THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

SECOND SEMESTER EXAMINATIONS - 2020

APPLIED CHEMISTRY - FOURTH YEAR DEGREE

CH 462 - INDUSTRIAL CHEMISTRY

TUESDAY 27 TH OCTOBER, 2020 – 08:20 A.M.

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES:

1. You have 10 minutes to read the paper. You must not begin writing in the answer book during this time.

2. **ANSWER ALL QUESTIONS**

3. All answers must be written in the answer books provided.

4. Write your name and number clearly on the front page. Do it now.

5. Calculators are permitted in the examination room. Notes and textbooks are not allowed.

6. Show all workings and calculations in the answer book.

MARKING SCHEME

SECTION A

QUESTION 1	[5 MARKS]
QUESTION 2	[17 MARKS]
QUESTION 3	[16 MARKS]
QUESTION 4	[11 MARKS]
QUESTION 5	[11 MARKS]

1. (a) Define agrochemicals. [1 mark]

(b) Name the two forms of inorganic arsenic insecticides. [2 marks]

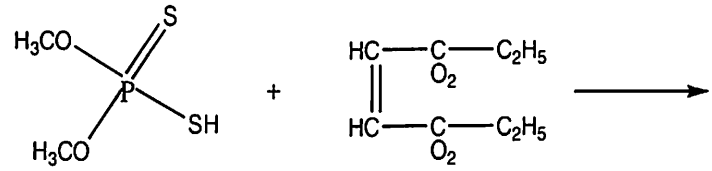
(c) Explain the mode of activity of the arsenic insecticides. [2 marks]

(Total = 5 Marks)

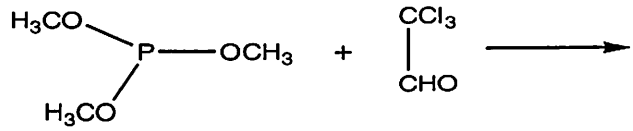
2. (a) Most chlorinated insecticides are banned due to environmental issues except lindane which includes 9 stereo isomers. Show the equation for the synthesis of this compound indicating it's correct stereo isomerism. [4 marks]

(b) Complete the equations below for the synthesis of the organophosphates and name the products. [6 marks]

(i)



(ii)



(iii) Explain the mode of activity of organophosphate insecticides. [2 marks]

(c) Rotenone is a phytochemical insecticide that is in use today.

(i) Draw the structure of this natural product. [2 marks]

(ii) What class of natural products does rotenone comes under? [1 mark]

(iii) Name the plant family and genus that rotenone is extracted from. [2 marks]

(Total = 17 Marks)

3. (a) Show the equation for the production of the herbicides included below.

(i) Phenoxypropanoic acid. [3 marks]

(ii) Paraquat. [3 marks]

(b) Why has it been difficult to treat plant fungal infections? [2 marks]

(c) These questions relate to fertilizers.

(i) Name at least FOUR micronutrients. [2 marks]

(ii) Three major plant nutrients are nitrogen, phosphorus and potassium. What role does potassium (K) play in the healthy growth of an agricultural crop? [3 marks]

(iii) Show the chemical reaction equation for the production of ammonium sulphate fertilizer. [3 marks]

(Total = 16 Marks)

4. As related to paints;

(a) what is the function of a binder? [2 marks]

(b) Explain the functions of the following:

(i) active solvent. [1 mark]

(ii) diluent. [1 mark]

(iii) thinner. [1 mark]

(c) Show the chemical equations relating to the synthesis of the resins below.

(i) Alkyd resin. [3 marks]

(ii) Amino resin. [3 marks]

(Total = 11 Marks)

5. (a) Fats and oils are saponifiable lipids. Explain what this means. [1 mark]

(b) Show the general saponification reaction equation of a triglyceride. [4 marks]

(c) Explain what dry washing is, and give TWO examples of the dry washing agents. [3 marks]

(d) Explain the environmental impact of the heavy use of detergents. [3 marks]

(Total = 11 Marks)