CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

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

CHEM 443: INDUSTRIAL AND APPLIED CHEMISTRY II

STREAMS: BSC CHEMISTRY **TIME: 2 HOURS**
DAY/DATE: THURSDAY 23/09/2021 **5.00 P.M – 7.00 P.M.**

INSTRUCTIONS:

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

QUESTION ONE [30 MARKS]

(a) (i) Discuss the fractional distillation of crude oil. (**3 marks**)

(ii) State the major uses of fractions obtained after fractional distillation of crude oil. (**2 marks**)

(b) Describe the industrial production of the following chemicals from ethylene. (**8 marks**)

(i) Styrene (ii) vinyl acetate (iii) 1,3-propanediol (iv) Butan-1-ol

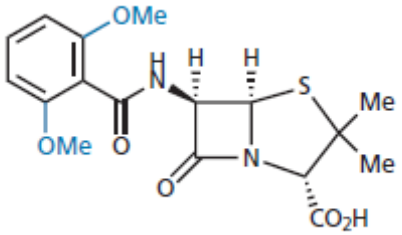
(c) Describe, with the aid of relevant equation(s) the industrial production of sodium hypochlorite from brine. (**5 marks**)

(d) Discuss the industrial production of the superphosphate fertilizer from apatite. (**5 marks**)

(e) Penicillins are extensively used as antibacterial agents

(i) Explain the mode of action of penicillins. (**1 mark**)

(ii) Describe the semi-synthetic method for industrial production of methicillin. (**4 marks**)

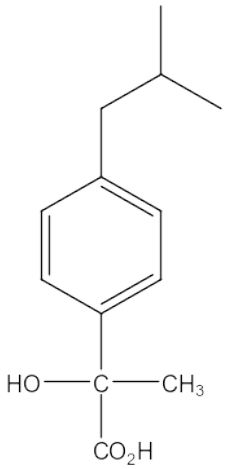


Methicillin

(iii) Explain two strategies that are used to overcome bacterial resistance to penicillins (**2 marks**)

QUESTION TWO [20 MARKS]

(a) Describe, with the aid of relevant equations, the industrial production of ibuprofen, a strong analgesic with anti-inflammatory activity. (**6 marks**)



Ibuprofen

(b) Discuss the steam cracking of ethane. (**10 marks**)

(c) Describe the fermentation method for industrial production of penicillins (**4 marks**)

QUESTION THREE [20 MARKS]

(a) (i) Discuss the industrial manufacture of low density polyethylene (**4 marks**)

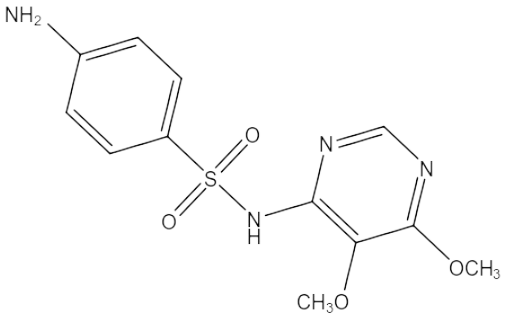
(ii) State two properties of low density polyethylene (**1 mark**)

(iii) Give two major uses of low density polyethylene **(1 mark)**

(b) Sulfa drugs were the first effective antibacterial drugs

(i) Explain the mode of action of sulfa drugs **(2 marks)**

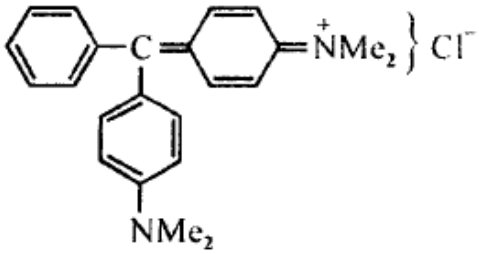
(ii) Design a plausible method for synthesis of sulphadoxine, starting with benzene and any other reagent(s) of your choice **(7 marks)**



Sulphadoxine

(iii) Explain bacterial resistance to sulfa drugs **(1 mark)**

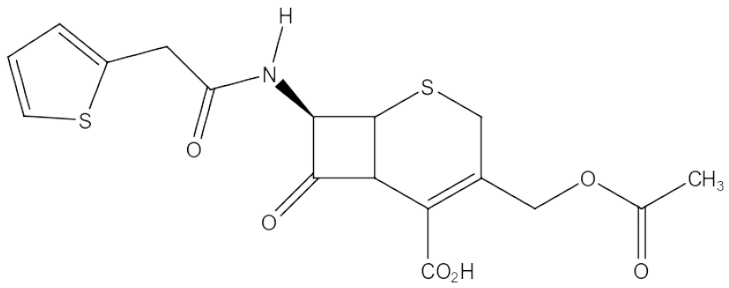
(c) Malachite green is used to dye wool and silk directly and cotton using a mordant. Discuss the industrial manufacture of malachite green **(4 marks)**



malachite green

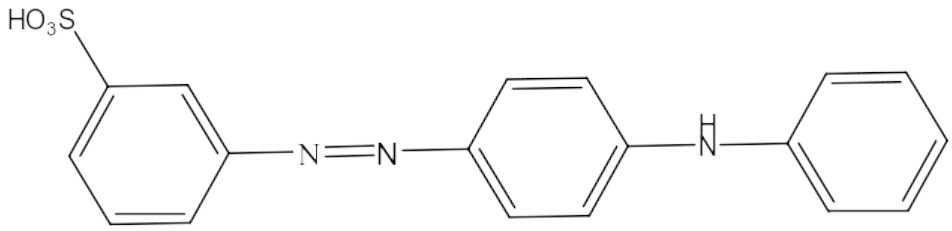
QUESTION FOUR [20 MARKS]

(a) Design a method for synthesis of cephalothin **(6 marks)**



Cephalothin

(b) The azo dye metanil yellow is used for dyeing silk and cotton fibers. Design a stepwise method for synthesis of metanil yellow starting with nitrobenzene (**7 marks**)



Metanil Yellow

(c) Discuss the catalytic cracking of gas oil and other heavy residues (**7 marks**)
