KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE-UNIVERSITY CHEMISTRY

COURSE CODE: PCHEM 021

COURSE TITLE: BASIC ORGANIC CHEMISTRY

STREAM: SEMESTER TWO

DAY: WEDNESDAY

TIME: 9.00 – 11.00 A.M.

DATE: 15/11/2010

INSTRUCTIONS:

- **Attempt all questions Total Marks = 70 %**

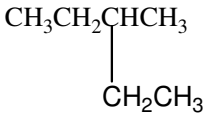
PLEASE TURN OVER

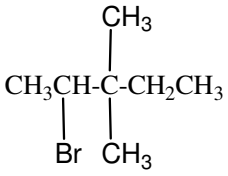
QUESTION ONE

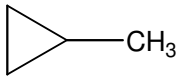
(a) Define the following terms used in organic chemistry: (i) Hydrocarbons
(ii) Unsaturated hydrocarbons (iii) Homologous series (iv) homolog (4.5 mks)

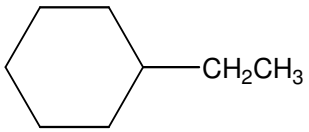
(b) Explain how the boiling points of alkanes vary with (i) increase in molecular weight (ii) branching of carbon atoms in the molecule. (3 mks)

(c) Write the IUPAC names for the following alkanes: (4 mks)

(i) 

(ii) 

(iii) 

(iv) 

(d) Write structural formulars for the following alkanes: (3 mks)
(i) 2,2-dimethylbutane (ii) 4-isopropyloctane (iii) Cyclobutane

(e) Give the products A, B, C and D formed in the following reactions: (3 mks)

(i) $CH_4 + Cl_2 \xrightarrow{\text{UV-light}} A + B$

(ii) $CH_3CH_3 + O_2 \xrightarrow{\text{heat}} C + D$

QUESTION TWO

(a). (i) Explain what 'Cis & Trans mean.

(ii) Draw structures for Cis and Trans-1,2-dichloroethene (4 mks)

(b) Describe a practical analysis on differentiation of a propene and propyne.

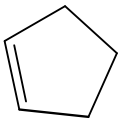
(2.5 mks)

(c) Name the following alkenes: (4 mks)

(i) $CH_3CH=CHCH_2CH_3$

(ii) $CH_3-C(CH_2CH_3)=CH_2$

(iii)



(iv) $CH_3-C(CH_2CH_3)(Br)-C(CH_3)=CH_2$

(d). Write structures for the following alkynes: (2 mks)

(i) 4-methyl-2-pentyne (ii) 3,3-dimethyl-1-butyne

(e). Give the missing reactants/ products / reagents in the following reaction equations: (4 mks)

(i) $CH_3CH_2OH \xrightarrow[\text{haet}]{\textbf{A}} CH_2=CH_2$

(ii) $CH_3-C(CH_3)=CH_2 + HBr \xrightarrow{CCl_4} \textbf{B}$

(iii) $\textbf{C} \xrightarrow{\text{Zn dust}} CH3\text{-}C\equiv CH$

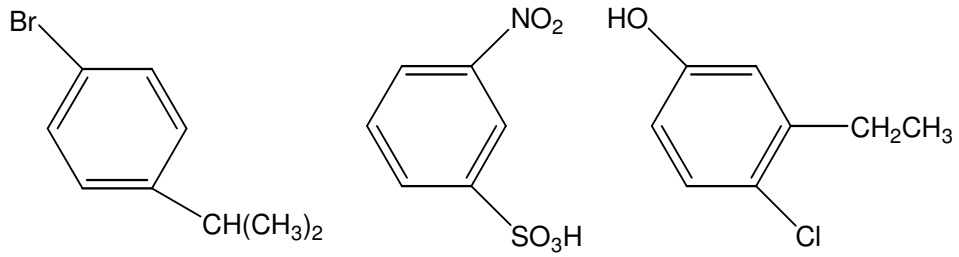
(iv) $CH_3-C\equiv CH + 2HCl \longrightarrow \textbf{D}$

QUESTION THREE

(a). (i) Draw the resonance structures of benzene ring.

(ii) What does the 'circle' represent in the structural formula of benzene? (2 mks)

(b). (i) Write IUPAC names for the following compounds:



(ii). Write the structural formulas for the following compounds:

1,3,5-tribromobenzene, n-propylbenzene and *m*-hydoxyanaline (6 mks)

(c). (i). Give the general formulas for the following groups of organic compounds:

Phenol, alcohols and ethers.

(ii). Name the type of intermolecular bond present in ketones, alcohols and ethers.

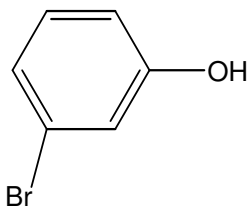
(iii). Explain why alcohols have higher boiling points than alkanes. (3.5 mks)

(d). Give all possible isomers of the alcohol with general formular C_4H_9OH. (4 mks)

(e). Give the IUPAC names for the following compounds: (2 mks)

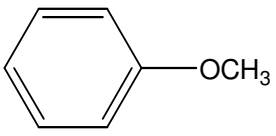
(i) CH_3-CH(CH_3)-CH_2OH

(ii)



(iii) CH_3CH_2-O-CH_3

(iv)



QUESTION FOUR

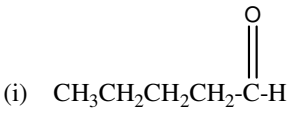
(a). (i) Explain why carboxylic acids (RCOOH) have generally higher boiling point than alcohols.

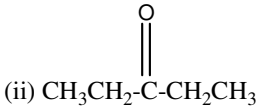
(ii). Give general formulas for the primary, secondary and tertiary amines.

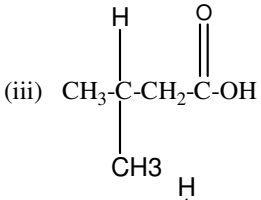
(4.5 mks)

(b) Explain a reaction test used to differentiate between aldehyde and a ketone. (3 mks)

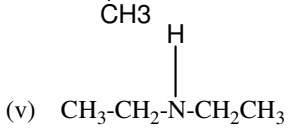
(c) Give the IUPAC names for the following compounds: (6 mks)

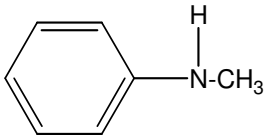
(i) 

(ii) 

(iii) 

(iv) $CH_3CH_2NH_2$

(v) 

(vi) 

(d). Give the missing reactants / products / reagents in the following reaction equations:

(4 mks)

(i) $CH_3COOH + NaOH_{aq} \xrightarrow{heat} \mathbf{X} + H_2O$

(ii) $CH_3CH_2COOH + \mathbf{Y} \longrightarrow CH_3CH_2COONa + H_2$

(iii) $Z + Na_2CO_3 \longrightarrow CH_3COONa + CO_2 + H_2O$

(iv) $CH_3COOH + CH_3CH_2OH \longrightarrow \mathbf{T} + H_2O$