



EDO UNIVERSITY, IYAMHO, EDO STATE
FACULTY OF SCIENCE, DEPARTMENT OF CHEMISTRY
SECOND SEMESTER EXAMINATION, 2016/17 SESSION

COURSE CODE: CHM 123

COURSE TITLE: INTRODUCTORY CHEMISTRY II

INSTRUCTION: ANSWER AT LEAST ONE QUESTION FROM EACH SECTION AND FOUR (4) QUESTIONS IN ALL

TIME ALLOWED: 3 HOURS

SECTION A

QUESTION 1

- (a) i What is a chemical bond?
ii. In VSEPR model, what is the principle behind distribution of electron pair as it reflects the shape of molecules?
(b) Using the VSEPR model, predict the molecular geometry and bond angles of the following molecules: PF_5 , BrF_5 , NH_3 and XeF_4
iv. Predict the hybridization and bond angle around each central atom in the compounds below: BeCl_2 , PBr_5 , NH_3
- (b) i. List two characteristics of an organic compound that can be steam distilled?
ii. An organic compound A was steam distilled at an atmospheric pressure of 760mmHg. Of the 250cm^3 of the distillate, 200cm^3 was H_2O . The mixture boiled at which the vapour pressure of H_2O is 740mmHg. Given that the density of A is 1.22g/cm^3 . Calculate the molecular mass of A. (Assume the density of water to be 1g/cm^3)

Question 2

- (a) 50cm^3 of water containing 2g of caffeine was extracted with 20cm^3 of ether. Given that the partition coefficient between ether and water is 8, calculate the mass of caffeine extracted.
- (b) 1.62g of an unknown organic compound containing only carbon, hydrogen and oxygen gave 2.64g of CO_2 and 0.9g of H_2O on complete combustion.
- i. Determine the empirical formula of the compound.
- ii. What is the molecular formula of the compound if its relative molecular mass is 180?
- (c) The structure of D-erythrose is given below:
- $$\begin{array}{c} \text{CHO} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_2\text{OH} \end{array}$$
- i. How many chiral centres are there in the molecule?
ii. Draw the structures of all the possible stereoisomers
iii. From 2(c)ii above, list the pair (s) of enantiomers and diastereomers

Section B

Question 3

(a) When 2-methylbut-2-ene reacts with HBr, the major product is 2-bromo-2-methylbutane. Propose a mechanism for this reaction, and explain why the second product is not observed.

(b) Predict with reasons the member of the following pairs that will be more acidic.

i. ethanol or 2-chloroethanol

ii. 2-methylpropan-2-ol or 2-chloropropan-2-ol

(c) Write briefly on the following and give one example for each:

i. carbonium ion ii. electrophile iii nucleophile iv. Tautomers

(d) Give the structure and name of a member of the following groups of compounds with only two carbons.

i. ester ii. Acid chloride iii. Acid anhydride iv. Amide

Question 4

(a) Show how you would accomplish the following synthetic conversions.

i. 2-methylbutan-2-ol to 2-bromo-2-methylbutane

ii. Butanal to butanoic acid

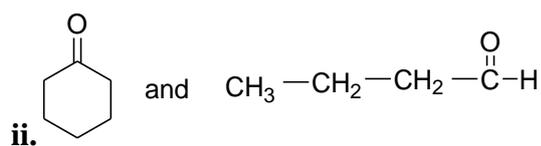
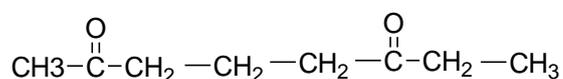
(b) Using specific examples, give any chemical test to differentiate between the following

i. Internal alkyne and terminal alkyne

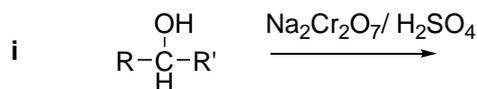
ii. Aldehydes and ketones

(c) Give structures of the alkenes that would give the following products upon ozonolysis–reduction.

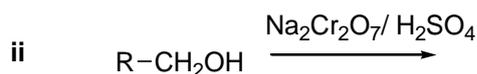
i.



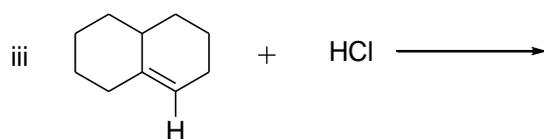
b. Give the products of the following reactions



secondary alcohol

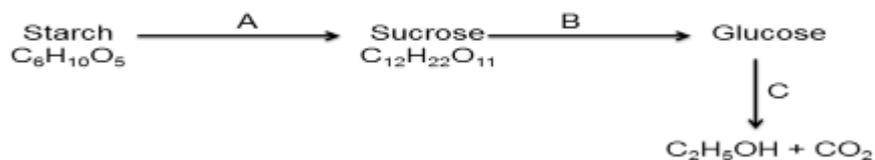


primary alcohol



Section C

Question 5



- (a) Identify the enzymes A, B and C
- (b) Draw the structure of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)
- (c) Differentiate between glucose and sucrose based on the following classifications:
 - i. Number of carbon atoms
 - ii. Functional group
 - iii. Hydrolysis
- (d) Give the names of three catalysts which can be used for the **oxidation** of glucose
- (e) Draw the structure and give the common name of the product formed when glucose is oxidized

Question 6

- (a) State one similarity and three differences between a saturated fatty acid and an unsaturated fatty acid
- (b) Write the general molecular formula for a saturated fatty acid; hence write the chemical formula of the saturated fatty acid with 6 to 9 carbon atoms
- (c) Differentiate between lipids and proteins based on the following: (i) Functional group (ii) Monomer unit (iii) Bond holding the monomers
- (d) Highlight any two differences between soaps and detergents