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MAIN EXAMINATION

JANUARY – APRIL 2014 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCE

SCHOOL FOCUSED PROGRAMME

CHEM 101: ORGANIC CHEMISTRY

Date: APRIL 2014	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions	

Q1. a) This question concerns the following alkanes:

A n – butane
B 2 – methylpropane
C n- pentane
D 2 – methylbutane
E 2, 2 – dimethylpropane

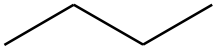
i) Draw the structures of the alkanes A to E. **(3 marks)**
ii) Explain briefly why alkanes generally have low melting and boiling points. **(1 mark)**
iii) Place the alkanes in order of increasing (I) BP (Boiling Point) (II) density. **(2 marks)**

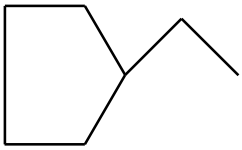
b) Draw the structures of the following organic compounds:

i) Ethylbutanoate
ii) 2 – bromobutane
iii) Pentanoic acid
iv) Methyl ethyl ether
v) Methylcycloheptane
vi) Cis – but – 2 – ene
vii) 3 – hexanone

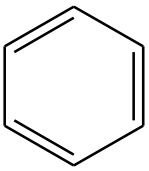
viii) 2, 2, 3 – trimethylbutane **(7 marks)**

c) Give the systematic IUPAC names for the following compounds:

i) 

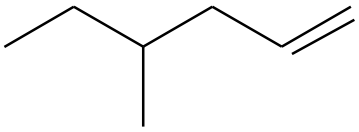
ii) 

iii) $CH_3C(=O)-OCH_2CH_2CH_3$

iv) 

v) $(CH_3)_2CHCH(Cl)CH_3$

vi) $ClCH_2C \equiv CH_2Br$

vii) 

(7 marks)

d) Indicate the most plausible products from the following reactions under experimental conditions stated:

i) $CH_2 = CH_2 + Br_2 \rightarrow P$

ii) $C_2H_5Br + NaOH_{(aq)} \xrightarrow{heat} Q$

iii) $CH_3CH_2CH_2OH \xrightarrow{K_2Cr_2O_7/H^+} R$

iv) $CH_3CH_2CHO + NH_2NH_2 \rightarrow S$

v) $CH_3CH = CH_2 + HBr \rightarrow T$

vi) $CH_3CH_2COCH_3 \xrightarrow{LiAlH_4} U$

vii) $CH_3CHO \xrightarrow{HCN} V \xrightarrow{H^+} W$

viii) $CH_3CH_2OH \xrightarrow[180^0C]{C.H_2SO_4} X$

ix) $CH_3COOH + CH_3OH \xrightarrow{H^+} Y$

x) $CH_3CH_2OH + PCl_3 \rightarrow Z$ **(10 marks)**

Q2. a) For each of the following compounds:
Butan – 1 – ol
2, 3 – dimethylpentanal
1, 2 – dimethylcyclopent – 1 - ene

i) Write the structural formula of the compound **(3 marks)**

ii) Write the structural formula for an isomer of the compound and name the isomer. (The isomer should have a different functional group). **(3 marks)**

iii) Suggest a simple chemical test you would use to distinguish between the compound and the isomer. **(4 marks)**

b) Compare and contrast the reactions of ethanal and propanone. **(10 marks)**

Q3. For each of the following typical groups:

i) ROH
ii) RX
iii) RCOOH
iv) $RC \equiv CR$
v) RCHO
vi) R – O – R

a) Name the class of compound of which each group is characteristic. **(6 marks)**

b) Give **TWO** reactions which are characteristic of each group stating clearly the experimental conditions under which the reaction occurs. **(12 marks)**

c) State **ONE** use of any compound in the groups ROH, RX, ROR and RCOOH. **(2 marks)**

Q4. a) Explain clearly and concisely the meaning of the following terms in organic chemistry and briefly indicate, by one example in each case how the processes are carried out.

i) Halogenation
ii) Fermentation
iii) Ozonolysis
iv) Condensation
v) Esterification
vi) Isomerism. **(12 marks)**

b) Discuss the bonding in:

i) ethane
ii) ethyne

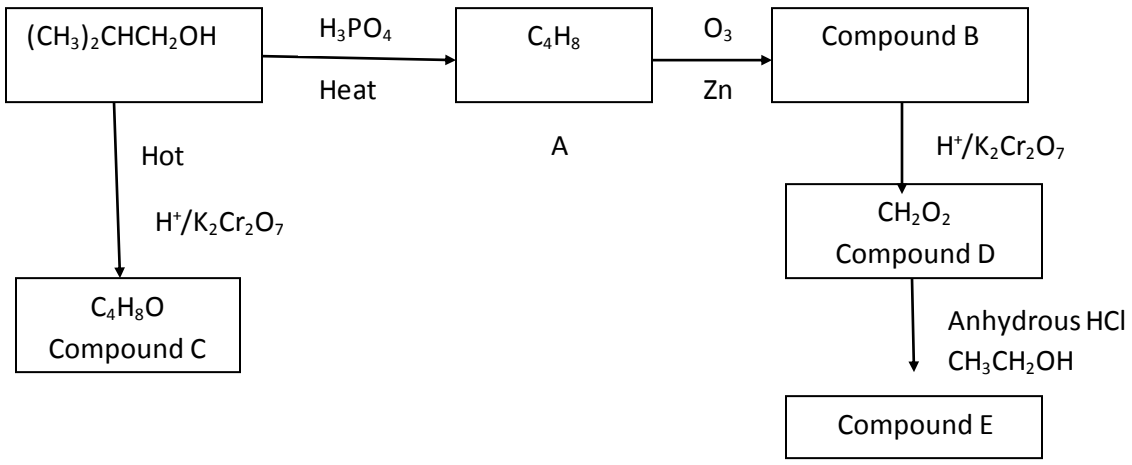
in terms of S and P hybridization. **(8 marks)**

Q5. a) Complete the table below by writing suitable reactions where possible. Indicate the reactions conditions:

Type of reaction	**Ethane**	**Ethene**	**Ethyne**
Reaction with chlorine			
Burning in the presence of excess oxygen			
Method of preparation			

(9 marks)

b) Study the flow chart below and answer the questions that follow:



i) Deduce showing your reasoning, the structures of the compound A, B, C, D and E. **(10 marks)**

ii) Compound A can undergo polymerization. Draw the structure of the polymer of compound A. **(1 mark)**

END