INTI INTERNATIONAL UNIVERSITY

FOUNDATION IN SCIENCE (CFSI)
CHM1204: CHEMISTRY 2
FINAL EXAMINATION: JAN2016 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Draw the skeletal structure (line-angle) for each of the following.

(i) 3-ethyl-2,4,5-trimethylheptane

(2 marks)

(ii) 2-isobutyl-5-propyl-3-hexyne

(2 marks)

(iii) 1-chloro-4-phenyl-2-heptene

(2 marks)

(iv) 4-cyclobutyl-2-pentene

(2 marks)

(b) Draw the skeletal structure (line-angle) of all the products when 2-iodohexane is heated with potassium hydroxide and alcohol.

(4 marks)

(c) An alkene can be hydrated with a catalyst to produce an alcohol.

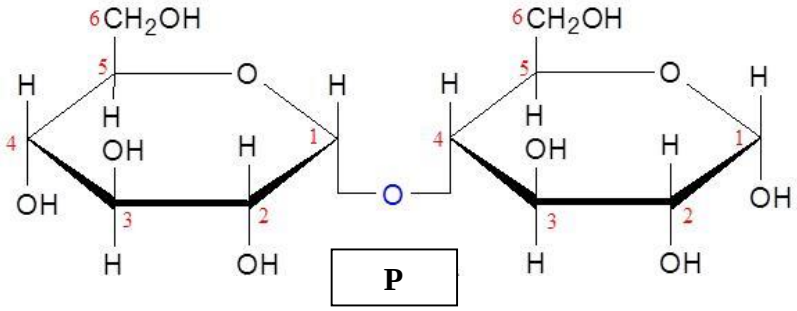
(i) Write a full chemical reaction when 2-methyl-2-pentene is hydrated.

(4 marks)

(ii) Name the rule that is used to determine the major product of the reaction.

(1 mark)

(d) **P** is a dissacharide sugar formed by glycosidic linkage formed from two units of α-D-glucose molecules shown below:



P

(i) Name the compound **P.**

(1 mark)

(ii) Name the type of glycosidic linkage formed in **P.**

(1 mark)

(iii) The α-D-glucose exists as a pair of enantiomers. Draw the structure of enantiomers in Fischer projection form.

(4 marks)

(iv) State the observation of Benedict test if water is added into **P.**

(2 marks)

(TOTAL: 25 MARKS)

Question 2

(a) Explain:

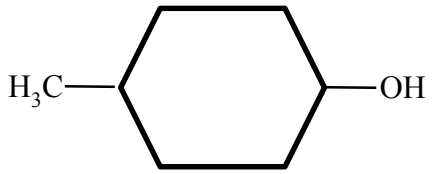
(i) Between pentane and 2-pentanol, which has higher boiling point?

(2 marks)

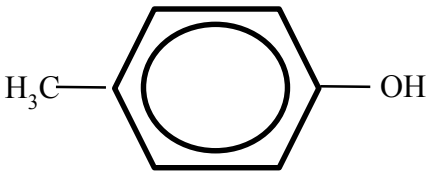
(ii) The solubility of ethanol and 2-heptanol in water.

(2 marks)

(b) The structural formula of two compounds, **P** and **Q** are shown below;



P



Q

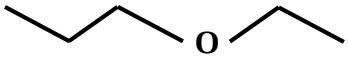
(i) State the IUPAC name for P and Q.

(4 marks)

(ii) Suggest a reaction on **P** to produce an organic compound, **W** which can cause bromine water to become colorless.

(2 marks)

(c) This is an alkoxy compound, ***X***.



(i) Give the IUPAC name for ***X*.**

(2 marks)

(ii) How to form ***X*** from alcohols?

