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

DEGREE IN NURSING SCIENCE  

FINAL EXAMINATION PAPER 2015  

TITLE OF PAPER : ORGANIC CHEMISTRY AND BIOCHEMISTRY FOR NURSES  
COURSE CODE : GNS :12  
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 UNLESS PERMITTED BY THE INVIGILATOR.
QUESTION ONE

a) 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 dioxide
   iii) Methanol
   iv) 4,5 divinyl octane
   v) 2-bromo-4-methoxyhexanal

   [10 Marks]

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

\[ \begin{array}{c}
\text{H} \quad \text{N} \\
\text{O} \\
\text{C} \quad \text{NH}_2 \\
\end{array} \]

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

   [6 Marks]

ii) Determine the hybridization of the carbon atom.

   [3 Marks]

c) There are two molecules with the molecular formula C₂H₂N. Draw them and describe how they differ.

   [6 Marks]

QUESTION TWO

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 isopropyl group on the fourth carbon and a carboxyl group on the eighth carbon.
(iii) An unsaturated compound, \( \text{C}_2\text{H}_4 \), undergoes a halogenation reaction to produce dichloride product, \( \text{A} \). Draw the molecular structure of Product A. [15 Marks]

**QUESTION THREE**

a. ____________ is the ability of carbon to form long chains with itself therefore creating millions of organic compounds. [3 Marks]

b. Organic compounds contain heteroatoms such as H, N, O, S, P and ____________. [3 Marks]

c. Benzene contains only ____________ hybridised carbons. [3 Marks]

d. Account for the following facts;

(iii) The boiling point of ethanol is 78.4 °C while the boiling point of ethane is -88 °C

(iv) Ethene is not soluble in water yet ethanal is soluble in water [10 Marks]

e. Give the molecular formulae of a hydrocarbon containing four carbon atoms that is;

(i) An alkane

(ii) Cycloalkane

(iii) An alkene [6 Marks]

**QUESTION FOUR**

a. Explain what is meant by the term ‘anticoagulant’ and give three examples of anticoagulants [6 Marks]

b. What is the difference between blood serum and blood plasma [4 Marks]

c. Steroids are a class of biomolecules made up of three six-membered carbon rings and one five-membered ring with an aliphatic chain attached on the five carbon ring. Give three examples of steroids and give the function of each example. [6 Marks]
d. Explain how antioxidant enzymes function and give three examples of antioxidant enzymes. (use chemical equations in your answer) [9 Marks]

QUESTION FIVE

a. Write explanatory notes on the following carbohydrates. Include examples in your explanations
   (i) Simple
   (ii) Storage
   (iii) Structural [9 Marks]

b. State four properties of enzymes. [8 Marks]

c. Explain how temperature and pH affects the activity of enzymes in biological systems. [8 Marks]