

الإجابة النموذجية لامتحان مادة كيمياء المبيدات والسموم

٣١٣ ك
(نصف ورقة امتحانيه)

المستوى: الثالث

الشعبة: كيمياء وكيمياء تطبيقية

التاريخ: الثلاثاء ٢٠١٧/١/٣

الممتحن: د. هاني إبراهيم محمد إبراهيم

قسم: الكيمياء

كلية: العلوم



Chemistry of Pesticides & Toxins [313 Ch]

Answer the following questions: [40 marks]

[3] Use chemical structures to complete the following: [20 marks]

- 1) + Diethyl maleate $\xrightarrow[\text{heat}]{\text{hydroquinone}}$ Malathion [3 marks]
- 2) Ethyl acetoacetate + *n*-Propyl amidine $\xrightarrow[\text{ii. Enolization}]{\text{i. EtOH/base}}$ $\xrightarrow[\text{base}]{\text{.....}}$ Pirazinon [4 marks]
- 3) Diethyl thiophosphoryl chloride + $\xrightarrow{\text{base}}$ Resitox [3 marks]
- 4) Dichloroacetaldehyde + $\xrightarrow{\text{anhyd. ZnCl}_2}$ Perthane [3 marks]
- 5) 2,2-Bis(*p*-chlorophenyl)-1,1,1-trichloroethane $\xrightarrow[\text{FeCl}_3]{\text{heat}}$ [2 marks]
- 6) + Pot. fluoride/CHCl₃ \longrightarrow Dimefox [2 marks]
- 7) + $\xrightarrow{\text{base}}$ Dithion [3 marks]

[4] (a) Account briefly on the following: [Pick 10 marks only]

- i) Martin & Wain theory for the SAR of DDT with its evidences. [4 marks]
- ii) Mode of action of organo-phosphorus insecticides. [3 marks]
- iii) Influence of temperature on the life of pests. Give example [3 marks]
- iv) Characteristics of protective pesticides. [2 marks]
- v) Choosing the proper chemical for pest control. [2 marks]

(b) Interpret the following by chemical equations: [Pick 10 marks only]

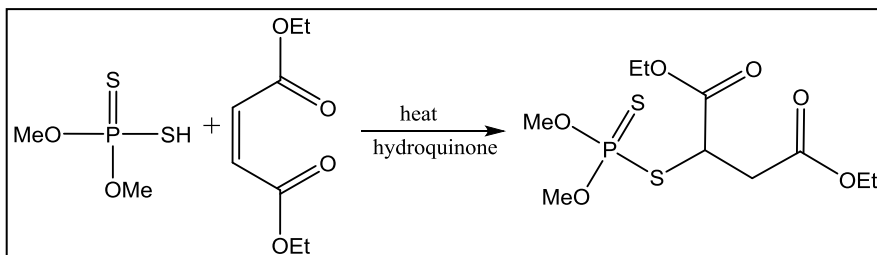
- i) Preparation of pyrazothion. [2 marks]
- ii) Brothman continuous process for DDT production. [3 marks]
- iii) Preparation of a phosphate pesticide with four sulphur atoms. [3 marks]
- iv) Conversion of less toxic to more toxic compounds inside plant. [2 marks]
- v) Preparation of a pyrophosphoramidate pesticide. [2 marks]

Best wishes
Dr/ H. I. Mohamed

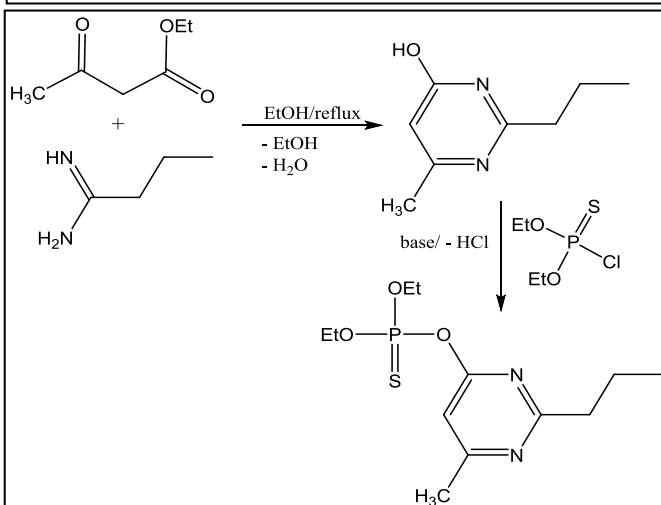
Model Answer

[3]

