



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE (ANALYTICAL CHEMISTRY WITH MANAGEMENT)

SCH 107: INTRODUCTION TO INDUSTRIAL CHEMISTRY

DATE: MONDAY, 2ND APRIL, 2012

TIME: 2.00 P.M. – 4.00 P.M.

INSTRUCTIONS

Answer ALL questions.

1. The marks associated with each question are indicated in the margins
2. Use diagrams and chemical equations wherever possible

Question 1.

- a) Batch and continuous processing are principal methods employed in industries. Briefly state the major differences between the two types of processing. [3 marks]
- b)
 - i) What is evaporation and how does it differ from distillation? [1+1=2 marks]
 - ii) Explain, in detail the single-effect evaporation system. [4 + 2= 6 marks]
- c) How will you differentiate gravity and centrifugal sedimentations and explain the continuous-flow-rake type settler for slowly? [2+2+2+1= 7 marks]
- d) Quality control is very important to any country such as KENYA. State any four general services provided by full pledged national quality control laboratory e.g the Kenya Bureau of Standards in Kenya. [2 marks]

Question 2.

- a) To set up a chemical plant, one has to consider the costs involved. One such type of cost is the capital cost. Apart from the cost of building materials there are other features that highly increase the capital cost. State any THREE of these features and explain how each increases the cost. [3marks]
- b)
 - i) What do you understand by the term “Drying of solids and how is drying conducted industrially by using two basic methods? [1+ 1¹/₂+ 1¹/₂= 4 marks]
 - ii) Explain, the types of driers and their processes, used for:
 - a) Vacuum drying of slurries and thick pastes. [2+1= 3 marks]
 - b) Drying of granular materials [2+ 1= 3 marks]

- c) Discuss, in detail , any THREE of the following topics:
- i) Continuous submerged isohydric drum crystallizer.[2+1=3 marks]
 - ii) Flat – septum gas filters [2+ 1=3 marks]
 - iii) Paddle agitators (For very thick slurries) [2+1=3 marks]
 - iv) Evaporation by Thermo compression. [2+1=3 marks]
 - v) In selecting the location of a chemical plant; explain the followings;
 - i) Sources of power. [$1\frac{1}{2}$ marks]
 - ii) Consumer markets [$1\frac{1}{2}$ marks]

Questions 3

- a) Sodium hydroxide can be made in the laboratory by purring some sodium carbonate solution in the test- tube and adding some solid calcium hydroxide both from the store. The test-tube is then shaken to mix the reactants and Heated to the required temperature.The precipitate of calcium carbonate formed is either allowed for setting and Decanting OR Separated. The solution of Sodium hydroxide is then analyzed for purity and the precipitate discarded. There are several operations that takes place in the above process. State how the underlined operations are usually achieved in most industries and also give its chemical reaction which occurs during the process.

[1 $\frac{1}{2}$ +1 $\frac{1}{2}$ +1 $\frac{1}{2}$ +1 = 5 $\frac{1}{2}$ marks]

- b) i) Define the term research and development and explain its significance in any industry. [3 marks]
- ii) Three moles of ethane were passed through a hydrolyser with five moles of water in acidic medium. Analysis of the effluents indicated the following : 2.874 moles of unreacted ethane, 4.875 moles of water and selectivity of the process is 95%. Calculate the conversion of ethane to ethanol and hence amount of ethanol formed. [3 marks]
- c) In terms of research objectives list any TWO major differences between academic and industrial research. [3 marks]
- d) Apart from studying industrial Chemistry in the lecture theatres, it is advisable to pay visits to some selected factories. In your own view, state briefly and precisely the gains of such visits. [4 marks]
- e) Define the term “ Distillation” and explain, in detail, the continuous distillation system (Intended to separate the feed stock into two components i.e Binary distillation). [2+ 3+1 $\frac{1}{2}$ = 6 $\frac{1}{2}$ marks]