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CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

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

CHEM 334: ORGANIC CHEMISTRY IV

STREAMS: BSc. (CHEM) **TIME: 2 HOURS**

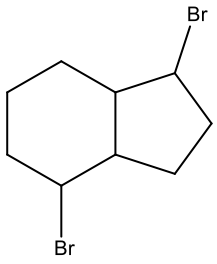
DAY/DATE: FRIDAY 12/4/2024 **11.30A.M. – 1.30 P.M.**

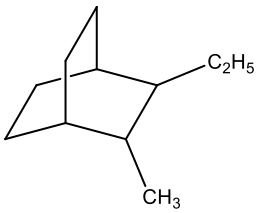
INSTRUCTIONS

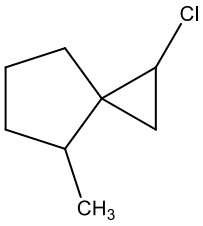
Answer question **One** (Compulsory) and any other **Two** questions

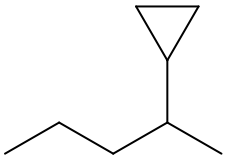
QUESTION ONE [30 MARKS]

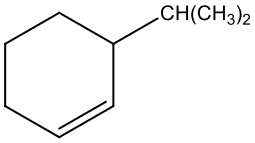
(a) Write the substitutive IUPAC name of each of the following compounds **(6 marks)**

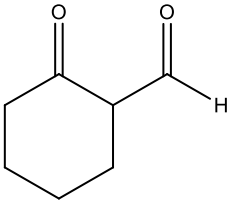
(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

(b) Write the structure of major organic product(s) of the reaction of cyclopropane with the following reagents **(4 marks)**

(i) Cl_2, *hv* (ii) Br_2, $FeBr_3$ (iii) Conc. H_2SO_4, H_2O (iv) H_2, Ni, 80^oC

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

(d) Discuss the Baeyer's strain theory **(3 marks)**

(e) Design a stepwise synthesis of naphthalene using the Haworth method **(6 marks)**

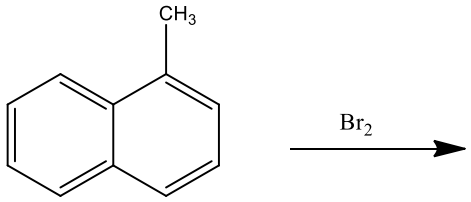
(f) Write the major organic product(s) of the reaction of phenanthrene with each of the following reagents **(5 marks)**

(i) Na, C_2H_5OH (ii) CrO_3, AcOH (iii) Cl_2, AcOH, heat (iv) Br_2, CCl_4 (v) H_2O_2, AcOH

QUESTION TWO [20 MARKS]

(a) Predict the major organic product(s) of each of the following reactions **(4 marks)**

(i)



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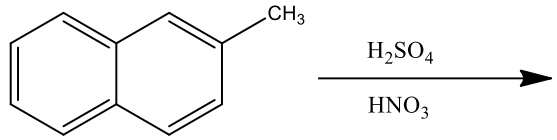

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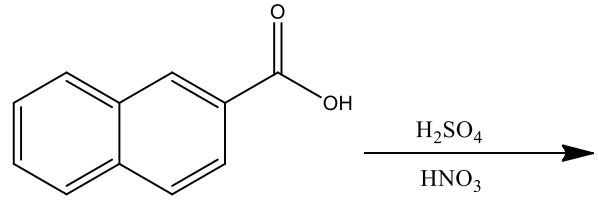

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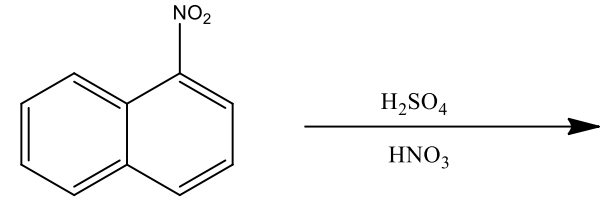
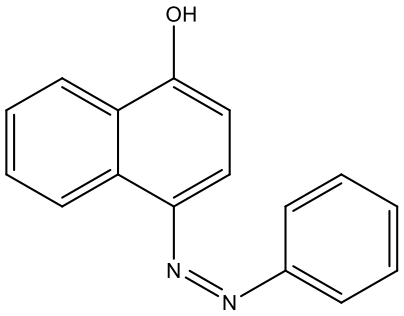
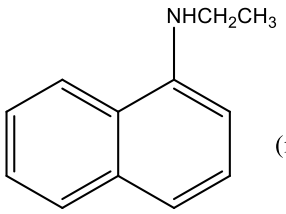
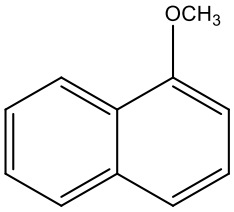


(b) Write the reagents for conversion of 1-naphthol to each of the following compounds

(6 marks)

(i) 

(ii) 

(iii) 

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

(4 marks)

(i) Dilute HNO_3 (ii) CH_3COCl, $AlCl_3$ (iii) H_2SO_4 (iv) Br_2, Heat

(d) Describe, using relevant equations, four methods that are used to prepare biphenyls

(6 marks)

QUESTION THREE [20 MARKS]

(a) Design a stepwise method for the synthesis of anthracene using a Diels-Alder reaction

(3 marks)

(b) Write the major organic product(s) of the reaction of naphthalene with each of the following reagents **(8 marks)**

(i) O_2, V_2O_5, 350-400^oC (ii) $KMnO_4$, H_3O^+ (iii) Excess Cl_2 (iv) Br_2, $AlCl_3$

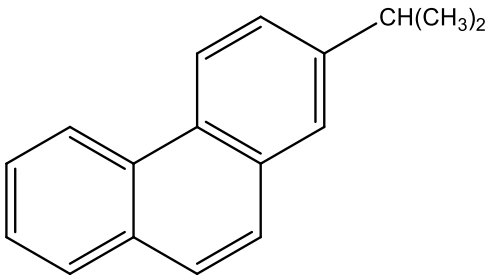
(v) H_2, Ni, 200^oC (vi) HNO_3, H_2SO_4 (vii) H_2SO_4, 160^oC

(viii) H_2SO_4, 80^oC then NaOH, 300^oC

(c) Discuss a stepwise synthesis of Gly-Ala-Phe tripeptide using the solid-phase peptide synthesis method **(9 marks)**

QUESTION FOUR [20 MARKS]

(a) Design a suitable stepwise method for the synthesis of the following phenanthrene derivative **(8 marks)**



(b) Design a method to synthesize the following amino acids **(6 marks)**

(i) Phenylalanine using the N-Phthalidomalonic ester synthesis

(ii) Valine using a Strecker synthesis

(iii) Alanine using reductive amination

(c) Write the structure of the major organic product(s) of the reaction of diphenic acid with each of the following reagents **(2 marks)**

(i) $KMnO_4$ (ii) Sodalime

(d) Describe, with the aid of relevant equations, two methods that can be used to prepare cyclobutane **(4 marks)**

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