THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

JANUARY – APRIL 2014 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCE

SCHOOL FOCUSED PROGRAMME

CHEM 100: INTRODUCTION TO LABORATORY TECHNIQUES

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

Q1. a) The amount of a substance extracted from an aqueous solution using an organic solvent can be obtained using the equation

$$W_1 = W_0\left(\frac{K_D V_{aq}}{K_D V_{aq} + V_{org}}\right)^n$$

i) Define all the terms. **(6 marks)**

ii) Suppose 30g of an aqueous solution of P in 200mL of water is to be extracted using dichloromethane. How much of P is left in the aqueous phase when the following quantities of dichloromethane is used:
I) 200mL once
II) Four 50mL portions
Comment on your results.
(Distribution ratio Dichloromethane/water = 3). **(7 marks)**

b) i) When do we use mixed melting point method? **(6 marks)**

ii) By means of a typical illustration using three compounds (X, Y and Z) explain how the mixed melting point method is used. **(6 marks)**

c) List **FIVE** types of fire extinguisher likely to be found in a laboratory. **5 marks)**

Q2. a) i) What is Thin layer chromatography? **(3 marks)**

ii) Draw a simple diagram illustrating how TLC is performed. **(5 marks)**

iii) Describe **TWO** ways of identification of colourless spots on a TLC plate. **(4 marks)**

b) Explain **FOUR** uses of TLC in the laboratory. **(8 marks)**

Q3. a) By means of a suitable diagram explain how a bubble plate column work. **(8 marks)**

b) Name a suitable drying agent for each of the following types of compounds:

i) Alcohols
ii) Ketones
iii) Hydrocarbons
iv) Organic acids
v) Alkyl halides **(5 marks)**

c) Make a sketch of the apparatus employed in steam distillation of plant volatiles and state the requirements for the actual practical use of steam distillation in the laboratory. **(7 marks)**

Q4. a) Explain how the various categories of impurities encountered in purification of an organic sample are removed. **(8 marks)**

b) Outline the procedures employed during the recrystallization of an impure sample citing the factors to consider in the choice of solvent used. **(12 marks)**

Q5. a) i) When do we use vacuum distillation in the laboratory? **(3 marks)**

ii) List **TWO** types of equipments used only for vacuum distillation. **(2 marks)**

b) List **FIVE** precautions to observe when carrying out vacuum distillation. **(5 marks)**

c) i) Differentiate between a batch and continuous distillation. **(4 marks)**

ii) Draw **SIX** pieces of quickfit apparatus used in simple distillation. **(6 marks)**

END