



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF APPLIED SCIENCE**

**DEPARTMENT OF APPLIED CHEMISTRY**

**INDUSTRIAL ORGANIC CHEMISTRY II**

**SCH 4115**

**Supplementary Examination Paper**

**August 2015**

This examination paper consists of 4 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Special Requirements:**

**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.**

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
1.	<b>40</b>
2.	<b>20</b>
3.	<b>20</b>
4.	<b>20</b>
<b>TOTAL</b>	<b>100</b>

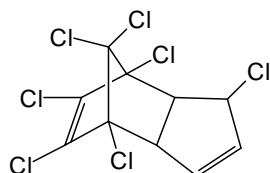
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**SCH 4115**

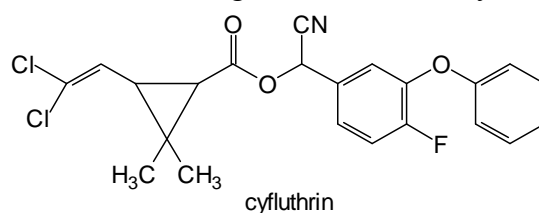
## **SECTION A:**

- (a) (i) Heptachlor's insecticidal activity is three times stronger than that of chlordane. The structure of the insecticide is shown below. One of the starting materials to synthesise heptachlor is cyclopentadiene. Use any chemicals and reagents needed for the synthesis of heptachlor. Write the reaction mechanism for heptachlor. Use curved arrows.



(8 Marks)

- (ii) Draw the structure of the acid moiety and alcohol moiety for the following pyrethroid. What is the name given to acid moiety.



cyfluthrin

(4 Marks)

- (b) Suggest four principal areas where pyrethrin products are in use. (4 Marks)
- (c) Draw the structure of cholinesterase and suggest its function in the animal kingdom? (6 Marks)
- (d) What is the difference between a soap and a detergent? (2 Marks)
- (e) Draw the structure of the insect repellent, DEET and methyl antranilate which acts as a bird repellent. (4 Marks)
- (f) Suggest the name of the plant from which atropine is extracted. Draw the structure and indicate the function of atropine. (6 Marks)
- (g) Give one of the two names (botanical name) of plants from which natural pyrethrins are obtained. (2 Marks)
- (h) Draw the general structure of carbamate. (2 Marks)
- (i) Why are the avermectins very useful insecticides? (2 Marks)

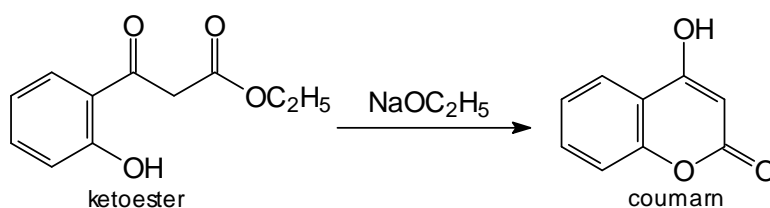
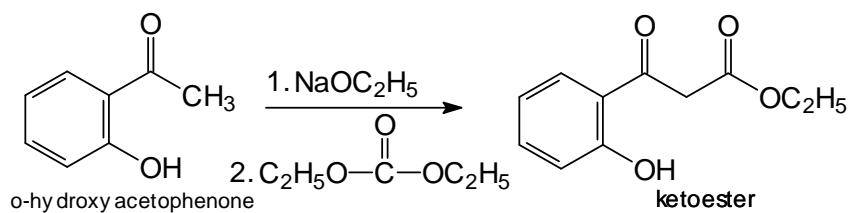
## **SECTION B:**

- 2.(a) transfluthrin (Baygon mosquito coil) is synthesised by the esterification of permethrin acid with 2,3,5,6-tetrafluorobenzyl alcohol. Write an equation for the synthesis of transfluthrin. Use reagents of your choice. (Use curved arrows).  
(6 Marks)
- (b) Explain (i) systemic and (ii) contact insecticides.  
(4 Marks)
- (c) Draw schematic diagram for the manufacture of a detergent.  
(10 Marks)
3. (a) 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.  
(8 Marks)
- (b) Explain the function of synergist in pyrethroids spray.  
(8 Marks)
- (c) Draw the structure of parathion and describe the toxicity in humans.  
(4 Marks)
- 4.(a) Warfarin is a rodenticide and is manufactured from *O*-hydroxyacetophenone and ethyl carbonate in presence of sodium ethoxide. When these two compounds react,  $\beta$ -ketoester forms which further reacts in presence of ethoxide and forms an intermediate known as coumarin. Write reaction mechanism for both steps. Use curved arrows. (The synthesis is at the end of the question paper).  
(10 Marks)
- (b) Describe the process of extraction of natural pyrethroids from the chrysanthemum flower.  
(10 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)
- (b) Illustrate the disruption of the nervous the system in insects with organophosphate or carbamate insecticide which result in death?  
(8 Marks)
- (c) Explain the advantage of organophosphorus insecticides over organochlorine insecticides.  
(4Marks)
- (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) and any reagents of your choice.  
(5 Marks)

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Synthesis below is for question 4(a):



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