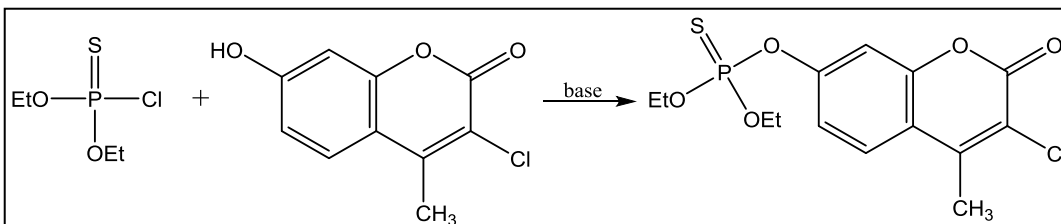
1)



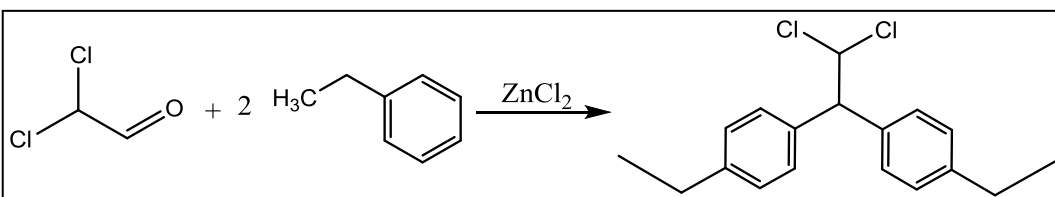
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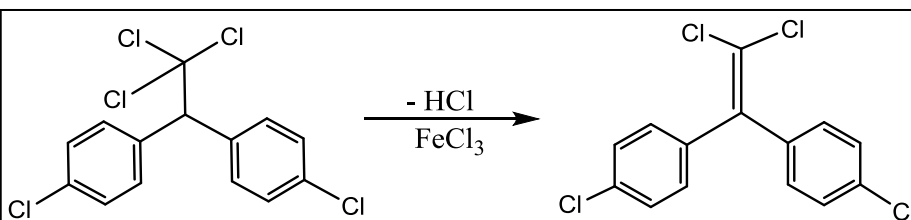
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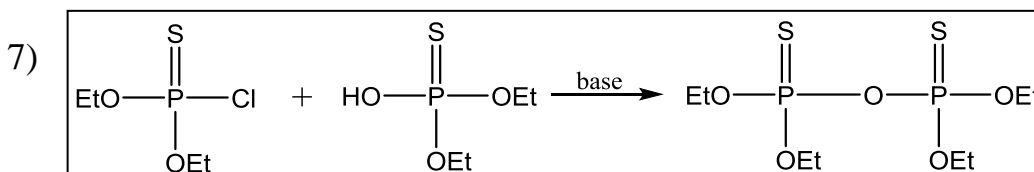
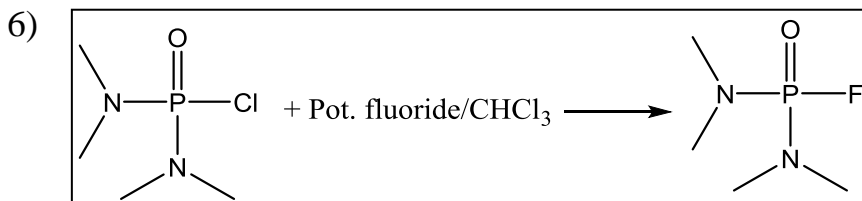


4)



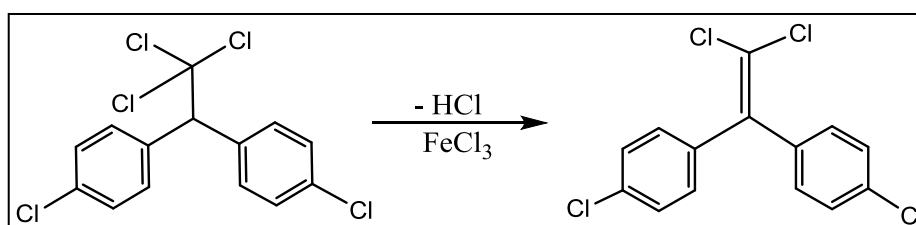
5)





[4] (a)

i) Martin & Wain theory was based on that:



- p-chlorophenyl grouping would be responsible the lipid solubility, and
- Trichloromethyl group furnishes toxicity in relation to the amount of hydrochloric acid, which is split off by dehydrohalogenation at vital centers in the organism.

Theory evidences:

- a) p,p'-isomer liberates HCl 67 times faster than does o,p'-isomer. The p,p'-isomer is by far more toxic than o,p'-isomer.
 - b) Rothane or DDD is close to DDT in toxicity to insects and undergoes dehydrohalogenation in the same manner.
 - c) Compound corresponding to DDT but with all four available ethane linkages chlorinated does not dehydrohalogenate and it is almost completely inactive against insects.
- ii) Organo-phosphorus insecticides inactivate acetylcholine esterases (enzymes) via phosphorylation at or near the active center. Such enzymes are responsible for the breakdown of the acetylcholine within the insect nerve cord. therefore, death ensured owing to the buildup of acetylcholine.

iii) Generally, the lethal high temperature for the majority of insects is about 50 C, while the low lethal one ranges from zero to 14 C.

