

BONDO UNIVERSITY COLLEGE

UNIVERSITY EXAMINATION 2012/2013

**1ST YEAR 2ND SEMESTER EXAMINATION FOR THE
DEGREE OF BACHELOR OF EDUCATION SCIENCE WITH
IT (REGULAR)**

COURSE CODE: SCH 103

TITLE: BASIC ORGANIC CHEMISTRY

DATE: 5/12/2012

TIME: 8.00-10.00AM

DURATION: 2HOURS

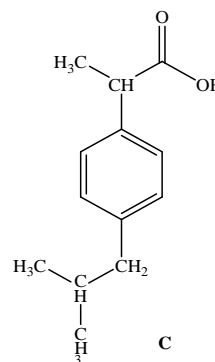
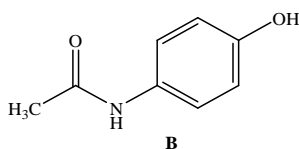
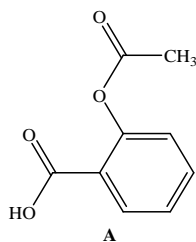
INSTRUCTIONS

- 1) This paper contains TWO sections.**
- 2. Answer ALL questions in sectionA_COMPULSORY and any other TWO in section B**
- 3. Write ALL answers in the booklet provided.**

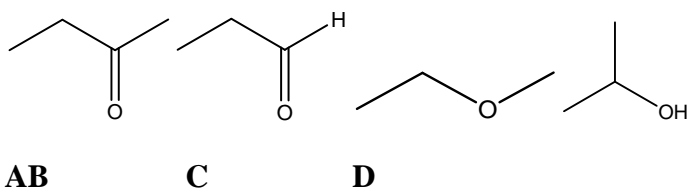
Section A (30 marks)

- a. Write Lewis structures for the following species [4 marks]
i. HCN ii. CO₂ iii. C₂H₂ iv. CH₃OH

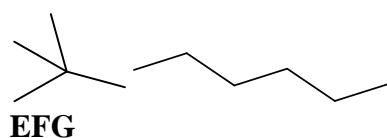
- b. Compounds A, B and C are active ingredients in over-the-counter drugs used as analgesics (to relieve pain without decreasing sensibility or consciousness), antipyretics (to reduce the body temperature when it is elevated), and/or anti-inflammatory agents (to counteract swelling or inflammation of the joints, skin, and eyes). Identify at least *two* functional groups in each molecule [6 marks]



- c. Referring to the compounds below, answer the questions that follow.



- i. Write the systematic (IUPAC) names for the compounds **A** and **B** [1 mark]
ii. What is the relationship between molecules **C** and **D** above? Explain [2 marks]
d. Considering the following organic compounds, place them in order of increasing boiling point. Explain your reasoning. [4 marks]

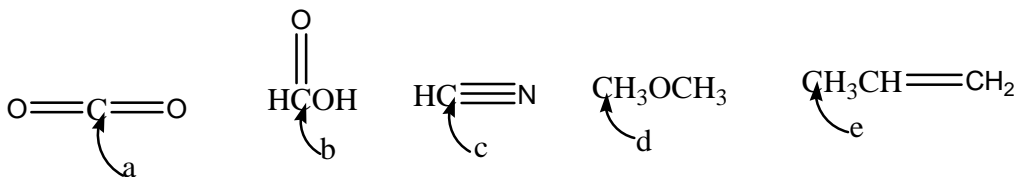


- e. Comment on the relative stabilities of cyclopropane, cyclobutane, cyclopentane and cyclohexane [8 marks]
f. Comment on the differences between SN1 and SN2 reactions [5 marks]

Section B

Question Two [20 marks]

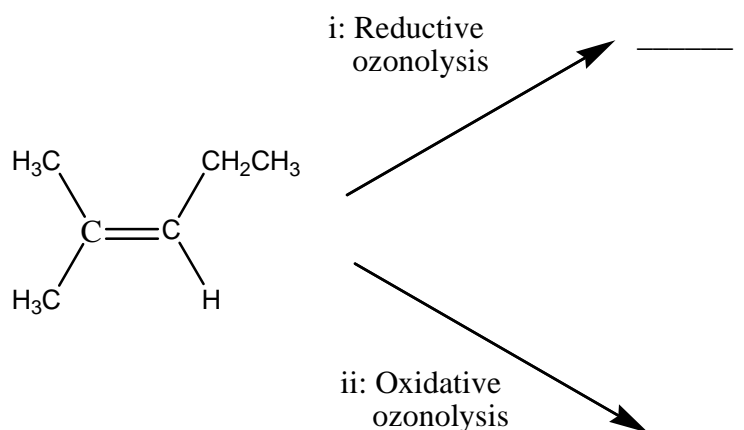
- a. Define the term hybridization [3 marks]
- b. For each of the following compounds, state the hybridization at each of the carbon atoms indicated a- e. [5 marks]



