UNIVERSITY OF EMBU

2017/2018 ACADEMIC YEAR

SECOND SEMESTER EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INDUSTRIAL CHEMISTRY AND ANALYTICAL CHEMISTRY

SCI 202: INTRODUCTION TO UNIT OPERATION

DATE: APRIL 3, 2018 **TIME: 11:00AM-1;00PM**

INSTRUCTIONS:

Answer Question ONE and ANY other two Questions

QUESTION ONE (30 MARKS)

a) Name the three most important characteristics of an individual particle (3 marks)

b) Define the following terms as used in unit operation. (3 marks)

i) Unit operation

ii) Unit Process

iii) Material Balance

c) Explain the importance of size reduction in the chemical industry (3 marks)

d) The economic construction and efficient operation of a process unit will depend on how well the plant and equipment specified on the process flow-sheet is laid out. Briefly describe three principal factors to be considered for plant layout. (3 marks)

e) List three properties to be considered when selecting materials of construction (3 marks)

f) What is dust collection as applied to gas solid separation? (2 marks)

g) Explain the importance of dust collection in the Chemical plant (3 marks)

h) What is size enlargement? (2 marks)

i) Outline purposes of size enlargement in the chemical industry (3 marks)

j) Distinguish between commodity chemicals and specialty chemicals (2 marks)

k) Explain the following unit operations: (3 marks).

   i) Evaporation

   ii) Froth Flotation.

   iii) Crystallization.

QUESTION TWO (20 MARKS)

a) Who is a chemical engineer from the point of view of Unit Operation (2 marks)

b) Explain how Evaporation differs from drying, distillation and crystallization (3 marks)

c) Briefly explain any five important steps involved in Unit Operation. (5 marks)

d) The physical and chemical properties of the liquid to be operated determines the design of the unit. Describe how two properties listed below might change during evaporation

   i) Temperature.

   ii) Scaling (6 marks)

e) Briefly describe the unit operation involved in petroleum industry from crude oil to the consumer (4 marks).

QUESTION THREE (20 MARKS)

a) Distinguish between agitation and mixing (4 marks)

b) Define the following terms as used in water treatment (6 marks)

   i) Flocculants

   ii) Sedimentation

   iii) Coagulation

c) How useful are the flowsheets to the chemical engineer (5 marks)

d) The amount of information shown on a process flow diagram (PFD) depends on the custom and practice of the particular design office or company. Outline the essential information required on the PFD. (5 marks).

QUESTION FOUR (20 MARKS)

a) Distinguish between batch processes and continuous processes. (2 marks).

b) With aid of a diagram, describe the basic components of chemical processes (12 marks).

c) Describe three factors to be considered when selecting raw material for the chemical industry. (6 marks).

QUESTION FIVE (20 MARKS)

a) Define cleaner production. How is it achieved? (4 marks).

b) Explain four functional components of integrated solid waste management (8 marks).

c) Briefly describe the main causes of Industrial pollution (8 marks).

--END--