



# KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**FOURTH YEAR SECOND SEMESTER  
SPECIAL/SUPPLEMENTARY EXAMINATIONS**

**FOR THE DEGREE OF B.ED (SCIENCE) AND BSC (CHEMISTRY)**

**COURSE CODE: SCH 400**

**COURSE TITLE: INDUSTRIAL CHEMISTRY**

**DURATION: 2 HOURS**

**DATE: 18/1/2022**

**TIME: 2-4PM**

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## 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 4 printed pages. Please Turn Over



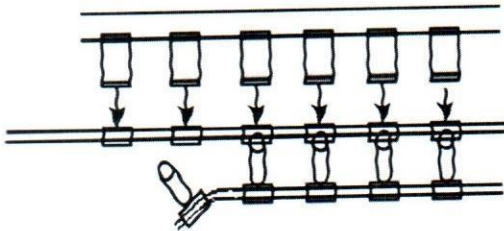
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## Question one (30 marks)

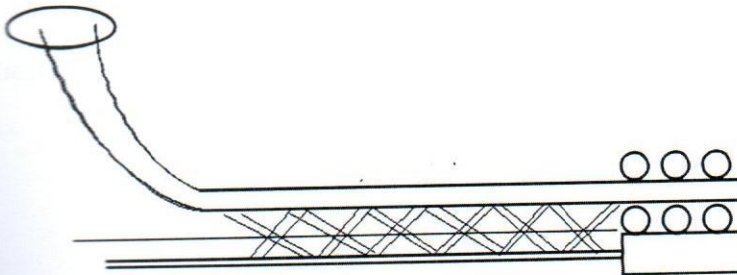
- a) What are petrochemicals? [01]
- b) State any FOUR industrial uses of petro chemicals. [02]
- c) Using a suitable diagram/schematic chart, show how primary petrochemicals are produced in an oil refinery. [03]
- d) Ethylene is widely used in petrochemical industry as raw material for the production of plastics and industrial chemicals.
- i. Ethylene is produced industrially by **cracking**. Explain the meaning of cracking. [02]
  - ii. Differentiate between Thermal cracking and catalytic cracking. [02]
  - iii. Explain the advantages of catalytic cracking over steam cracking. [03]
- e) 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 TWO industrial uses for
    - Ethanol [02]
    - Ethylene glycol. [02]
- g)
- i) Ethylene can, treated differently form the following key monomers in industry.
    - Vinyl chloride
    - StyreneDraw structures for the two monomers. [02]
  - ii) Why are additives added to polymers? Differentiate 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 [04]

## Question two (20 Marks)

- a) What are the main components of glass? In what ratio are the main components mixed? [02]
- b) Describe the processes involved in glass production? [02]
- c) How is colored glass made? [01]
- d) How is reflective glass made? [01]
- e) Why does glass protect against UV rays? [01]
- f) How are ceramics produced from glass? [01]
- g) How are raw materials 'fed' into the furnace? [02]
- h) Describe the method is used for the production of hollow glasses? [02]
- i) The following are methods of forming, used to produce sheet glass? Which operation does the below figure represent? Explain. [02]



- j) Which forming operation does the below figure represent? [02]



- k) What is Glass transition temperature? [02]

- 1) Generally, materials experience either ductile or brittle type of fractures. Differentiate between Brittle and Ductile fractures. [02]

### Question Three (20 Marks)

- a) What are pesticides? [02]
- b)
- i. State any **Four** classes of pesticides by target organism: [02]
  - ii. State any **three** types of pesticides according to chemical families. [02]
  - iii. Explain briefly how a pesticides works. [04]
- c)
- i) What are '**carriers**' as used in pesticides and pest control? [02]
  - ii) Examples of pesticide carriers. [02]
- d) Discuss the environmental impact of using pesticides. [02]
- 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]

### Question four (20 Marks)

- a) What are catalysts? Why is it necessary to add catalysts in the course of a reaction? [02]
- b) During synthesis for a homogeneous, organometallic catalyst, state THREE important criteria to be considered. [03]
- c) Some compounds are applied as a catalysts or catalyst precursors in different processes. State any TWO and the processes where they are applied. [02]
- d) Hydroformylation of alkenes may lead to alcohol and aldehyde products. The reaction is Stereoselective, and chemoselective. Differentiate between stereoselectivity and chemoselectivity. Explain how each affects the overall reaction. [02]
- e) Explain the mechanism for chemisorption of CO on a metal (M) surface? [02]
- f) What are catalytic converters. How do they work? [02]
- g) What are zeolites? Explain how they are used as catalysts. [02]
- h) What would be the main reason for replacing the  $\text{PPh}_3$  ligands in a catalyst by  $\text{P}(\text{C}_6\text{H}_4\text{SO}_3^-)_3$  ligands? [02]
- i) Explain the use of Ziegler-Natta catalysis in industry: [01]
- j) Explain the use of catalysts in the industrial Haber process for  $\text{NH}_3$  production? [02]

### Question five (20 marks)

- a) Define the following terms
- i. A dye [01]
  - ii. A pigment [01]
  - iii. Chromophore [01]
  - iv. Auxochrome
- b) State any four properties of a good dye. [02]
- c) State any EIGHT different classes of dyes. [04]
- 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. [01]
  - iii. State one key use of MO. [01]
  - iv. Why is MO not used as a fabric dye. [01]
- f)
- i) What is the structure of a molecule of Methyl orange. [02]
  - ii) Propose a mechanism for the synthesis of MO starting with benzene. [02]
  - iii) How can the colour of an Azo dye be modified? [01]