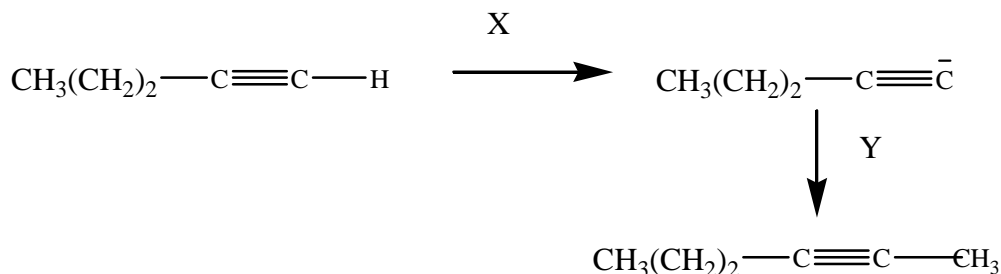
- c. Draw and discuss the bonding scheme for ethene ($\text{H}_2\text{C}=\text{CH}_2$) using valence bond theory. Be sure to include hybridization, bond angles, σ - and π -bonding as well as molecular geometry. [6 marks]
- d. Give the reaction mechanism for the photochlorination of methyl benzene (toluene) to chloromethylbenzene. Name the type of reaction intermediate involved in the reaction and comment on its relative stability. [6 marks]

Question Three [20 marks]

- a. Briefly explain what is meant by the following terms [2 marks]
- i. Covalent bond
ii. Carbocation
iii. Nucleophile
iv. Electrophile
- b. Explain the difference between structural isomers and stereoisomers. Provide an example in each case [2 marks]
- c. Give the products from the two ozonolysis reactions shown below [4 marks]

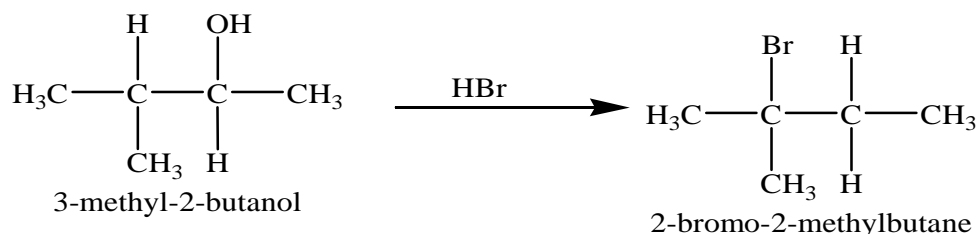


- d. Give the reagents (X and Y) necessary to complete the equation for the reaction shown below [2 marks]



e. The reaction of bromomethane (CH_3Br) with sodium hydroxide (NaOH) in water forms methanol (CH_3OH). If sodium iodide (NaI) is added to the reaction mixture, the rate of methanol formation is dramatically increased (i.e. sodium iodide acts as a catalyst).

- Is the mechanism for this reaction $\text{S}_{\text{N}}1$ or $\text{S}_{\text{N}}2$? Explain [2 marks]
- Draw a reaction energy diagram showing the two different reaction pathways (i.e. catalyzed and uncatalyzed). Indicate each species formed at all energy minima in the diagram. [2 marks]
- Explain why adding NaI increases the reaction rate. [2 marks]
- Would you expect the same catalytic activity on this reaction if you added NaCl (sodium chloride) instead? Explain your answer. [1 mark]
- When 3-methyl-2-butanol is treated with concentrated HBr , the major product is 2-bromo-2-methylbutane as shown below:

