than monovalent copper salts? [3]
(ii) What is the difference between "22 carat gold" and pure gold. [3]
c) What is blue vitriol? How it is prepared? [2]
d) What is Fulminating gold? [2]
e) What happens when sodium thiosulphate is added to an aqua solution of $AgNO_3$. [2]
f) $CuSO_4$ and $CdSO_4$ react with KCN in different way; explain. [2]

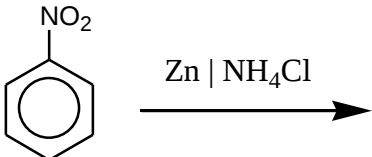
Group-B

Unit I

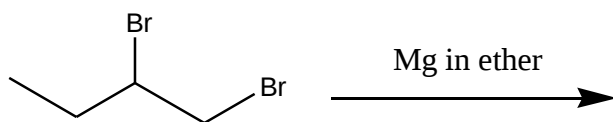
Answer **any one** question:

[1×15]

3. a) Write short notes on the followings: [3×2]
i) B_{AC2} ester hydrolysis
ii) Sandmeyer's reaction
- b) Arrange the following molecules in increasing order of basicity and explain. [3]


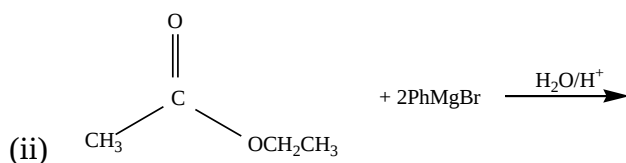
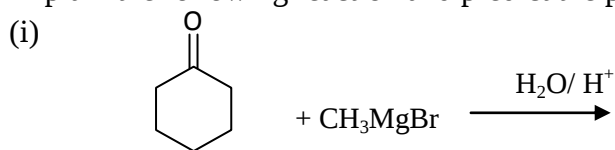
The structures shown are: cyclohexylamine (a cyclohexane ring with an NH_2 group), aniline (a benzene ring with an NH_2 group), 4-nitroaniline (a benzene ring with an NH_2 group and a NO_2 group at the para position), and 4-methylaniline (a benzene ring with an NH_2 group and a CH_3 group at the para position).
- c) How can you differentiate 1° and 2° aliphatic amine by chemical reactions. [3]
- d) Predict the structure of the products in the following reactions: [1½×2]


The reaction shows nitrobenzene (a benzene ring with a NO_2 group) reacting with $Zn | NH_4Cl$ to form an arrow pointing to the right.



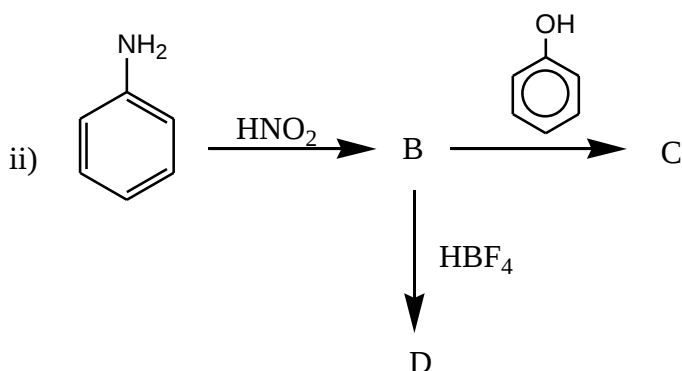
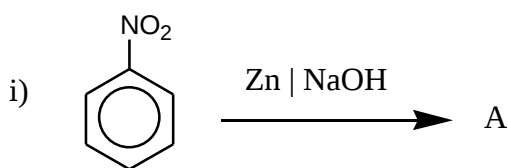
4. a) Explain the following reaction and predict the products:—

[3 × 2]



b) Predict the structure of product for the following reactions:

[2½×2]

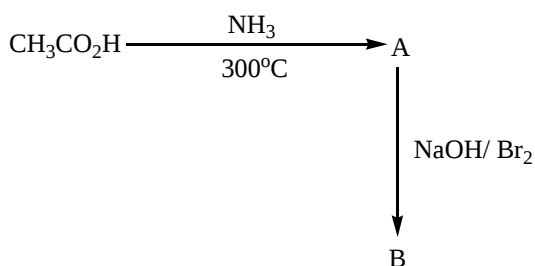


c) Describe the synthesis of acrylic acid using Grignard reaction as one of the step.

