

BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING EXAMINATION, 2019

1st Year, 2nd semester (Old)-2019
ORGANIC CHEMISTRY

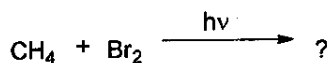
Time: 3 hours

Full Marks: 100

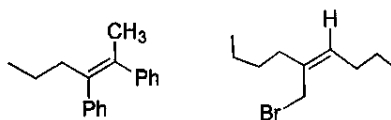
(50 marks for each Part)
Use separate answer script for each part

PART-I (50 Marks)

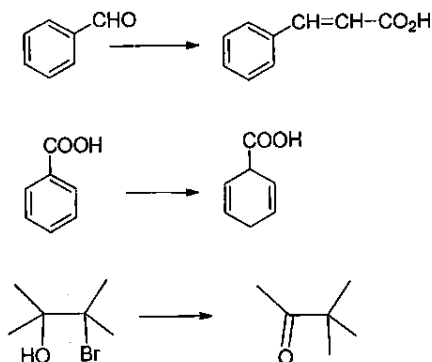
- Write notes on (*any four*).
 - Free radical;
 - Carboanion;
 - Carbocation;
 - Resonance;
 - Inductive effect;
 - Hyper conjugation
- Draw the energy profile diagram with all the conformations of ethane. 5
- Predict the products of the following reaction with suitable mechanism. 4



- Write down the E and Z conformation for each double bond. Comment on their cis and trans geometry. 5



- How can you obtain a single product in a cross-aldol condensation reaction? Provide all the possible conditions with examples 4
- The observed rotation of 4 gm of a sample in 75 ml of a solution in a polarimeter tube of 25 cm long is $+15.4^\circ$. What is the specific rotation of the sample? The monochromatic light used is sodium D line. 4
- Carry out the following transformations with suitable mechanism. 3x4



[Turn over

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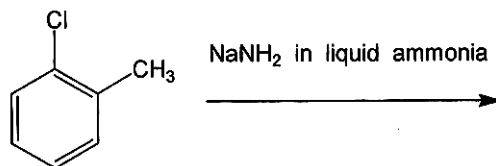
(First Year, Second Semester, OLD)

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PART – II

Answer all of the following questions

8. a) Write down the mechanism of electrophilic substitution of benzene. Draw the energy profile diagram with due emphasis to the rate-determining step. In view of this mechanism, explain why toluene ($C_6H_5CH_3$) undergoes nitration mainly at the *para*-position at low temperature using a mixture of conc. HNO_3 and conc. H_2SO_4 as nitrating agent. 3+3+3
- b) Applying Huckel's rule of aromaticity, designate the following species (with reason) as aromatic/nonaromatic/antiaromatic. 2×4
- | | |
|------------------------------|-----------------------------|
| i) nitrobenzene | ii) cyclooctatetraene |
| iii) cyclopentadienyl cation | iv) cyclobutadienyl dianion |
9. a) Discuss with suitable examples about
- | | | |
|---------------------------|-------------------------------|-----|
| i) Beckmann rearrangement | ii) Baeyer-Villiger oxidation | 4×2 |
|---------------------------|-------------------------------|-----|
- b) State how you will carry out the following transformations (only mention the steps with reagents, no mechanism is needed): 3×4
- | | |
|---|--|
| i) Benzene \longrightarrow <i>m</i> -Dinitrobenzene | |
| ii) Benzaldehyde (C_6H_5CHO) \longrightarrow Benzilic acid [$(C_6H_5)_2C(OH)-COOH$] | |
| iii) Phenol \longrightarrow Oil of Wintergreen | |
| iv) Benzene \longrightarrow Phenol | |
10. a) Predict the product of the following reaction with plausible mechanism. 4



b) Write short notes on

- | | | | |
|-------------|---------------------|------------------|-----|
| i) Nylon 66 | ii) Malachite Green | iii) Picric acid | 3×3 |
|-------------|---------------------|------------------|-----|