

**DEPARTMENT OF CHEMISTRY**  
**SCHOOL OF NATURAL AND APPLIED SCIENCES**  
**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA**  
**FIRST SEMESTER EXAMINATION 2012/2013 SESSION**

**COURSE CODE: CHM 314**

**COURSE UNITS: 2 UNITS**

**COURSE TITLE: ORGANIC REACTION MECHANISM**

**TIME ALLOWED: 2 HOURS**

**INSTRUCTIONS: Answer any three questions**

- 1(a) Identify the major characteristics of stereoisomers (8 Marks)  
 (b) Define the terms chiral and diastereomer (2 Marks)  
 (c) Draw and name the four stereoisomers of 3-bromo-2-butanol using perspective formula (8 Marks)  
 (d) Determine the R or S configuration in 1(c) above (2 Marks)

(20 Marks)

- 2(a) Explain the terms optically inactive and racemic mixture (4 Marks)

- (b) (i) State the equation for the specific rotation of an optically active compound

(2 Marks)

- (ii) A sample of pure (*S*)-2-butanol was placed in a 10.0cm polarimeter tube. Using the D line of a sodium lamp, the observed rotation at 20°C was +104°. The density of this compound is 0.805g ml<sup>-1</sup>. What is specific rotation of (*S*)-2-butanol?

(10 Marks)

- (iii) Draw and name its enantiomers (4 Marks)

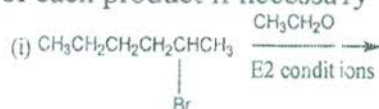
(20 Marks)

- 3(a) (i) Explain the term E2 and what happens at its transition state? (3 Marks)  
 (ii) State the general rate law for E2 reaction of an alkyl halide with HO<sup>-</sup> (1 Mark)  
 (iii) What is the order of E2 reaction & its implication on the concentration? (2 Marks)

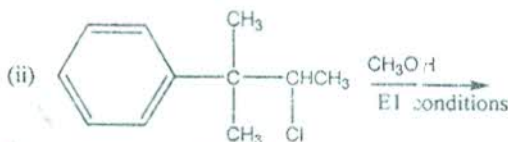
- (b) (i) Arrange the following alkyl halide in order of decreasing reactivity in an S<sub>N</sub>1 reaction: bromomethane, 1-bromopropane, 2-bromopropane, 2-bromo-2-ethylpropane (2 Marks)

- (ii) Explain your order of arrangement (2 Marks)

- (c) Give the elimination products for the following reactions, showing the configuration of each product if necessary



(2 Marks)



(2 Marks)

- d) The relative rate of reaction of 2, 3 and 4-chloropyridine with sodium methoxide in methanol are 30,000, 1, and 81,000.

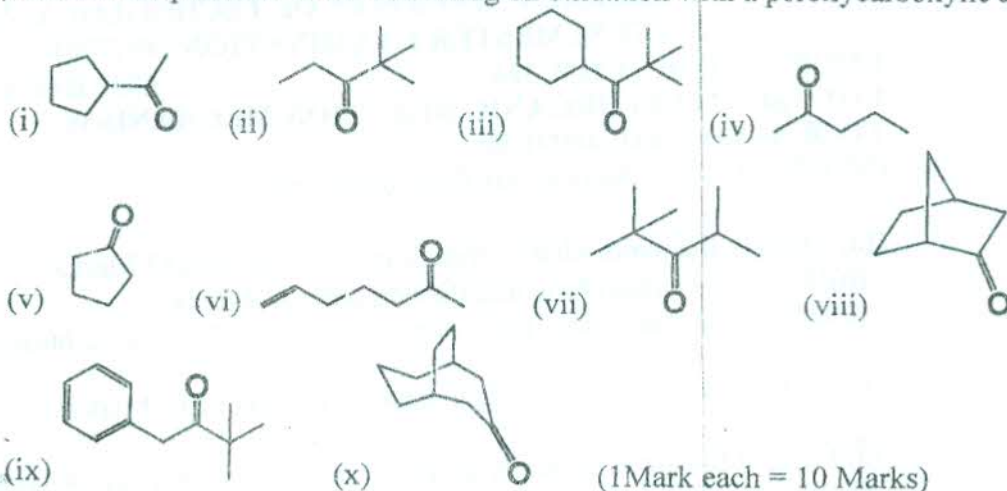
- i) Write out the equations for the above reactions respectively. (3 Marks)

- ii) What is responsible for this observed rate of reactions? (3 Marks)

(20 Marks)

4a) Draw the structure of perbenzoic acid and peroxydicarboxylic acid (4 Marks)

b) Predict the products of the following on oxidation with a peroxydicarboxylic acid



c) Mention six applications of Mannich synthesis (6 Marks)

(20 Marks)