

FATHIMA ARTS AND SCIENCE COLLEGE  
DEPARTMENT OF CHEMISTRY

CHE4B 01 ORGANIC CHEMISTRY

BASIC REACTION MECHANISM

SECTION A 2 Marks

1. Which one is more acidic acetic acid or trichloroacetic acid? Why?
2. Ortho-nitro phenol is more acidic than meta-nitro phenol". Justify your answer?
3. What are free radicals? How are they formed?
4. Which is more stable but-1-ene or but-2-ene? Why?
5. Distinguish between intermolecular and intramolecular hydrogen bonding with suitable examples
6. Why-OH group is ortho- para orienting?
7. Which is a stronger acid? Acetic acid or formic acid?
8. What are the consequences of intermolecular hydrogen bonding?
9. Discuss hyperconjugation and its significance with illustrative examples.
10. Which is more acidic 2-Chlorobutanoic acid or 3-Chlorobutanoic acid. Justify your answer.
- 11.

SECTION B 5 Marks

1. Write any two applications each of inductive effect and mesomeric effect.
2. Compare the stability of methyl carbocations and ethyl carbocation by hyperconjugation.
3. Explain +E and -E effects with suitable examples.

4. Explain Keto-enol tautomerism with proper examples.
5. Arrange the carbocation given in their increasing stability order  $\text{CH}_3^+$  ,  $\text{C}_2\text{H}_5^+$  ,  $(\text{CH}_3)_3\text{C}^+$  . Justify
6. What are Carbanions? Discuss the stability of carbanions.
7. Define mesomeric effect? Give examples for + M and -M groups and also compare the basicity of aniline and p-nitroaniline.
8. Define Hyperconjugation. How it can be used to compare stability of 1-butene and 2 butene

## STEREOCHEMISTRY

### SECTION A 2 Marks

1. Draw the Newman projection of completely staggered butane.
2. Which conformation of cyclohexane is more stable? Why?
3. What are the limitations of Baeyer's strain theory?
4. Define specific rotation?
5. Represent tartaric acid in Fischer projection.
6. Discuss ring flipping with suitable examples ?
7. Explain the term enantiomeric excess
8. Distinguish between enantiomers and diastereomers.
9. Draw the chair and boat forms of cyclohexane and indicate the axial and equatorial bonds.
10. Represent the E and Z isomers of 1-bromo-1-chloropropene.
11. Write the R and S configurations of lactic acid.
12. Draw the Sawhorse projection formulae for staggered and eclipsed forms of ethane.
13. What is meant by enantiomeric excess? Calculate the enantiomeric excess of a chiral substance with 70% of one enantiomer and 30% of the other.
- 14.

### SECTION B 5 Marks

1. Distinguish between relative configuration and absolute configuration with examples.
2. Differentiate enantiomers and diastereomers with suitable example.
3. Discuss the conformational analysis of ethane with energy diagrams.
4. With the help of a suitable example, explain the influence of steric effect of reactivity.
5. Discuss the conformations of n-butane with proper energy profile diagram.
6. Draw the planar representations of dextro, laevo and mesotartaric acids and explain their optical activities
7. Explain the geometrical isomerism in fumaric acid and maleic acid
8. Discuss the different methods of resolution of a racemic mixture.
9. What do you understand by Chair and Boat conformations of cyclohexane? Why chair form is more stable than boat form?
10. Discuss with suitable example, the E and Z system of nomenclature of geometrical isomers.
- 11.

### SECTION C 10 Marks

1. Explain the following:
  - (a) Racemization.
  - (c) Enantiomeric excess.
  - (b) Resolution.
  - (d) Asymmetric synthesis.
2. Taking suitable examples illustrate different rules followed to assign R and S notation to optical isomers.
  - (b) Suggest two methods to resolve racemic Lactic acid into optically active forms.

- 3 . (a) Discuss the conformational analysis of ethane.  
(b) Explain the optical isomerism in biphenyls.

