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KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**FOURTH YEAR SECOND SEMESTER
SUPPLEMENTARY EXAMINATIONS**

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 421/421*

COURSE TITLE: INDUSTRIAL CHEMISTRY

DURATION: 2 HOURS

DATE: 23/11/2022

TIME: 8:00AM-10:00AM

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)
- Describe the composition of crude oil. [01]
 - 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.
- Ethylene is produced industrially by **cracking**. Explain the meaning of cracking. [01]
 - Differentiate between Thermal cracking and catalytic cracking. [02]
 - 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.
- Write the chemical equations to show how ethanol and glycol are produced clearly indicating the conditions. [02]
 - State One industrial use for
 - Ethanol [01]
 - Ethylene glycol. [01]
- g)
- Ethylene can, treated differently form the following key monomers in industry.
 - Vinyl chloride
 - StyreneDraw structures for the two monomers. [02]
 - Why are additives added to polymers? Differentiate between stabilizers and plasticisers. [03]
 - State two forms of polysterene [02]
 - 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) 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 catalysts or catalyst precursors in different processes. State any TWO such catalysts 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 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 NH_3 production? [02]

Question Four (20 Marks)

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- a) What are Agrochemicals? [01]
- b)
- i. State any **Four** classes of pesticides by target. [02]
 - 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? Discuss the different types of pesticide formulations coomonly used. [02]
 - 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]
- f) What are IRAC numbers? Why are they important in pest control? [01]

END