

CHUKA

UNIVERSITY



UNIVERSITY EXAMINATIONS

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

CHEM 334: ORGANIC CHEMISTRY IV

STREAMS: BSC (CHEM)

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 15/04/2020

2.30 P.M. – 4.30 P.M.

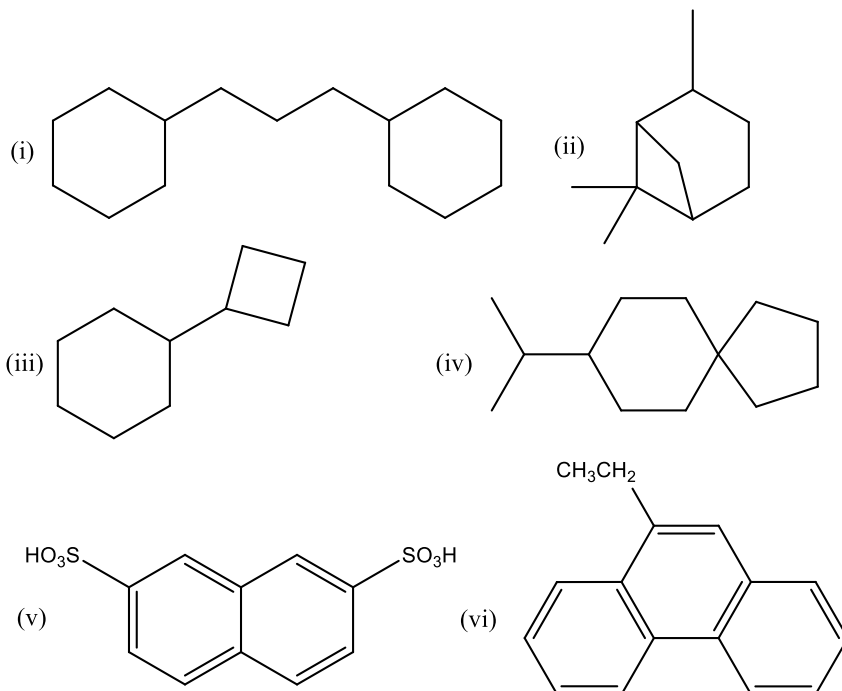
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 INSTRUCTIONS: Answer question **One** (Compulsory) and any other **Two** questions
 

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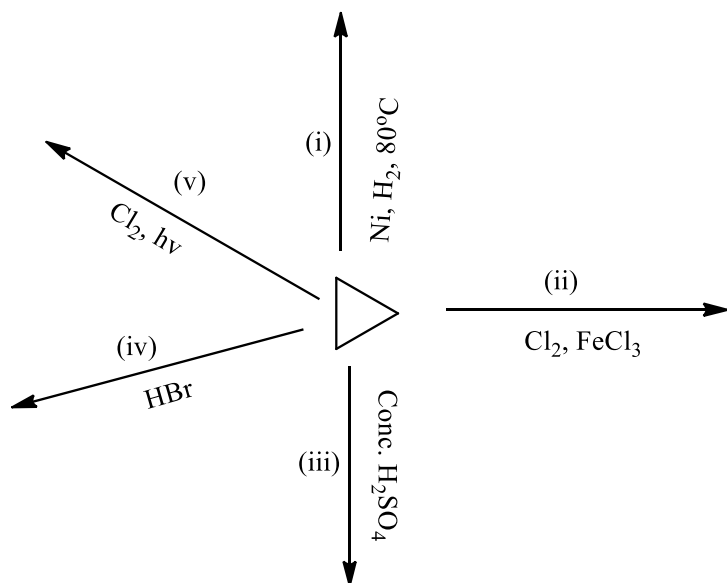
## QUESTION ONE [30 MARKS]

(a) Write the IUPAC name of each of the following compounds (6 marks)



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(b) Draw the structure of the major product(s) for each of the following reactions (5 marks)



(c) Describe, with the aid of suitable examples, three methods that can be used to synthesize cyclohexane (6 marks)

(d) Design a plausible stepwise method for preparation of 6-methylnaphthalene using the Howarth method (6 marks)

(e) Outline the synthesis of valine using the following methods (7 marks)

(i) Acetamidomalonic synthesis    (ii) Strecker synthesis    (iii) Hell-Volhard-Zelinsky reaction

### QUESTION TWO [20 MARKS]

(a) Starting with phenylalanine and glycine, outline the steps in the preparation of Phe-Gly by the Merrifield method (5 marks)

(b) Discuss the structure of peptides and proteins (6 marks)

(c) Write the major organic product(s) of anthracene with each of the following reagents (6 marks)

(i) Dil.  $\text{HNO}_3$     (ii) Na in Ethanol    (iii)  $\text{Cl}_2$     (iv)  $\text{O}_2$  (1 mol equivalent)

(v) Ethanoyl chloride,  $\text{AlCl}_3$  in benzene    (vi)  $\text{H}_2\text{SO}_4$  at low temperature

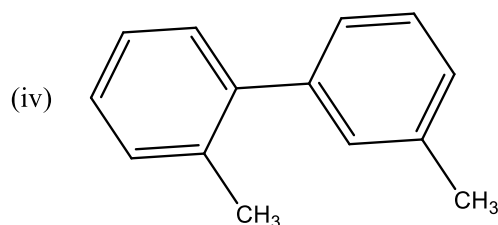
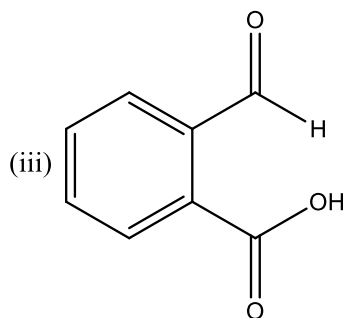
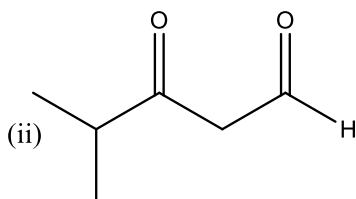
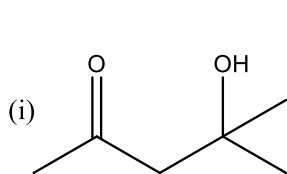
(d) Outline the steps in the preparation of Phenanthrene using the Pschorr method (3 marks)

**QUESTION THREE [20 MARKS]**

- (a) Explain the Baeyer strain theory (3 marks)
- (b) Design a stepwise method of preparing cyclopentane using the Dieckmann method (5 marks)
- (c) Draw the structures of the following amino acids in their zwitterionic form (4 marks)
- (i) L-Isoleucine      (ii) L-Glutamic acid      (iii) L-Serine      (iv) L-Phenylalanine
- (d) Write the major organic product(s) of phenanthrene with each of the following reagents (8 marks)
- (i)  $\text{H}_2$ , Pt      (ii)  $\text{O}_2$  then  $\text{H}_2\text{O}$       (iii)  $\text{CrO}_3$ , AcOH      (iv)  $\text{Cl}_2$ , AcOH, heat

**QUESTION FOUR [20 MARKS]**

- (a) Write the name of each of the following compounds (4 marks)



- (b) Outline the synthesis of benzidine from benzene (4 marks)
- (c) Write the organic product(s) of diphenyl methane with each of the following reagents (6 marks)
- (i)  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$       (ii)  $\text{Br}_2$ ,  $h\nu$       (iii)  $\text{K}_2\text{Cr}_2\text{O}_7$
- (d) Discuss two methods that can be used to separate mixtures of amino acids (6 marks)
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