



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF APPLIED CHEMISTRY**

**BACHELOR OF SCIENCE HONOURS DEGREE**

**SUPPLEMENTARY EXAMINATIONS – SEPTEMBER 2010**

**INDUSTRIAL ORGANIC CHEMISTRY II – SCH 4115**

**TIME: THREE (3) HOURS**

**INSTRUCTIONS TO CANDIDATES:**

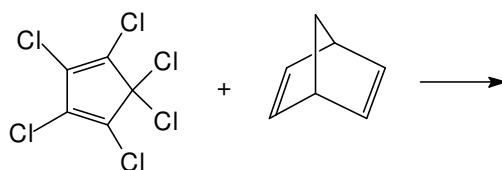
- 1. ANSWER ALL QUESTIONS FROM SECTION A AND ANY THREE FROM SECTION B. SECTION A CARRIES 40 MARKS AND EACH QUESTION IN SECTION B CARRIES TWENTY (20) MARKS. MARKS ARE INDICATED IN BRACKET.**

**TOTAL MARKS = 100**

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

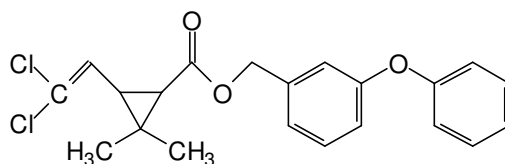
**SECTION A:**

1. (a) (i) Draw the structure of the product arising from the following pericyclic reaction. Suggest the name of the product.



(2 Marks)

- (ii) Draw the structures of the starting material to produce the following compound.



Permethrin

(2 Marks)

- (b) Suggest four principle areas where pyrethrin products are in use.  
(4 Marks)
- (c) What do you understand by teratogenic agents? Draw the structure of one of the compounds that you may know?  
(4 Marks)
- (d) What is the difference between a soap and a detergent?  
(2 Marks)
- (e) Draw the structures of the following compounds.  
(i) piperonyl butoxide and (ii) endosulfan.  
(4 Marks)
- (f) Draw the structure of atropine and indicates its function.  
(4 Marks)
- (g) Give one of the two names (botanical name) of plants from which natural pyrethrines are obtained.  
(2 Marks)
- (h) Draw the structures of the following compounds.  
(i) piperonyl butoxide and (ii) endosulfan.  
(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 deltamethrin.  
It is produced by the esterification of dibromo permethrin acid with  $\alpha$ -cyano-3-phenoxybenzyl alcohol. Draw the structures of these two compounds. (4 Marks)
- (b) Explain (i) systemic and (ii) contact insecticides. (6 Marks)
- (c) The metabolism of DDT by (i) reductive dechlorination (ii) oxidation and (iii) dehydrochlorination forms three different products. Draw structures of these compounds. (6 Marks)
- (d). Draw two synthetic pyrethroids of your choice other than deltamethrin. (4 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 2,4-D and (ii) 2,4,5-T. What are the uses of these herbicides in agriculture industry? (4 Marks)
- (c) What do you understand by synergist? (4 Marks)
- (d) Naturally occurring pyrethroids are used with synergist. Explain the action of synergist. (6 Marks)
4. (a) Describe the batch process with the aid of a diagram 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 can kill crops and also harm livestock and humans. (i) Draw the structure of paraquat. (ii) Suggest (a) what type of herbicide it is? and (b) also indicate how it acts on plants? (4 Marks)
5. (a) There are three different types of detergents are available: (i) anionic (ii) cationic and (iii) neutral detergents. Draw structures of these detergents. (3 Marks)
- (c) Explain the advantage of organophosphorus insecticides over organochlorine insecticides. (4 Marks)
- (d) Describe the process of extraction of natural pyrethroids from the plant describe in 1(g). (8 Marks)
- (e) 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*