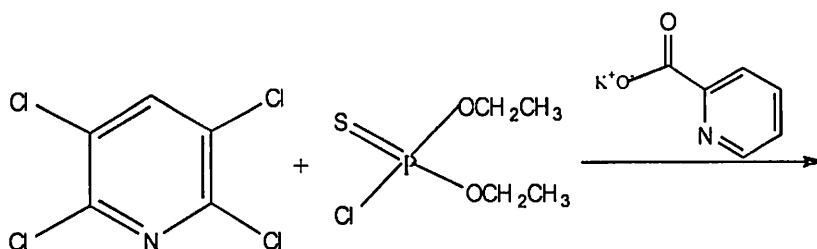


1. (a) As related to insecticides, define the following:
- (i) Half-life.
 - (ii) Systemic insecticide.
 - (iii) LD₅₀. [3 marks]
- (b) (i) What is Diels-Alder reaction in organic chemistry? [3 marks]
 (ii) Show the reaction equation for the production of Chlordane. [4 marks]

(Total = 10 Marks)

2. (a) Complete the equation below and give the name of the product. [3 marks]



- (b) Explain why first generation carbamate insecticides were not as effective as the second generation carbamate insecticides. [2 marks]
- (c) (i) Draw the structure of rotenone. [3 marks]
 (ii) What chemical family does rotenone come under? [1 mark]
 (iii) Name the plant genus from which rotenone is extracted. [1 mark]

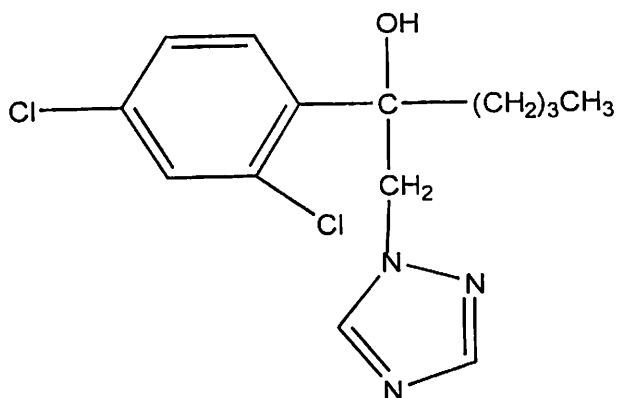
(Total = 10 Marks)

3. (a) Distinguish between contact and translocated herbicides. [2 marks]
- (b) Starting with phenol, show the synthesis of 2,4-D herbicide. [5 marks]
- (c) Trichloroethanoic acid is a hormone-type herbicide produced by Hell-Volhard-Zelinski reaction. Explain the mechanisms involved in this type of reaction. [3 marks]

(Total = 10 Marks)

4. (a) With respect to fungicides, explain as to what is meant by *latent infection*? [1 mark]

- (b) Following is a structure of an agrochemical. Give the name of the compound and explain its use. [2 marks]



- (c) Name THREE micronutrients normally included in fertilizers. [3 marks]
- (d) Show chemical equations for the synthesis of the fertilizers below.
- (i) urea. [4 marks]
- (ii) ammoniumsulphate fertilizer. [4 marks]

(Total = 10 Marks)

5. (a) Explain the functions of RESINS and PIGMENTS in paints. [4 marks]
- (b) Show the reaction equation for the synthesis of:
- (i) Phenolic resin. [6 marks]
- (ii) Polyurethane resin. [6 marks]

(Total = 10 Marks)

6. (a) A soap is produced when a vegetable oil, bearing esters of one lauric acid, one myristic acid and one oleic acid is reacted with NaOH. Show the chemical equation for the reaction. [3 marks]
- (b) Show the reaction equation involved in the synthesis of sodium Alkylsulphatedetergent. [4 marks]
- (c) What are the reasons for adding the following ingredients into detergents:
- (i) Amylases. [3 marks]
- (ii) Sodium perborate.
- (iii) Aromatics.

(Total = 10 Marks)

7. (a) Explain the general process of fermentation. [2 marks]
- (b) Show the chemical equations involving the steps in the production of ethanol from glucose in fermentation. [2 marks]
- (c) One step used in the separation of biomass is flotation. Briefly explain the technique. [3 marks]
- (d) One of the final separation techniques of the fermented products is called "gel-filtration chromatography". Explain how molecular products are separated using this method. [3 marks]

(Total = 10 Marks)