Example: Codling moth

Only one generation of these species is produced in the season in the cold climate of England, however, in warmer climate of Middle east and California the same insect possess five or six generation in the season.

iv) Characteristics of protective pesticides:

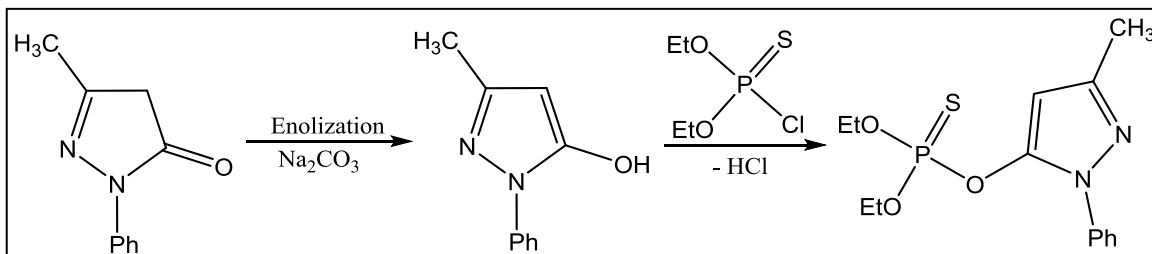
- They must still a long period on plants with their toxicity.

- They decrease the activity of insects

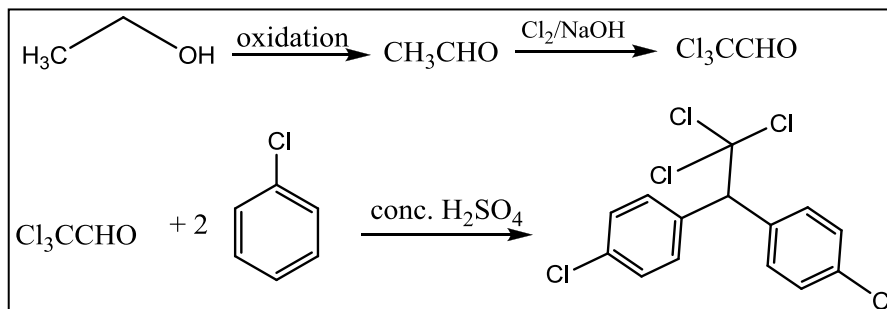
v) For insects with biting or chewing mouthparts, a stomach poisons is usually recommended because such insecticides are distributed over the surface on which the insects feed. In addition, they should be insoluble in water and withstand for long periods of exposure without decomposition. on the contrary, insects which are not surface feeders, it is necessary to be killed by direct connection between insecticide and insect. These materials are called direct or contact insecticides.

(b)

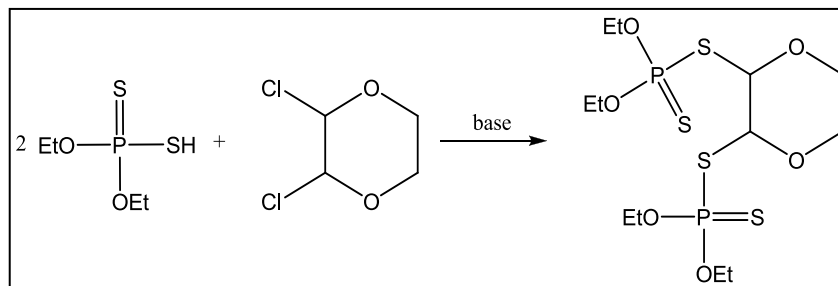
i) Preparation of pyrazothion:



ii) Brothman continuous process for DDT production

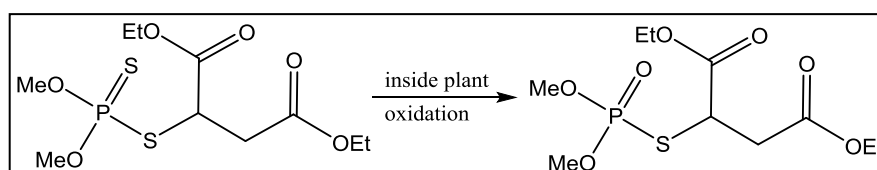


iii) Preparation of a phosphate pesticide with four sulphur atoms



iv) Conversion of less toxic to more toxic compounds inside plant

Inside plant cells, some toxic compounds “systematic pesticides” are converted to highly toxic ones via chemical reactions. e.g. malathion is converted to mala-oxon via oxidation.



v) Preparation of a pyrophosphoramidate pesticide