## ALIPHATIC HYDROCARBONS

### SECTION A 2 Marks

1. 1. Explain why unsaturated compounds decolorize bromine water.
2. Give the major product of dehydrohalogenation of 2-bromobutane. Explain the reaction.
3. What is Wurtz reaction?
4. Explain the Kharasch effect.
5. Benzene does not decolorize bromine water through it has three double bonds. Why?
6. Write the products when 2-Butyne reacts with  $H_2$ /Lindlar catalyst.
7. An alkene on ozonolysis gave only acetone as the product. Identify the alkene and write the equation for ozonolysis reaction.
8. What is the major product of dehydration of butanol-1? Explain.
9. Which isomeric alkene is formed when 2-Butyne is reduced with Sodium in liquid ammonia ? Write the reaction.
- 10 . How does 2-Butyne react- with (a)  $H_2$ /Lindlar catalyst and (b)  $Na$ /Liquid ammonia
12. Predict the structure of alkyne which would give Dimethyl glyoxal on ozonolysis.
- 13.

### SECTION B 5 Marks

1. Explain cis and trans hydroxylation of alkenes with example
2. Explain Anti-Markownikov addition reaction.

3. Explain the mechanism of dehydration of alcohols.
4. Discuss the mechanism of addition of water into alkene with proper example
5. State and explain Markovnikov's rule with a suitable example
6. Illustrate the acidity of terminal alkynes with suitable reactions. Also explain the reason for the acidity of terminal alkynes
7. What is meant by Kharasch effect? Explain the mechanism with an example.

### SECTION C 10 Marks

1. Give any three methods of preparation and discuss briefly addition and oxidation reactions of alkynes.
- .
- (b) Would you expect 1-bromo 2-methylbutane to be more/less active than 1-bromo 3-methylbutane in SN2 reaction? Explain.
1. Write the mechanism of SN2 reaction. Discuss how the structure of substrate molecule and nucleophilicity of the attacking reagent affect the reactivity of an S<sub>N</sub>2 reaction.
2. Illustrate the stereochemical aspects of SN1 and SN2 mechanisms. Also discuss the effect of substrate structure, solvent, nucleophile and leaving group.
- 3.

## AROMATICITY

### SECTION A 2 Marks

1. Which one is more basic pyridine or pyrrole?
2. Explain the aromaticity in pyrrole.
3. What are Anti-aromatic compounds? Give examples.
4. State and explain Huckel's rule.
5. Explain the aromaticity of tropylium ion on the basis of Huckel's rule.
6. What are annulenes? Give two examples of annulenes that are aromatic.
7. Is anthracene aromatic? Justify your answer.
8. Cyclopentadienyl anion is aromatic. Why?
- 9.

#### SECTION B 5 Marks

1. State Huckel's ( $4n + 2$ ) rule. Explain the aromatic character of indole and c
2. How does Huckel's rule explain the aromaticity of cyclopropenyl cation and annulenes?
- 3.
- 4.

#### SECTION C 10 Marks

1. Write a detailed comparison note on basicity of pyrrole and pyridine.
2. State Huckel's ( $4n + 2$ ) rule. How will you explain aromatic character of Furan, Indole and Annulene by Huckel's rule ?
- 3.

### AROMATIC HYDROCARBONS AND ARYL HALIDES

#### SECTION A 2 Marks

1. What is Birch reduction?

2.

### SECTION B 5 Marks

1. What is Friedel-Craft's alkylation ?
2. Arrange the compounds in order of decreasing reactivity toward aromatic electrophilic substitution : Benzene, phenol, toluene, nitrobenzene.
3. Give the mechanism of halogenation of benzene.
4. How will you convert: (i) Benzene to acetophenone; (ii) Benzene to parabromotoluene ? Give equations.
5. Explain the directive influence of nitro group in aromatic electrophilic substitution.
6. Briefly discuss benzyne intermediate mechanism.

### SECTION C 10 Marks

1. (i) Discuss briefly the structure and stability of benzene.  
  
(ii) How will you calculate the resonance energy of benzene from heat of hydrogenation?
- 2.
3. Discuss addition elimination mechanism of aromatic nucleophilic substitution reactions. Give the evidence in support of this mechanism.
- 4.