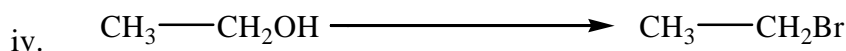
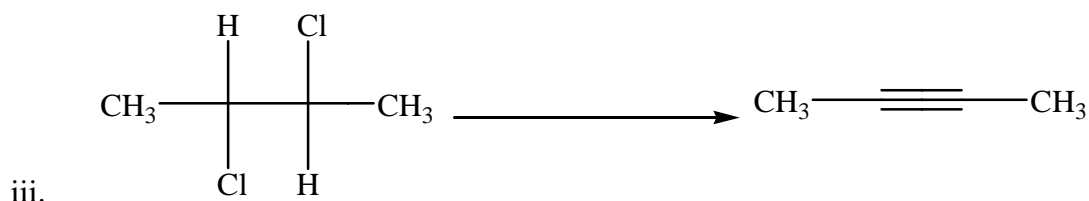
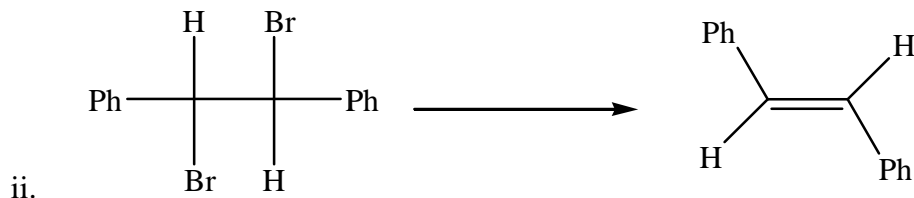
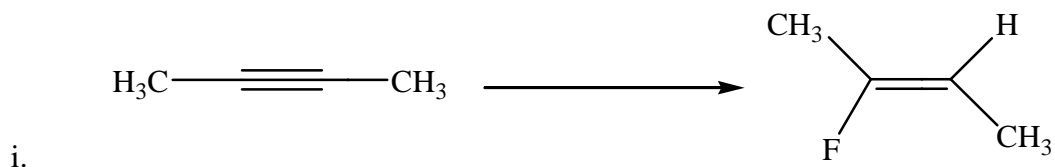


Propose a reaction mechanism for the formation of this product [3marks]

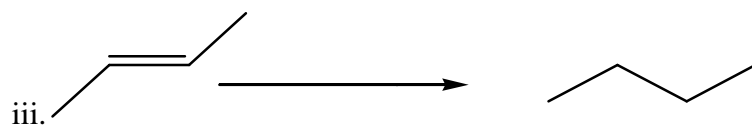
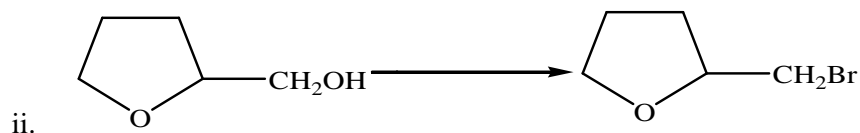
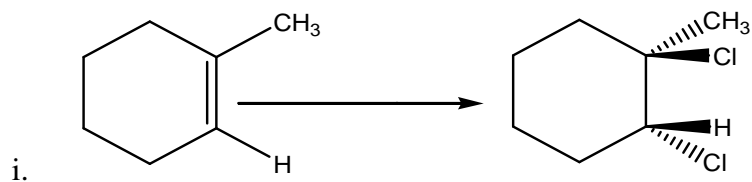
Question Four [20 marks]

- Draw the chemical structure of the following: [6 marks]
 - 1-Ethyl-3-methylcyclohexane
 - 4-chloro-2-ethyl-1-methylcyclohexane
 - trans*-5,5-dimethylhex-2-ene
 - But*-3-yn-1-ol

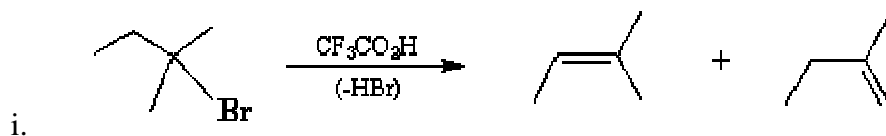
b. Classify each of the following reactions as an Elimination, Addition or Substitution. [4marks]

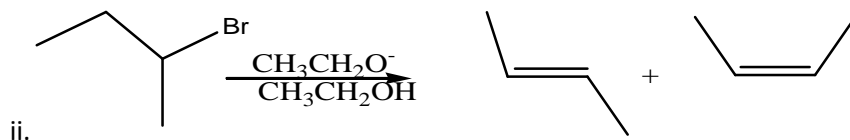


c. Give reagents that are necessary to perform the following transformations. [6marks]



d. Consider only the elimination products that would be formed in the following reactions:





Which one would be expected to be formed in greater amounts in each case, and why?

[4 marks]

Question Five [20 marks]

a. Methylcyclohexane can exist in two conformations

i. Define the term conformation (2 marks)

ii. Draw the two conformations indicating their equilibrium status showing the preferred conformer with an explanation for the same. (8 marks)

b. Explain and show the mechanism for the acid-catalysed elimination in alkene formation. (10 marks)

.....**END**.....