

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN  
INDUSTRIAL CHEMISTRY

CHIN 326: PETROCHEMICAL INDUSTRIES

STREAMS: BSC (IND CHEM)

TIME: 2 HOURS

DAY/DATE: MONDAY 05/07/2021

8.30 A.M. – 10.30 A.M.

## INSTRUCTIONS:

- Answer question **One** (Compulsory) and any other **Two** questions.

**QUESTION ONE [30 MARKS]**

(a) Discuss technologies that are used to clean natural gas before domestic consumption.

(6 marks)

(b) Describe, with the aid of relevant equations, the steam cracking of ethane in the petrochemical industries.

(6 marks)

(c) Explain, using relevant equations, how the following chemicals are manufactured from ethylene.

(8 marks)

(i) Ethylene oxide      (ii) Acetaldehyde

(d) Describe the Montedison-UOP process for ammoxidation of propylene

(4 marks)

(e) Discuss the production and uses of maleic anhydride from n-butenes

(6 marks)

**QUESTION TWO [20 MARKS]**

(a) Describe, with the aid of relevant equations, the catalytic reforming of naphtha. (6 marks)

(b) Describe, using a flow diagram, the Union Carbide UNIPOL process for production of polyethylene. (4 marks)

(c) Discuss the industrial production of acrylic acid from propylene. (4 marks)

(d) Explain the sources and uses of xylenes in the petrochemical industry. (6 marks)

**QUESTION THREE [20 MARKS]**

- (a) Describe the catalytic cracking of gas oil in the petrochemical industry. **(6 marks)**
- (b) Discuss the industrial hydroformylation of propylene. **(4 marks)**
- (c) Describe using equations the production of the following chemicals from toluene. **(10 marks)**
- (i) Caprolactam    (ii) Toluene diisocyanates    (iii) Terephthalic acid

**QUESTION FOUR [20 MARKS]**

- (a) The production of polypropylene is the largest consumer of propene in the petrochemical industry.
- (i) Describe the industrial production of polypropylene. **(3 marks)**
- (ii) State four properties of isotactic polypropylene. **(2 marks)**
- (iii) Give four major uses of polypropylene. **(2 marks)**
- (iv) Write the stepwise mechanism for polymerization of propylene using organometallic zirconium complexes. **(3 marks)**
- (b) Discuss the industrial production and uses of the following chemicals from benzene **(10 marks)**
- (i) Phenol    (ii) Aniline    (iii) Styrene    (iv) Cyclohexane
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