

2011

CHEMISTRY

(Major)

Paper : 1.2

(Organic Chemistry)

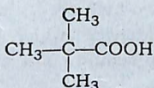
Full Marks : 60

Time : 2½ hours

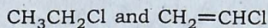
The figures in the margin indicate full marks
for the questions

1. Answer the following questions : 1×7=7

(a) Give the IUPAC name of the following compound :



(b) Identify the more polar compound of the two :



(c) Draw the structure of (Z)-3-methyl-pent-2-ene.

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- (d) Find out the number of chiral centres in 2,3,4-trihydropentane.
- (e) Draw the energy profile diagram of a two-step reaction involving a stable intermediate.
- (f) Give one example of each of an electrophile and a nucleophile.
- (g) Give the most stable and the least stable conformers of *n*-butane.

2. Answer the following questions : 2×4=8

- (a) Draw the orbital diagram of the acetylene molecule. Why is the acetylenic hydrogen atom acidic?
- (b) Of *o*-hydroxy and *p*-hydroxy benzaldehyde, which one will have the higher boiling point and why?
- (c) What do you understand by the activation energy of a reaction? How is it influenced by a catalyst?
- (d) Define tautomerism. How is it different from resonance?

3. Answer any three questions

- (a) Define K_a and pK_a values. The pK_a values of *m*-nitrobenzoic acid and 3,4-dinitrobenzoic acid are 3.43 and 3.43 respectively. Give a brief explanation for the observed acidity.
- (b) What is meant by optical activity? State the necessary conditions for a molecule to be optically active? Define specific rotation and explain its dependence on wavelength and concentration.
- (c) What are enantiomers? Illustrate with an example by taking the example of tartaric acid.
- (d) What is atropisomerism? Illustrate with two suitable examples.
- (e) What is a racemic mixture? Why is it difficult to separate the enantiomers of a racemic mixture? Describe the resolution of a racemic mixture with a suitable example.

4. Answer any three questions : $10 \times 3 = 30$

- (a) What are π -diastereomers? Comment on their physical and chemical properties. With suitable examples, illustrate the *E,Z*-system of nomenclature of π -diastereomers. $2+3+5=10$
- (b) What do you understand by the thermodynamic control of a reaction? How is it different from kinetic control? Illustrate with suitable examples. In the case of parallel reactions, which product should dominate in the initial and final stage of the reaction? Discuss. $5+5=10$
- (c) What are carbocations? Sketch the geometry of a carbocationic species. Discuss with examples the important factors affecting the stability of carbocations. $1\frac{1}{2}+1\frac{1}{2}+7=10$
- (d) What are carbon-free radicals and how are they detected? Describe three types of reactions which generate carbon-free radicals. Give examples. $4+6=10$

12A—1500/95

(Continued)

- (e) Discuss the mechanism of electrophilic addition of bromine to an alkene. In the mechanism, explain the formation of anti and syn products, while the addition is not.
- (f) Define a nucleophilic substitution reaction. Give an example, discuss the mechanism of an aliphatic nucleophilic substitution reaction. Describe the stereochemical support of the mechanism of the reaction.

12A—1500/95