

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATIONS

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

CHEM 447: INDUSTRIAL AND APPLIED CHEMISTRY II

STREAMS: BSC (CHEM)

TIME: 2 HOURS

DAY/DATE: MONDAY 22/03/2021

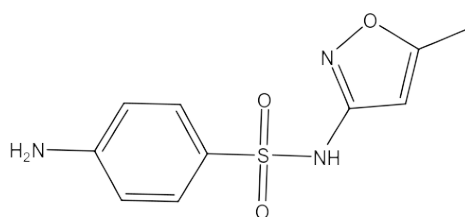
8.30 A.M. – 10.30 A.M.

## INSTRUCTIONS:

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

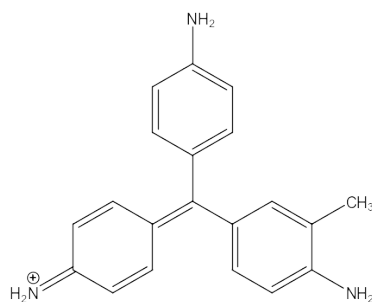
**QUESTION ONE [30 MARKS]**

- (a) Describe the atmospheric fractional distillation of crude oil. **(3 marks)**
- (b) State the effect(s) of the major contaminants in natural gas. **(3 marks)**
- (c) Explain the technologies that are used to remove contaminants from natural gas **(3 marks)**
- (d) Describe the production, properties and uses of high density polyethylene. **(5 marks)**
- (e) Design a stepwise method for synthesis of sulphamethoxazole, starting with benzene and any other reagent(s) of your choice **(6 marks)**



sulphamethoxazole

- (f) Design a stepwise method of preparing rosaniline from benzaldehyde and other reagents of your choice **(6 marks)**



Rosaniline

(g) Describe the commercial manufacture of the following fertilizers: **(4 marks)**

- (i) Dipotassium hydrogen phosphate    (ii) Urea

### **QUESTION TWO [20 MARKS]**

(a) Steam cracking of hydrocarbons is the main route for production of light olefins:

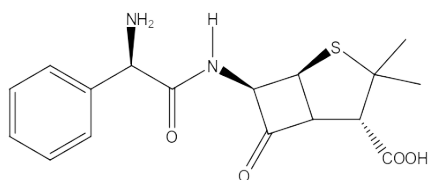
- (i) Describe the steam cracking process **(6 marks)**  
 (ii) Write the mechanism for the steam cracking of ethane **(4 marks)**  
 (b) Discuss the fermentation process for bulk production of penicillins **(5 marks)**  
 (c) Describe the industrial manufacture, properties and uses of polypropene **(5 marks)**

### **QUESTION THREE [20 MARKS]**

- (a) Discuss, with the aid of relevant equations, the chemical transformation(s) that occurs during the catalytic reforming of naphtha fractions **(8 marks)**  
 (b) Discuss the Kolbe-Schmidt method for production of aspirin **(5 marks)**  
 (c) Discuss the catalytic cracking of hydrocarbons **(7 marks)**

### **QUESTION FOUR [20 MARKS]**

- (a) Describe the industrial manufacture of the following chemicals from ethylene **(10 marks)**  
 (i) Vinyl chloride                      (ii) acetaldehyde                      (iii) vinyl acetate  
 (iv) styrene                              (v) ethanol  
 (b) Discuss the semi-synthetic acid chloride process for commercial production of ampicillin **(6 marks)**



Ampicillin

(c) Explain the mode of action of the following antibiotics **(4 marks)**

(i) Cephalosporins (ii) Sulfonamides (iii) Quinolones (iv) Tetracycline

---