

**CHUKA UNIVERSITY EXAMINATIONS (2019/2020)**

**CHEM 447: INDUSTRIAL AND APPLIED CHEMISTRY II**

**STREAMS: BSc (CHEMISTRY)**

**TIME: 2 HRS**

**INSTRUCTIONS**

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

**QUESTION ONE [30 MARKS]**

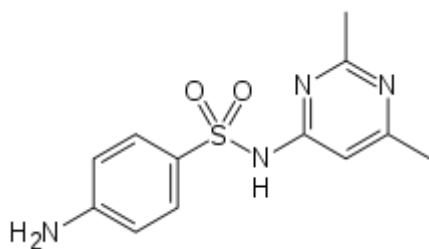
- (a) Discuss the treatment processes of natural gas before domestic use (**6 marks**)
- (b) Describe five parameters that are used to characterize crude oils (**5 marks**)
- (c) Explain the industrial production of each of the following compound from ethylene (**6 marks**)
- (i) Ethylene glycol                      (ii) vinyl chloride                      (iii) ethanol
- (d) (i) Explain the mode of action of penicillins (**1 marks**)
- (ii) Discuss the biosynthetic method for industrial production of penicillins (**5 marks**)
- (ii) Explain two methods that are used to counter  $\beta$ -lactamases (**2 marks**)
- (e) Discuss the industrial manufacture of the superphosphate fertilizer from apatite (**5 marks**)

**QUESTION TWO [20 MARKS]**

- (a) Discuss, with the aid of relevant equations, the catalytic reforming of during naphtha fractions (**8 marks**)
- (b) Describe, with the aid of relevant equation(s), the industrial manufacture of ibuprofen from isobutyl benzene (**6 marks**)
- (c) Describe the industrial production of each of the following compound from butenes (**6 marks**)
- (i) Acetic Acid                      (ii) Methyl ethyl ketone                      (iii) Methyl-*tert*-butyl ether (MTBE)

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

(a) Design a stepwise method for synthesis of sulfisomidine, starting with benzene and any other reagent(s) of your choice (**6 marks**)



Sulfisomidine

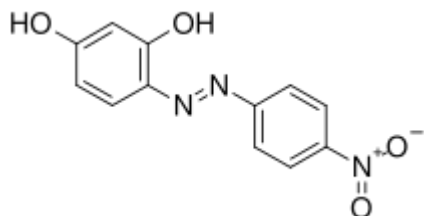
(b) Describe, with the aid of a suitable example, the semi-synthetic industrial production of penicillins (**6 marks**)

(c) Explain the industrial production of the following compounds from propene (**8 marks**)

(i) Acrolein            (ii) Acrylonitrile            (iii) Propylene oxide            (iv) Butanal

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

(a) Design a stepwise method of synthesizing the Azo violet from aniline and other reagents of your choice (**6 marks**)



Azo violet

(b) Compare the chemical structures and related physical-chemical properties, as well as expected bioaccumulation and persistence of DDT and endosulfan (**4 marks**)

(c) Explain why pyrethrins do not accumulate in soils or biota although they are lipophilic compounds (**2 marks**)

(d) Discuss, with the aid of suitable equation(s), the steam cracking of ethane (**8 marks**)