KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 400

COURSE TITLE: INDUSTRIAL CHEMISTRY

DURATION: 2 HOURS

DATE: 27TH SEPTEMBER 2017 TIME: 3 – 5PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **5** printed pages. Please Turn Over

KIBU observes ZERO tolerance to examination cheating

Question One (30 Marks)

a) What are petrochemicals? [01]

b) State any FOUR industrial uses of petro chemicals [02]

c) Using a suitable diagram/schematic chart, show how primary petrochemicals are produced in an oil refinery. [04]

d)

i. Describe the composition of crude oil. [01]

ii. What are the environmental implications of oil exploration. [03]

e) Ethylene is widely used in petrochemical industry as raw material for the production of plastics and industrial chemicals.

i. Ethylene is produced industrially by **cracking**. Explain the meaning of cracking. [01]

ii. Differantiate between Thermal cracking and catalytic cracking. [02]

iii. Explain the advantages of catalytic cracking over steam cracking. [02]

f) Ethanol and Ethan-1,2-diol (Ethylene glycol) are some of the chemicals that can be produced from ethylene.

i. Write the chemical equations to show how ethanol and glycol are produced clearly indicating the conditions. [02]

ii. State One industrial use for

-Ethanol [01]

-Ethylene glycol. [01]

g)

i) Ethylene can, treated differently form the following key monomers in industry.

- Vinyl chloride
- Styrene

Draw structures for the two monomers. [02]

ii) Why are additives added to polymers? Differantiate between stabilizers and plasticisers. [03]

iii) State two forms of polysterene [02]

iv) The development of polymers have had a huge impact on society and environment; including manufacture of plastic bottles, disposable medical instruments and packaging materials. State any TWO advantages and disadvantages of plastics [03]

Question Two (20 marks)

a) Define the following terms

i. A dye [01]

ii. A pigment [01]

iii. Chromophore [01]

iv. Auxochrome [01]

b) State any four properties of a good dye. [02]

c) State any seven different classes of dyes. [01]

d) Differentiate between an acid dye and a basic dye.Give examples of each. [02]

e) Methyl orange is a typical Azo dye.

i. What are Azo dyes [01]

ii. State any two properties of MO [02]

iii. State one key use of MO [01]

iv. Why is MO not used as a fabric dye. [01]

i) What is the structure of a molecule of Methyl orange [02]

ii) Propose a mechanism for the synthesis of MO starting with benzene. [04]

iii) How can the colour of an Azo dye be modified? [01]

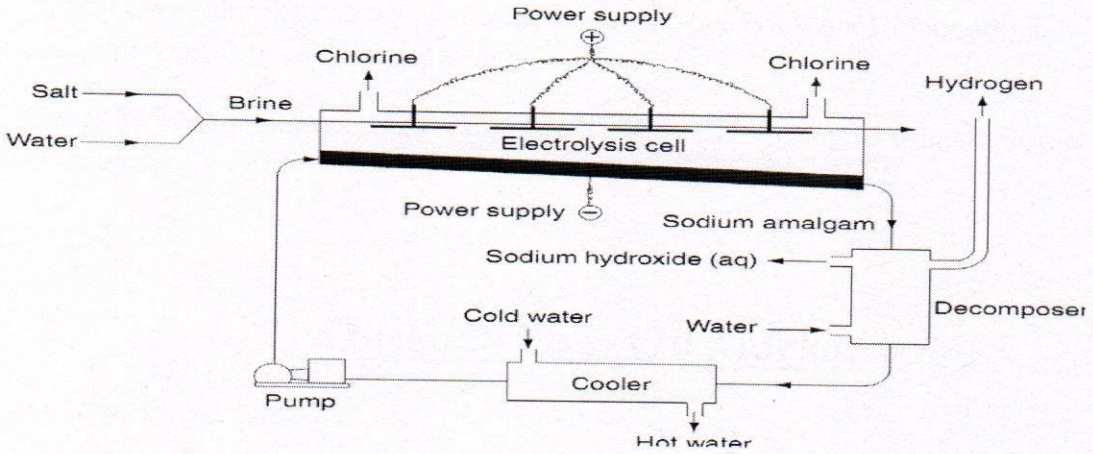
Question Three (20 Marks)

(a)

i) Sodium carbonate (soda ash) is among top 10 important inorganic chemicals in industry. Describe **TWO** industrial large scale processes of producing soda ash. [05]

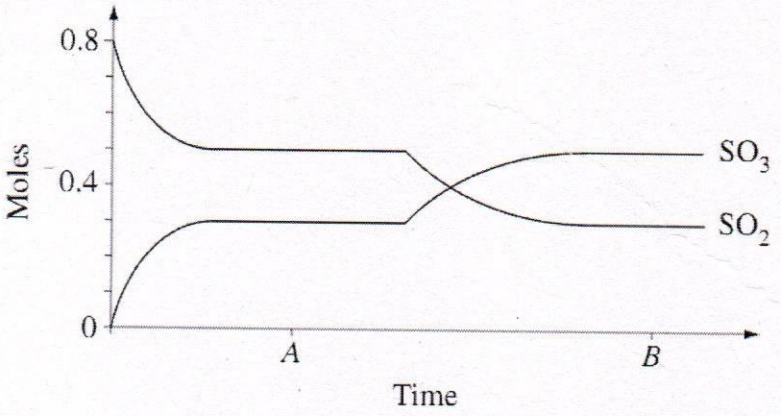
ii) State **SIX** industrial uses of soda ash ? [03]

iii) Identify the type of cell shown and outline the process used in the extraction of sodium hydroxide. [01]



b) Compare the electrolysis of molten sodium chloride and aqueous sodium chloride. Write the relevant half equations and overall reaction for each process. **[02]**

c) At room temperature 0.80 moles of SO2 and 0.40 moles of O2 were introduced into a sealed 10 L vessel and allowed to come to equilibrium.



d) Write the equilibrium constant expression and calculate the value for the equilibrium constant at time A. **[02]**

e) Explain why a new equilibrium position was established at time B. **[01]**

f) The equation represents a reaction that can be performed in a school laboratory.

$$\text{Oil} + 3\boxed{\text{A}} \rightarrow 3\text{KOC}(=\text{O})(\text{CH}_2)_{14}\text{CH}_3 + \text{Glycerol}$$

Identify both this type of reaction and the reactant A. **[02]**

(ii) Describe how this type of reaction could be carried out in a school laboratory including specific safety precautions for this process. **[02]**

(e) Assess both the importance and resulting environmental impacts of using limestone in the Solvay process. **[02]**

Question Four (20 Marks)

a) What are pesticides? **[01]**

b)

i. State any **Four** classes of pesticides by target. **[04]**

ii. State any **three** types of pesticides according to chemical families. **[03]**

iii. Explain briefly how a pesticides works. **[02]**

c)

i) What are '**carriers**' as used in pesticides and pest control? **[01]**

ii) Examples of pesticide carriers **[02]**

d) Discuss the environmental impact of using pesticides. **[03]**

e) Different techniques are employed by industry to recover priority pollutants during pesticide manufacturing. Explain any FOUR techniques of controlling pollutants by pesticides at source. **[04]**