



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
UNIVERSITY EXAMINATIONS: 2017/2018 ACADEMIC YEAR
SECOND YEAR SECOND SEMESTER EXAMINATIONS

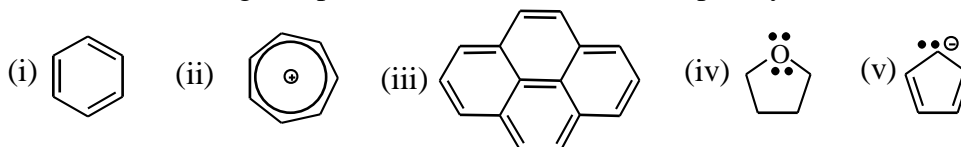
SCH 206: Organic Chemistry II

ANSWER ALL QUESTIONS IN SECTION A AND ANY TWO QUESTIONS IN SECTION B

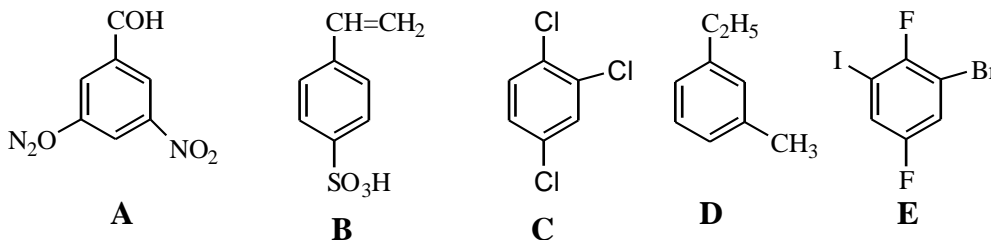
SECTION A (30 MARKS): ANSWER ALL QUESTIONS

QUESTION 1(30 MARKS)

- a) Which of the following compounds/ions are aromatic? Explain your answer. (10 marks)



- b) Give the IUPAC names of the following compounds: (10 marks)



- c) Explain the following terms; (10 marks)

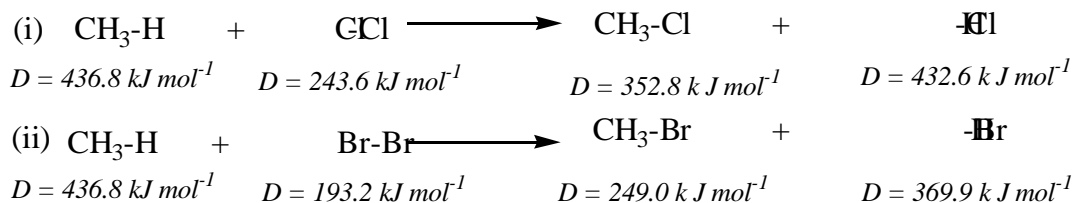
- (i) Stereochemistry
- (ii) Optical activity
- (iii) Racemic mixture
- (iv) Nucleophile
- (v) Electrophile

SECTION B (40 MARKS):

ANSWER ANY TWO QUESTIONS FROM THIS SECTION
EACH QUESTION CARRIES 20 MARKS

QUESTION 2 (20 MARKS)

- a) Discuss the principles underlying the naming of enantiomers. (6 marks)
- b) Give the mechanism for the nitration of benzene. (8 marks)
- c) Calculate the heat of reaction (ΔH) for the following reactions, assuming that in both reactions, bond breakage is homolytic. Comment on the reaction. (6 marks)

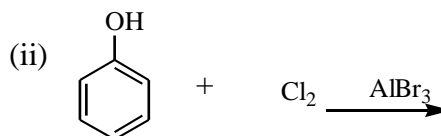
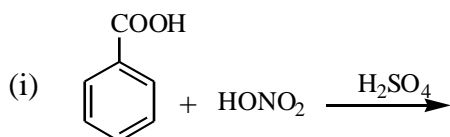


QUESTION 3 (20 MARKS)

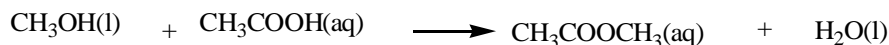
a) Define each of the following terms: (10 marks)

- (i) Diastereomers
- (ii) Stereogenic centre
- (iii) Meso compound
- (iv) Enantiometrically pure substances
- (v) Solvolysis reaction

b) Complete the following reactions; (5 marks)



c) Methanol reacts with acetic acid to form methyl acetate and water in the presence of a catalyst as shown by the following equation:



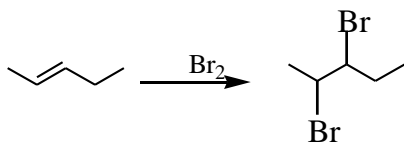
The bond dissociation energies in kJ mol^{-1} are given below;

$$\text{C-C} = 348; \text{C-H} = 413; \text{C=O} = 805; \text{O-H} = 464; \text{C-O} = 360$$

What is the heat of formation of methyl acetate in kJ mol^{-1} (5 marks)

QUESTION 4 (20 MARKS)

a) Consider the reaction below: (5 marks)



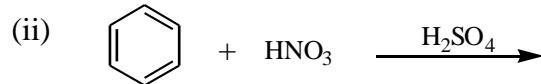
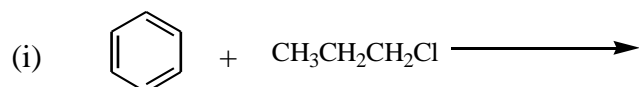
How many stereoisomers of the product are possible? Draw them.
Are the products optically active?

b) State any FIVE features of aromaticity. (5 marks)

c) Illustrate the effect of the substituent group on the benzene ring on further substitution. (10 marks)

QUESTION 5 (20 MARKS)

a) Complete the following reactions giving the necessary reagents and reaction conditions. (4 marks)



b) Give the mechanism for the reactions in (e) (i) and (ii) above. (12 marks)

c) At 24°C, a sample of S-2-iodobutane whose specific rotation is: $[\alpha]_{\text{D}}^{24} = 22.4^\circ$ was put in a 1 dm cell of solution of 1 gml⁻¹ showed an optical rotation of +3.975°.

(i) What is the optical purity? (2 marks)

(ii) What is the enantiomeric excess? (2 marks)

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