

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2018

FIRST YEAR (BATCH 2017-20)

CHEMISTRY (General)

Date : 29/05/2018

Time : 11.00 am – 1.00 pm

Paper : II

Full Marks : 50

[Use one Answer Book for each Group]

Group-A

Unit I

Answer **any one** question:

[1×13]

1. a) State and explain Werner's theory of coordination compounds. Explain the differences between perfect and imperfect complex. 3+2
b) What are metal chelates? Give an example. Why chelate complex is more stable than non-chelated complex? Give one use of a metal chelate in analytical chemistry. 1+1+2+1
c) What do you mean by radius ratio rule? Determine the limiting radius ratio for coordination number 4 for an ionic solid. 1+2
2. a) Establish Born-Haber cycle for the formation of NaCl crystal from metallic Na and gaseous Cl₂. Calculate the lattice energy of sodium chloride from the data given below:
Sublimation energy of sodium = 109
Ionisation energy of sodium = 496
Dissociation energy of chlorine = 244
Electron affinity of chlorine = -348
Heat of formation of sodium chloride = -411 (The energy values are given in KJ/mole unit) 2+3
b) Discuss VSEPR theory and explain the shape of XeF₂. 3
c) Formation of divalent cation and anion are endothermic yet MgO is a stable ionic solids, explain with reason. 2
d) From the IUPAC nomenclature write the name of the following: 1½+1½
K₄[Fe(CN)₆] and [Co(NH₃)₆]Cl₃

Unit II

Answer **any one** question:

[1×12]

3. a) Calculate the bond order of peroxide anion (O₂²⁻) and dioxygenyl cation (O₂²⁺) from the molecular orbital diagram. 3
b) Distinguish between Disproportionation and Comproportionation reaction with examples. 2
c) Explain the reaction in terms of Lux Flood concept: 3 CaO + P₂O₅ → Ca₃(PO₄)₂ 2
d) What happens if Ge is doped with little arsenic? 2
e) What is the pH of pure water at 100°C? K_w at 100°C is 5.45 × 10⁻¹³. Comment on the acidity / basicity/neutrality of water at that temperature. 2+1
4. a) Draw the MO diagram of CO molecule and comment on why CO acts as a pi-acid ligand. 3+1
b) What are standard and formal electrode potentials? Explain with an example. 2
c) On the basis of the band theory explain conductor, semi-conductor and insulator. 3
d) (i) Give an example of Redox indicator.
(ii) From the two electrodes Cu⁺² / Cu (E° = 0.337 V) and Ag⁺/Ag (E° = 0.799), calculate the E° of the cell. 1+2

Group-B

Unit I

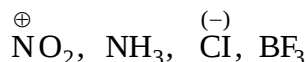
Answer **any one** question:

[1×15]

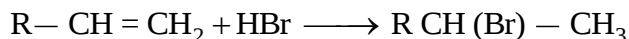
5. a) Write down the Fischer projections of the following compounds: 2

(i) (S) — $C_6H_5CH(OH)COOH$ (ii) (R) — $CH_3CH(NH_2)OH$

b) Classify the followings as electrophiles and nucleophiles. 2

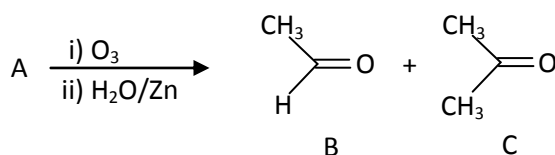


c) Write the mechanism of the following reaction. 2

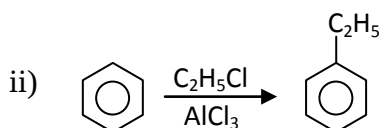
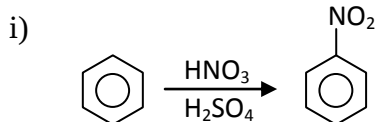


d) Write E and Z forms of 2-pentene. 1

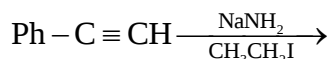
e) The following compound A, on ozonolysis gave two more compounds B and C. Find out the structure of A. 2



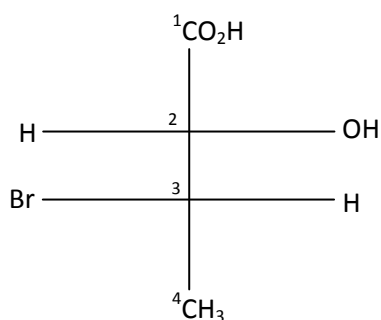
f) Write down the mechanism for the following reactions: 2+2



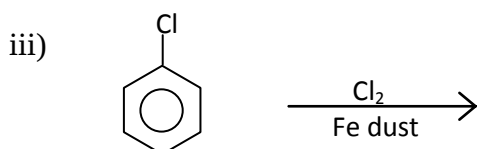
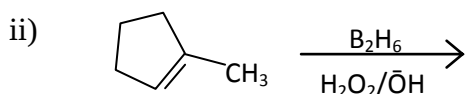
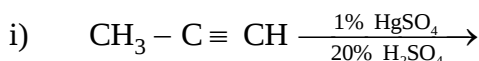
g) Complete the following reaction (no mechanism require): 2



6. a) Find out the absolute configuration (R / S) for the following molecule at C_2 and C_3 carbon center 3



b) Complete the following reactions with proper explanation: 2+2+2



- c) Write short notes on Markownikoff's rule and peroxide effect. 2
- d) How can you distinguish between 1-Butyne and 2-Butyne by a chemical test. 2
- e) Compare the stability and reactivity of primary, secondary and tertiary carbocations. 2

Unit II

Answer **any one** question:

[1×10]

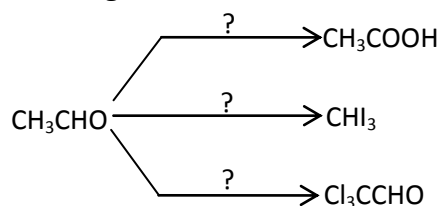
7. a) Write down short note (**any two**):

2 × 2½

- i) S_N2 reaction of alkyl halide
- ii) E₁ elimination
- iii) Perkin Reaction

- b) Write down the suitable reagents and conditions for the following conversion:

3

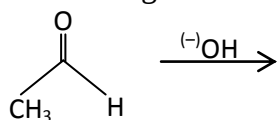


- c) Convert: Benzaldehyde to Cinnamic acid

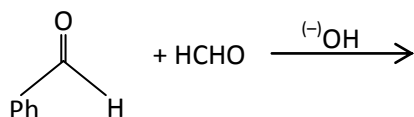
2

8. a) Complete the following reaction with mechanism:

3



- b) Explain Hofmann's elimination reaction, with an example. 2
- c) Aldehydes are in general more reactive than Ketones towards nucleophilic addition reactions. Explain. 2
- d) Convert: Benzaldehyde to Benzoin. 2
- e) Identify the products in the following reactions: 1



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