(2 marks)

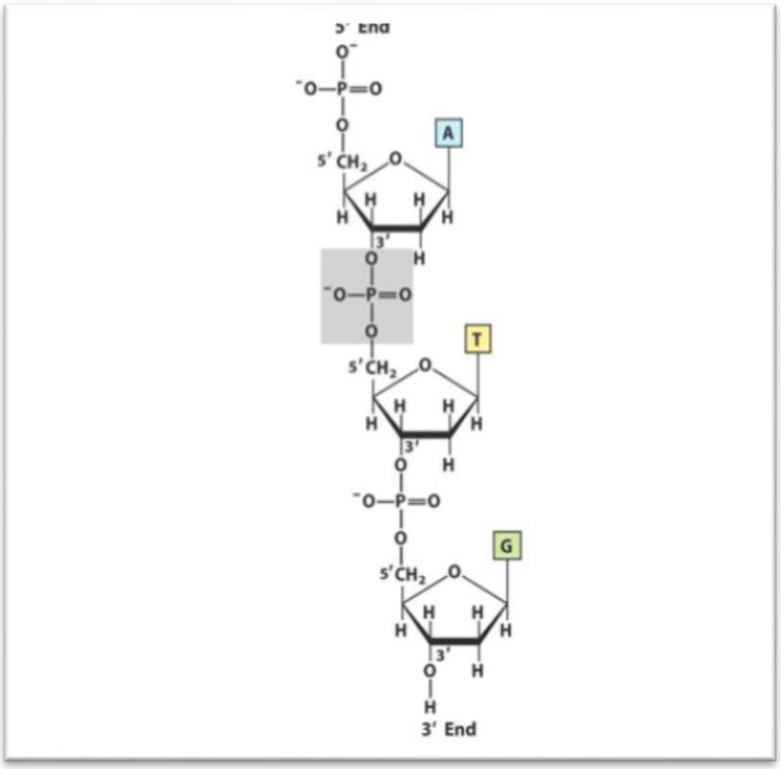
(d) (i) What does the designation of **DNA** stand for?

(1 mark)

(ii) What does the designation of **RNA** stand for?

(1 mark)

(e) The polynucleotide chain is made up of nucleotides linked together with ester linkage.



(i) Give the name of the ester linkage (as seen in box) in the diagram above.

(2 marks)

(ii) Name the process of polynucleotides formation.

(1 mark)

(iii) Classify the polynucleotide strand above as DNA or RNA strand.

(1 mark)

(iv) State the full name of all the bases A, T and G in the strand above.

(3 marks)

(f) Give TWO differences between RNA molecules and DNA molecules.

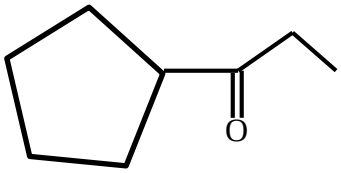
(2 marks)

(TOTAL: 25 MARKS)

Question 3

(a) Give the IUPAC names for each of the following compounds.

(i)

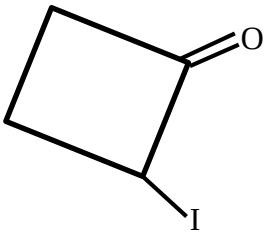


(2 marks)

(ii) $CH_3CH(CH_3)CH_2CH(CH_3)CHO$

(2 marks)

(iii)



(2 marks)

(b) The boiling points of hexanol and hexanal are 159°C and 131°C respectively.

(i) Explain why the alcohol compound has a higher boiling point than the carbonyl compound.

(4 marks)

(c) **A** and **B** are carbonyl compounds consisting of three carbon atoms. When **A** and **B** undergo a reaction with potassium dichromate, it is observed that:

Compound	**Observation**
A	Orange solution
B	Blue-green solution

(i) From the observation above, give the IUPAC name for **A** and **B**.

(4 marks)

(ii) State the name of the reaction above.

(1 mark)

(iii) Suggest another chemical test to differentiate between **A** and **B.**

(2 marks)

(d) Linolenic acid with full structural notation of 18:3 $\Delta^{9, 12, 15}$ ω-3, is a type of *polyunsaturated fatty acid.*

(i) Define *polyunsaturated fatty acid.*

(2 marks)

(ii) Draw the structure of linolenic acid.

