CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE GENERAL, BACHELOR OF EDUCATION SCIENCE, BACHELOR OF SCIENCE BIOCHEMISTRY, BACHELOR OF SCIENCE BIOMEDICAL

CHEM 130: ORGANIC CHEMISTRY I

STREAMS: BSC (GEN), BED (SCI), BSC (BIOCH) BSC (BIOMED) TIME: 2 HOURS

DAY/DATE: TUESDAY 12/07/2016 2.30 PM – 4.30 PM

INSTRUCTIONS:

Answer Question One and any other Two Questions

QUESTION ONE (30 MARKS)

(a) Write the IUPAC name for each of the following compounds. [3 marks]

(b) Write the structural formula of each of the following compounds. [3 marks]

(i) 3- isopropyl – 2,4- dimethylpentane

(ii) 4 – (1,1-dimethylethyl) octane

(iii) 3,3 – dibromocylohexanol

(iv) 2,4 – Dimethyl pentan-3-one

(v) 3 – Bromobutanal

(vi) Cyclobutyl isopropyl ether

(c) Identify the E/Z configuration of each of the C = C double bond in the following compound. [4 marks]

(d) Draw the structures and write the names of the C_6H_{14} isomeric alkanes. [6 marks]

(e) Write the stepwise mechanism of the following reaction. Explain each step.
$CH_4 + Cl_2 \xrightarrow{\text{UV}} CH_3 + HCl$ [5 marks

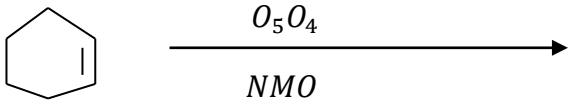
(f) With the aid of relevant examples, describe three methods for synthesis of alkenes. [6 marks]

(g) Write the structure of the major organic product(s) for each of the following reactions. [4 marks]

(i) $CH_3CH_2C \equiv CH \xrightarrow{HBr(excess)}$

(ii) $CH_3CH_2\,C \equiv C\,CH_2CH_3 \xrightarrow[NH_3\,(l)]{Na}$

(iii) $(CH_3)_2\,C = CH\,CH_3 \xrightarrow{\text{HBr}}$

(iv) 

QUESTION TWO (20 MARKS)

(a) Write the IUPAC systematic names of the following compounds [5 marks]

(b) Write the structures of the major organic product(s) of the following reactions. [5 marks]

(i) $CH_3CH_2CH_2CH_2CHBr_2 \xrightarrow[2)\ H_2O]{1)\ NaNH_2/NH_3\ (Excess)}$

(ii) $(CH_3)_2CH\ C \equiv CH_3 \xrightarrow[Lindlar\ catalyst]{H_2}$

(iii) $CH_3CHCH_2C \equiv CH \xrightarrow{Excess\ HBr}$

(iv) $CH_3(CH_2)_4CH_2C \equiv CH \xrightarrow[HgSO_4]{H_2SO_4, H_2O}$

(v) $CH_3CH_2C \equiv CH \xrightarrow[2)\ H_2O_2, NaOH]{1)\ 9\text{-BBN}}$

(c) State the following rules:

(i) Zaitser's rule [1 mark]
(ii) Markovnikov's rule [1 mark]

(d) Give reagents that can be used to effect each of the following transformation. [5 marks]

(e) Describe the laboratory synthesis of alkanes from alkenes and alkynes. [3 marks]

QUESTION THREE (20 MARKS)

(a) Write the IUPAC names of the following compounds. [5 marks]

(b) Discuss the physical properties of alkanes. [6 marks]

(c) Predict the major product(s) for each of the following reactions. [5 marks]

(d) Draw the structure of the major organic product(s) obtained from the reaction of 1-heptyne with the following reagents. [4 marks]

(i) $NaNH_2$ in NH_3, then $CH_3\,CH_2\,Br$
(ii) Hydrogen chloride (1 mol)
(iii) Ozone, then water
(iv) Chlorine (1 mol)

QUESTION FOUR (20 MARKS)

(a) Write the IUPAC names of the following alkyl groups. [5 marks]

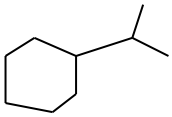
(b) Write the stepwise mechanism for free radical polymerization of ethene. [6 marks]

(c) Describe the fractional distillation of crude oil and state the uses of obtained fractions. [3 marks]

(d) Using ethyne and any other reagents of your choice, design a stepwise method for synthesis of 2-pentyne. [3 marks]

(e) Write the chemical reactions for the combustion of the following alkanes. [3 marks]

(i) $(CH_3)_3\ C\ CH_2CH_3$

(ii) 

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