

BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING EXAMINATION, 2017**(1st Year, 2nd Semester)****ORGANIC CHEMISTRY**

Time: Three hours

Full Marks: 100

(50 marks for each Part)

Use separate answerscript for each Part

PART – I**Answer all of the following questions**

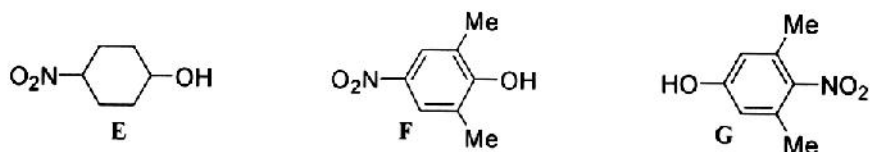
1. a) Which of the following covalent bonds will undergo homolytic cleavage preferentially and why? 3



- b) Which one of the following cations is more stable and why? 3



- c) Arrange the following compounds in the order of their decreasing acidity and give reasons for your answer. 5



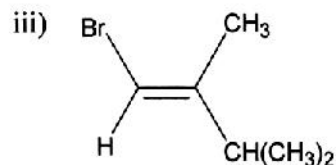
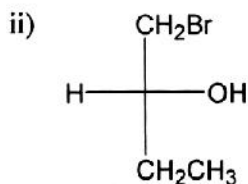
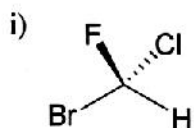
- d) Nitration of anisole ($\text{C}_6\text{H}_5\text{OCH}_3$) occurs mainly at the *para*-position – why? 5

2. a) A solution, prepared by dissolving 6 gm of an optically active compound (molecular formula $\text{C}_{21}\text{H}_{32}\text{O}$) in 100 ml of chloroform, shows optical rotation value of -1.8° when measured in a 5 cm long polarimeter tube. Calculate its specific and molecular rotation. Predict the rotation of a solution containing 30 gm of its enantiomer dissolved in 200ml of chloroform and the rotation is measured in a 10 cm long polarimeter tube. 6

- b) State with reason whether 1, 3-dichloro-propa-1, 2-diene is chiral or not. 4

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c) Assign *R* / *S* or *E* / *Z* (whichever applicable) to the following molecules showing the priority sequence of the ligands. 2 x 3



d) Comment on the chirality of *n*-butane on the basis of the chirality of its conformers obtained by the rotation of the C2 – C3 bond. 4

3. a) Logically suggest how you can prepare 2-deuteriobutane from *trans*-2-butene. 4

b) State with reasons why one cannot store acetyl chloride in a wet bottle. 3

c) How can you prepare methyl pentanoate (C₄H₉COOCH₃) from pentanoic acid (C₄H₉COOH) and methanol without using sulphuric acid? 3

d) Carry out the following transformation (mention only the steps with reagents, no mechanism is needed): 3



e) Suggest a chemical test to distinguish between ethanoic acid and ethanol. 1

PART II (50 Marks)

Answer any five questions. (5 X 10 = 50)


- Write the mechanism of Nitration reaction of Benzene. Draw the energy profile diagram of the above reaction. Label the maxima and minima of the curve with proper formulae of each reaction intermediate. Nitration of Chlorobenzene is ~~faster than that of Benzene~~ different from Explain why?
- What is Cine Substitution Reaction? Explain the mechanism of the reaction with a suitable example. Do you know any Nucleophilic Substitution reaction of Benzene? Explain your answer.
- Explain the following reactions with name and formula of the product in each case.

- Bromine water is added to Phenol.
- Fuming Nitric acid is added to Salicylic Acid
- Naphthalene vapour mixed with air is passed over V_2O_5 at 450 C
- Acetylene gas is passed through a hot (80°C) aqueous solution (20%) of H_2SO_4 containing Hg_2SO_4
- HBr reacts with propylene.

- How will you carry out the following transformations?

- Acetone \longrightarrow Pinacolone
- Benzene \longrightarrow Cinnamic Acid
- Benzil \longrightarrow Diphenylacetic Acid
- Cumene \longrightarrow Phenol
- Phenol \longrightarrow Oil of Winter Green (Methyl Salicylate)

- Predict the product (s) of the following reactions and explain with plausible reaction mechanism.

- $\text{Ph.COCOCHO} \xrightarrow{\text{OH}^\ominus/\Delta}$
- $\text{Ph.CHO} \xrightarrow{\text{alc. KCN}/\Delta}$
- Salicylaldehyde $\xrightarrow{H_2O_2/\text{OH}^\ominus/\Delta}$
-  $\xrightarrow{\text{CHCl}_3/\text{OH}^\ominus/\Delta}$
- Phenol $\xrightarrow{\text{CHCl}_3/\text{OH}^\ominus/\Delta}$

- Write notes on (any five):

- Bayer Villiger Oxidation Reaction
- Huckel's Rule of aromaticity
- Dakin Reaction
- Beckmann Rearrangement Reaction
- DDT
- Malachite Green
- Nylon66
- Diazocoupling Reaction
- Picric Acid
- Terelene