UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
Department of Environmental Health Science

FINAL EXAMINATION PAPER 2016

TITLE OF PAPER	:	ORGANIC CHEMISTRY FOR HEALTH SCIENCES
COURSE CODE	:	EHS 112
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER **ANY FOUR** QUESTIONS
	:	EACH QUESTION **CARRIES 25** MARKS.
	:	WRITE NEATLY & CLEARLY
	:	NO PAPER SHOULD BE BROUGHT INTO OR OUT OF THE EXAMINATION ROOM.
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

QUESTION ONE

a. Hydrocarbon A has the formula C_9H_{12} and absorbs 3 equivalents of hydrogen to yield B, C_9H_{18}, when hydrogenated over a Pd/C catalyst. **[4 Marks]**

b. _____ is the ability of carbon to form long chains with itself therefore creating millions of organic compounds. **[2 Marks]**

c. Organic compounds contain heteroatoms such as H, N, O, S, P and _____. **[2 Marks]**

d. Benzene contains only _____ hybridised carbons. **[2 Marks]**

e. Draw saturated structures for the following compounds and fill in non-bonding valence electrons where they can be found.

i) 1,2 dichloroethane

ii) Carbon monoxide

iii) Methanol

iv) 2,4' dichloro biphenyl

v) 2-bromo-4-methoxyhexanal **[15 Marks]**

QUESTION TWO

a. PCBs are synthetic chlorinated hydrocarbons that have been used extensively since 1930 for a variety of industrial uses. PCBs have been shown to present a threat to human health and the environment because of their chemical stability and persistence.

(i) Draw three examples of PCBs and name each compound **[6 Marks]**

(ii) Under what international convention was the production of these compounds banned **[2 Marks]**

b. Natural organic matter is derived from the decomposition of naturally occurring material in water.

(i) Name any four classes of organic compounds that make up NOM **[8 Marks]**

(ii) What are the water treatment problems associated with the presence of NOM? Give a brief discussion on how these problems occur. **[9 Marks]**

QUESTION THREE

a. Account for the following facts;

(i) The boiling point of ethanol is 78.4 °C while the boiling point of ethane is -89 °C

(ii) Ethene is not soluble in water yet ethanol is soluble in water

[10 Marks]

b. Draw structures of the compounds described below and give the IUPAC name for each structure

(i) An aromatic compound containing one benzene ring and a single carboxyl group which is *ortho* to a bromo group and *para* to a hydroxyl group.

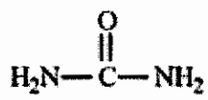
(ii) A straight chain of eight carbons with two methyl groups on the second carbon, an *iso*propyl group on the fourth carbon and a carbonyl group on the eighth carbon.

(iii) An unsaturated compound, C_3H_6, undergoes a halogenation reaction to produce dichloride product, A. Draw the molecular structure of Product A.

[15 Marks]

QUESTION FOUR

a) Consider the structure of urea shown below and answer the following questions



i) Fill in the non-bonding valence electrons that are missing from the line bond structure

ii) Determine the hybridization of the carbon atom

iii) Predict the bond angle of NH_2–C=O in urea **[9 Marks]**

b) There are two molecules with the molecular formula C_2H_7N. Draw them and describe how they differ. **[6 Marks]**

c) What is the difference between substitution and addition reactions? Give examples of each type of reaction. **[4 Marks]**

d) Draw all structural isomers of pentene, C_5H_{10}, that have unbranched carbon chains. **[6 Marks]**

QUESTION FIVE

a. Give the molecular formular of a hydrocarbon containing five carbon atoms that is;

(i) An alkane

(ii) Cycloalkane

(iii) An alkene

(iv) An alkyne.

[Marks 8]

b. Explain why the molecular formulars of the answers given in a. (i) and (ii) are different. **[Marks 4]**

c. Using appropriate examples, explain the difference between

(i) Alkane and an alkyl group

(ii) A saturated and unsaturated hydrocarbon

(iii) A branched and a straight chain hydrocarbon

(iv) Benzene and cyclohexane

[8 Marks]

d. Write a balanced chemical equation for the reaction of 2-pentene and bromine.

[5 Marks]

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