NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE

FIRST SEMESTER EXAMINATIONS – JANUARY 2011

INDUSTRIAL ORGANIC CHEMISTRY II – SCH 4115

TIME: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

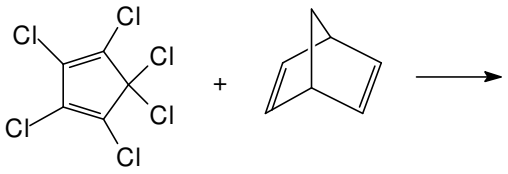
1. **ANSWER ALL QUESTIONS FROM SECTION A AND ANY THREE FROM SECTION B. SECTION A CARRIES 40 MARKS AND EACH QUESTION IN SECTION B CARRIES TWENTY (20) MARKS. MARKS ARE INDICATED IN BRACKET.**

TOTAL MARKS = 100

THIS QUESTION PAPER CONSISTS OF *FOUR PRINTED PAGES* (ON ONE SIDE ONLY) INCLUDING THE TOP PAGE WITH INSTRUCTIONS.

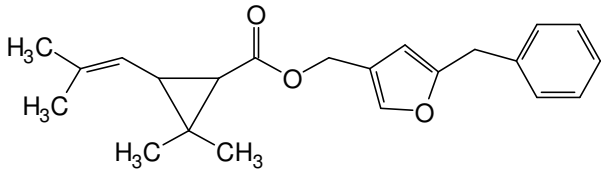
SECTION A:

1. (a) (i) Draw the structure of the product arising from the following pericyclic reaction. Suggest the name of the product. Use curved arrows to indicate how the reaction proceed to form product.



(4 marks)

(ii) Draw the structures of the starting material which can produce resmethrin.



resmethrin

(2 marks)

(b) Suggest **four** principle areas where pyrethrin products are in use.

(4 marks)

(c) Name the plant from which rotenoid insecticide is extracted. Draw the structure of rotenone.

(4 marks)

(d) Explain (i) systemic and (ii) contact insecticides.

(4 marks)

(e) Draw the structure of atropine and indicate its function.

(4 marks)

(g) Give one of the two names (botanical name) of plants from which natural pyrethrines are obtained.

(2 marks)

(h) What do you understand by acute and subacute rodenticides?

(4 marks)

(i) Draw the general structure of carbamate.

(2 marks)

(j) Why are the avermectins very useful insecticides?

(2 marks)

(k) Auxins are a class of plant growth substances. Give the name and structure of one naturally occurring auxin and one synthetic analogue.

(4 marks)

(l) Suggest **four** different types of teratogens.

(4 marks)

SECTION B:

2. (a) Draw the structure of malathion and in brief describe the toxicity in human of malathion.

(4 marks)

(b) The metabolism of DDT by (i) reductive dechlorination (ii) oxidation and (iii) dehydrochlorination forms three different products. Draw structures of these compounds.

(6 marks)

(c) Explain with the aid of chemical reactions and schematic diagram how organophosphate insecticide minicks acetylcholine.

(10 marks)

3. (a) Draw structures of sarin and tabun, and explain why these two organophosphates, despite the fact that they are powerful insecticides, have never been extensively used as insecticides.

(6 marks)

(b) Draw structures of (i) 2,4-D and (ii) 2,4,5-T. What are the uses of these herbicides in agriculture industry?

(4 marks)

(c) (i) What do you understand by anticoagulants?

(2 marks)

(ii) What is the function of anticoagulants as rodenticides?

(4 marks)

(d) Naturally occurring pyrethroids are used with synergist. Explain the action of synergist.

(4 marks)

4. (a) With the aid of a diagram Describe the batch process for the manufacture of soap.

(10 marks)

(b) There are four different pathways where carbaryl is synthesised. Draw any two pathways to synthesise carbaryl.

(6 marks)

(c) Paraquat is a bipyridinium herbicide which is available to farming community. If it is not used correctly, it can kill crops and also harm livestock and humans.

(i) Draw the structure of paraquat.

(ii) Suggest:

(a) what type of herbicide is it? and also

(b) indicate how does it act on plants?

(4 marks)

5. (a) There are three different types of detergents available:
   (i) anionic
   (ii) cationic and
   (iii) neutral detergents.

   Draw structures of these detergents.

   (3 marks)

   (b) Explain the advantage of organophosphorus insecticides over organochlorine insecticides.

   (4 marks)

   (c) Describe the process of extraction of natural pyrethroids from the plant described in 1(g).

   (8 marks)

   (d) MCPA (4-chloro-2-methylphenoxy acetic acid) is a well-known herbicide used in this country. Write synthesis of MCPA from *o*-cresol (2-hydroxy methyl benzene).

   (5 marks)

End of Question Paper