[2]

d) Complete the following reactions :

[2]



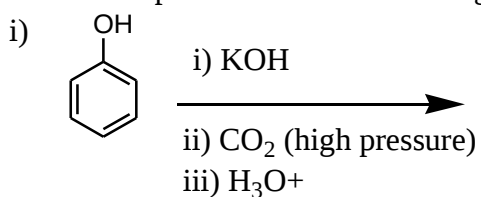
Unit II

Answer **any one** question:

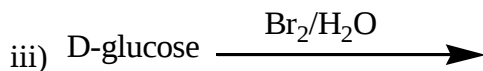
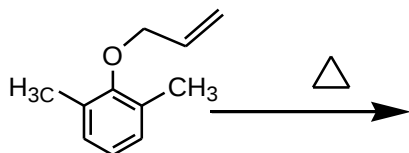
[1×15]

5. a) Predict the products for the following reactions (no mechanical needed):

[2×3]



ii)



b) Write a short note on the following:

[3 × 2]

- i) Isoelectric point
- ii) Glycosylation reaction and its important
- iii) Fries rearrangement

c) Define the following term:

[3]

- i) Epimer
- ii) Anomer

6. a) Write down note on followings.

[3 × 2]

- i) Reimann-Tiemann Reaction
- ii) Osazone reaction
- iii) Zwitter ions

b) What is mutarotation? Explain

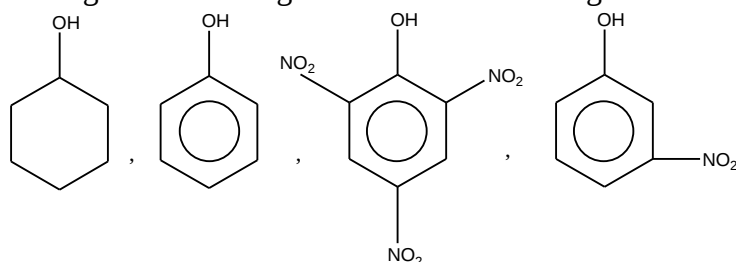
[2]

c) Describe the synthesis of aldohexose from aldopentose.

[2]

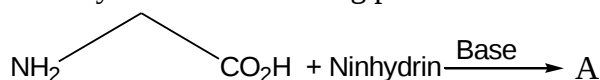
d) Arrange the following molecules in increasing order of acidity and explain.

[2]



e) Identify 'A' in the following product.

[2]



f) Draw any epimer of D-glucose.

[1]

Group-C

Unit I

Answer **any one** question:

[1×15]

7. a) Derive the expression of the efficiency of a Carnot cycle taking an ideal gas as a working substance. Is it possible to have a Carnot cycle of efficiency of one?

[4+1]

b) A carnot engine working between 0°C and 100°C takes up 840 Joules of heat from the high temperature reservoir. Calculate the work done and the heat rejected.

[3]

c) State and explain le Chatelier principle. Discuss the effect of pressure and temperature on the equilibrium of the reaction $\text{N}_2 + 3\text{H}_2 = 2\text{NH}_3 + 22.08 \text{ Kcal}$.

[2+2]

d) For a gaseous reaction $K_p = K_c$. What do you infer from it?

[1]

e) In a solution of 0.1 M KCl and KI, 0.01 M AgNO_3 is added drop wise. Which one, AgCl or AgI will be precipitated first and why? K_{sp} of AgCl and AgI are 1.8×10^{-11} and 8.3×10^{-17} , respectively.

[2]

8. a) A reversible (Carnot) engine operates between 0°C and 100°C and accepts 450 Kcal of heat. What will be the work done by the engine? [3]
- b) Derive Gibbs-Helmholtz equation and explain its significance. [3]
- c) One mole of an ideal gas expands from volume V_{cc} to $2V_{cc}$ at constant temperature 27°C . Calculate the change of entropy of this process. [3]
- d) Derive the expression of K_p and K_c for the following reaction. [3]
- $$\text{PCl}_5(g) \rightleftharpoons \text{PCl}_3(g) + \text{Cl}_2(g)$$
- e) Deduce a relation between solubility and solubility product of Ag_3PO_4 . [3]

Unit II

Answer **any one** question:

[1×15]

9. a) What is a triple point? Explain why there is no other choice of triple point, except a specific one in water system? What is upper limit of liquid-Vapour equilibrium line in water system? [3]
- b) Draw the phase diagram of CO_2 specifying every zone and line indicating the degrees of freedom. [3]
- c) How many gram of methyl alcohol should be added to 10 liter tank of water to prevent its freezing at 268 K? K_f for water is 1.86. [3]
- d) What is van't Hoff factor? Can it be a fraction? [2]
- e) What do you mean by lyophobic and lyophilic colloid. [3]
- f) What is Tyndall effect? [1]
10. a) Draw the phase diagram of water specifying every zone and line indicating the degrees of freedom. [4]
- b) 'Azeotrope is not a compound' — explain. [2]
- c) State and explain Raoult's law for elevation of boiling point of a solution. [2]
- d) 1.8 g of glucose (molecular weight = 180) is dissolved in 100 gm water. Calculate the boiling point of this solution. Given, K_b of water $0.513^{\circ}\text{C molal}^{-1}$. [3]
- e) What is Schulze-Hardy rule? Explain with example. [2]
- f) $\text{Al}_2(\text{SO}_4)_3$ is more effective than K_2SO_4 in coagulation of a colloid — why? [2]

_____ × _____