(2 marks)

(iii) State the physical state of linolenic acid at room temperature.

(1 mark)

(iv) A reaction between linolenic fatty acids and glycerol molecule, $C_3H_8O_3$ can form a fat molecule or also known as triacylglycerol.

1. Name the process of formation triacylglycerol.

(1 mark)

2. Draw the structure of the triacylglycerol formed.

(2 marks)

(TOTAL: 25 MARKS)

Question 4

(a) The pKa values of several compounds are given below.

1.29	**2.66**	**2.86**	**3.74**	**4.74**

(i) Match the pKa values with the respective compounds below.

	Compound	**pKa**
A	$CH_2ClCOOH$	
B	CH_2FCOOH	
C	CH_3COOH	
D	$CHCl_2COOH$	
E	HCOOH	

(5 marks)

(ii) Which of the compounds above is the strongest acid?

(2 marks)

(iii) Explain the difference in the acid strength of compounds ***A*** and ***B***.

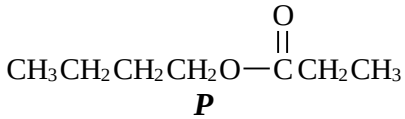
(3 marks)

(b) Arrange the following compounds in order of increasing boiling point.

butanal, butanoic acid, butane, 1-butanol

(2 marks)

(c)



P

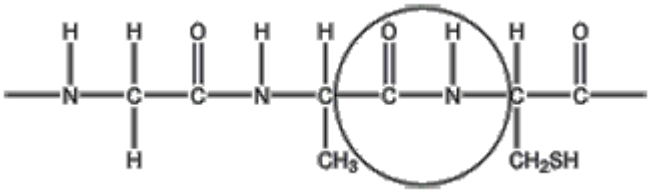
(i) Draw full equation to show how ***P*** can be formed.

(3 marks)

(ii) Give the IUPAC name of ***P***.

(2 marks)

(d)



X

(i) A protein is built up of amino acids. The amino acid molecules are held together by a bond, ***X***. State the name of ***X***.

(2 marks)

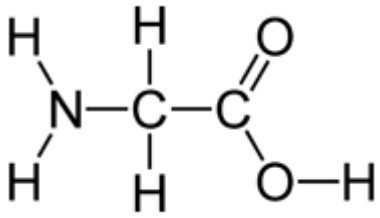
(ii) Name the reaction that forms a protein.

(1 mark)

(iii) Explain why protein cannot perform its biological function at a very high temperature.

(2 marks)

(iv) The structure of an amino acid is shown below.



Glycine (Gly)

Draw the D-isomer and L-isomers of Gly in Fischer projection.

(3 marks)

(TOTAL: 25 MARKS)

Question 5

(a) Give the degree (1˚, 2 ˚ or 3 ˚ amines) and IUPAC name for each of the following compounds.

(i) $CH_3CH_2CH_2NH_2$

(3 marks)

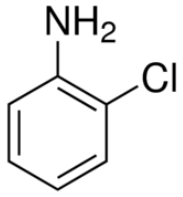
(ii) $C_6H_5CH(CH_3)CH_2NH_2$

(3 marks)

(iii) $CH_3CH(CH_3)NH(CH_3)$

(3 marks)

(iv)



(3 marks)

(b) Arrange the following compounds in increasing order of boiling point.

$CH_3CH_2CH_2OH$, $CH_3CH_2CH_2CH_3$, $(CH_3)_2CHNHCH_3$, $CH_3CH_2CH_2NH_2$

(2 marks)

(c) Suggest how to prepare N-ethylhexanamide from a carboxylic acid and an amine.

(4 marks)

(d) State the name of the processes in

W	Metabolic reaction pathways that break down food molecules and release biochemical energy
X	Sum total of all biochemical reactions that take place in living organism
Y	Metabolic reactions that build larger biological molecules from smaller pieces.

(3 marks)

(e) State the FOUR stages that food molecules undergo to provide energy.

(4 marks)

(TOTAL: 25 MARKS)

-THE END-