DEPARTMENT OF CHEMISTRY
SCHOOL OF NATURAL AND APPLIED SCIENCE
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
FIRST SEMESTER EXAMINATION 2012/2013 SESSION

COURSE CODE: CHM 317
COURSE TITLE: INDUSTRIAL CHEMICAL PROCESS I **UNIT: 2**
TIME ALLOWED: 2 HOURS
INSTRUCTION: ANSWER QUESTION (1) AND ANY OTHER TWO

1. a.i. What is an industrial chemical process?

   ii. Outline and explain briefly the different industrial chemical processes.

   iii. Give five methods by which raw materials could be rationally utilized.

   b. Methanol is oxidized using Cr^{6+} as shown in the equation below:

   $$CH_3OH_{(aq)} + {}^1/_2\, O_{2(g)} \rightarrow HCHO_{(aq)} + H_2O_{(l)} + by\ products$$

   When 5.2 moles of methanol were used for oxidation, a total of 3.2 moles of methanal and 1.2 moles of by- product were produced leaving 0.8 moles of methanol unoxidized. Calculate:

   i. the degree of conversion of methanol.

   ii. the percentage yield of methanal.

   iii. the process selectivity with respect to methanal.

   c.i. What is a production flow diagram?

   ii. Using a flow diagram only, sketch the production of ethanol from ethane.

   iii. State five uses of ethanol.

2. a. Define the term optimal process condition?

   b. Outline four operations and the equipment employed in the industrial production of ethanoic acid by the oxidation of ethanol.

   c. Explain the following terms;

   i. Mass transfer.

   ii. Energy balance.

   iii. Material balance.

3. a. State the technical and economic indices that could be used to determine the efficiency of a production process

   b. In the industrial production of ethyne by dehydrogenation of ethane, one of the side reactions that occur is cracking. How can this be controlled in order to increase the yield of ethyne?

   c. Outline finished products that could be derived from the following;

   i. Air

   ii. Petroleum

   iii. Sodium Chloride (NaCl)

4. a. Outline and explain the organizational stages of the chemical plant.

   b. Briefly explain the term 'Beneficiation' and list four beneficiation methods.

   c. Give four by-products of the industrial production of ethyne by dehydrogenation of ethane.