



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED CHEMISTRY

INDUSTRIAL ORGANIC CHEMISTRY II

SCH 4115

FOR SCH STUDENTS ONLY

First Semester Examination Paper
December 2016

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: NONE

Examiner's Name: DR C T PAREKH

INSTRUCTIONS

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 20 marks.
2. Show mechanism, chemical steps or synthesis by means of curved arrows.

MARK ALLOCATION

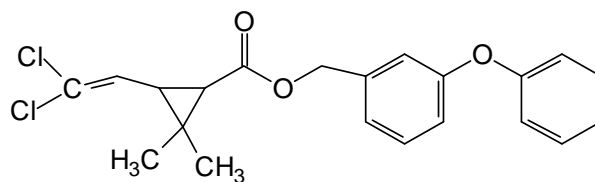
QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
5.	20
TOTAL TOTAL POSSIBLE MARKS	100

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SECTION A:

1. (a) Give two names of plants from which natural pyrethrins are obtained. (4 Marks)
- (b) Draw the structure of acetylcholine and explain the function of acetylcholine. (4 Marks)
- (c) What are pesticides? Classify pesticides and give one example of each. (6 Marks)
- (d) Suggest four principal areas where pyrethrin products are in use. (4 Marks)
- (e) Define LC50 and LD50. (4 Marks)
- (f) Name the plant from which rotenoids insecticide is extracted. Draw the structure of rotenone. (4 Marks)
- (g) Draw the structures of the starting material to produce the following compound.



permethrin

- (h) Draw the structure of malathion and describe its toxicity in humans. (2 Marks)
- (i) Draw the general structure of carbamate. (4 Marks)
- (j) Explain (i) systemic and (ii) contact insecticides. (2 Marks)
- (6 Marks)

SECTION B:

2. (a) What are the functions of the following compounds in detergents. (6 Marks)
- (i) sodium salt of aromatic sulphonates (ii) phosphates (iii) sodium sulphate
(iv) silicates (v) sodium perborate (vi) sodium carboxyl methyl cellulose.
- (b) Auxins are a class of plant growth substances. Give the name and structure of one naturally occurring auxin and one synthetic analogue. (4 Marks)
- (c) Draw the structure of sarin, and explain why this organophosphate, despite the fact that it is a powerful insecticide, has never been extensively used as an insecticide. (4 Marks)
- (d) Chemically, what is the difference between a soap and a detergent? (2 Marks)
- (e) Synthesise insect repellent DEET (N,N-diethyl-*m*-toluamide) which is used with other repellent to kill a mosquito which has recently been shown to cause the zika virus, from 3-methylbenzoic acid. Use reagent of your choice. (4 Marks)

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3. (a) Draw the structures of acid moiety and the alcohol moiety of naturally occurring pyrethrines. (4 Marks)
- (b) Endosulfan breaks down slowly to endosulfan sulphate and is also readily hydrolysed by acid or alkali to diol. Draw the structures of these three compounds. (6 Marks)
- (c) Explain, with the aid of chemical reactions and a schematic diagram, how the organophosphate insecticide mimics acetylcholine. (10 Marks)
4. (a) Brodifacoum is rodenticide known as Mortein. Draw its structure and describe its function (2 Marks)
- (b) Describe the insecticidal activity of organophosphorus insecticides. Explain the advantage of organophosphorus insecticides over organochlorine insecticides. (8 Marks)
- (c) Draw the structure of a known synergist. Explain the function of synergist although it has no insecticidal property. (10 Marks)
5. (a) What do you understand by “anticoagulant”? Draw the structure of warfarin which acts as an anticoagulant to kill rats and is also prescribed to heart patients to avoid thrombosis. (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)
- (d) List four different types of teratogens. (4 Marks)
- (e) Dieldrin is a potent, non-specific insecticide which is long-lasting and highly toxic to humans. This insecticide is synthesised from hexachloro – cyclopentadiene and norbornadiene which forms aldrin, followed by peroxide treatment to produce dieldrin. Write reaction mechanisms for the production of aldrin and the final product dieldrin. (6 Marks)

*****END OF QUESTION PAPER*****