

AGRICULTURAL CHEMISTRY

Supplementary Exercise *Exercise Make Perfect* BOOK

First Edition



Norina Yadin

Norsyafiqah' Suhaimi

Norshahadah Abd Rahman

AGRICULTURAL CHEMISTRY

Supplementary Exercise *Exercise Make Perfect* BOOK

First Edition

Norina Yadin

Norsyafiqah' Suhaimi

Norshahadah Abd Rahman

POLITEKNIK SANDAKAN SABAH

Published by:

Politeknik Sandakan Sabah

Education Hub, Batu 10,

Jalan Sungai Batang,

90000 Sandakan Sabah

<http://www.pss.edu.my>

First Published 2020

eISBN: 978-967-17957-0-5

A catalogue record for this ebook is available from the Politeknik Sandakan Sabah Website
(Penerbitan)

<http://www.pss.edu.my/v10/index.php/penerbitan/131-ebooks>

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the Publisher.

PREFACE

In order to become a successful Agrotechnologist and Aquaculturist, one must possess vital knowledge in Agricultural Chemistry. Agricultural Chemistry is part of the main subject that support the programme structure in Diploma of Agrotechnology and Diploma of Aquaculture of Politeknik Sandakan Sabah.

This **Agricultural Chemistry Supplementary Exercise Book** is specially written for Semester 1 students taking Agricultural Chemistry subject under Mathematics, Science & Computer Department. It contains all topical exercises. This book is designed to help develop students' problem-solving skills. All topics are covered in accordance to new syllabus; Introduction to Principles of Chemistry in Agriculture, Main Component of Chemistry, Chemical Equation & Reaction and Agrochemicals Application in Agriculture. All exercises provide practice questions for students to attempt on their own.

We hope that this book can be of help to students to enhance their understanding and comprehension on chemistry knowledge in agricultural field. Besides, we hope that they can master all fundamental skills needed for a successful Agrotechnologist and Aquaculturist in future through every topical exercises given.

Norina Yadin

Norsyafiqah' Suhaimi

Norshahadah Abd. Rahman

CONTENTS

		PAGE
Topic 1	Introduction to Principles of Chemistry in Agriculture	1
Topic 2	Main Component of Chemistry	6
Topic 3	Chemical Equation and Reaction	19
Topic 4	Agrochemicals Application in Agriculture	34

TOPIC

1

**INTRODUCTION TO PRINCIPLE OF
CHEMISTRY IN AGRICULTURE**

EXERCISES 1.1

Define the following term:

a) Chemistry

b) Agriculture

c) Agricultural chemistry

EXERCISES 1.2

Explain the importance of chemistry knowledge in agriculture industry.

EXERCISES 1.3

Complete the Figure 1 below:

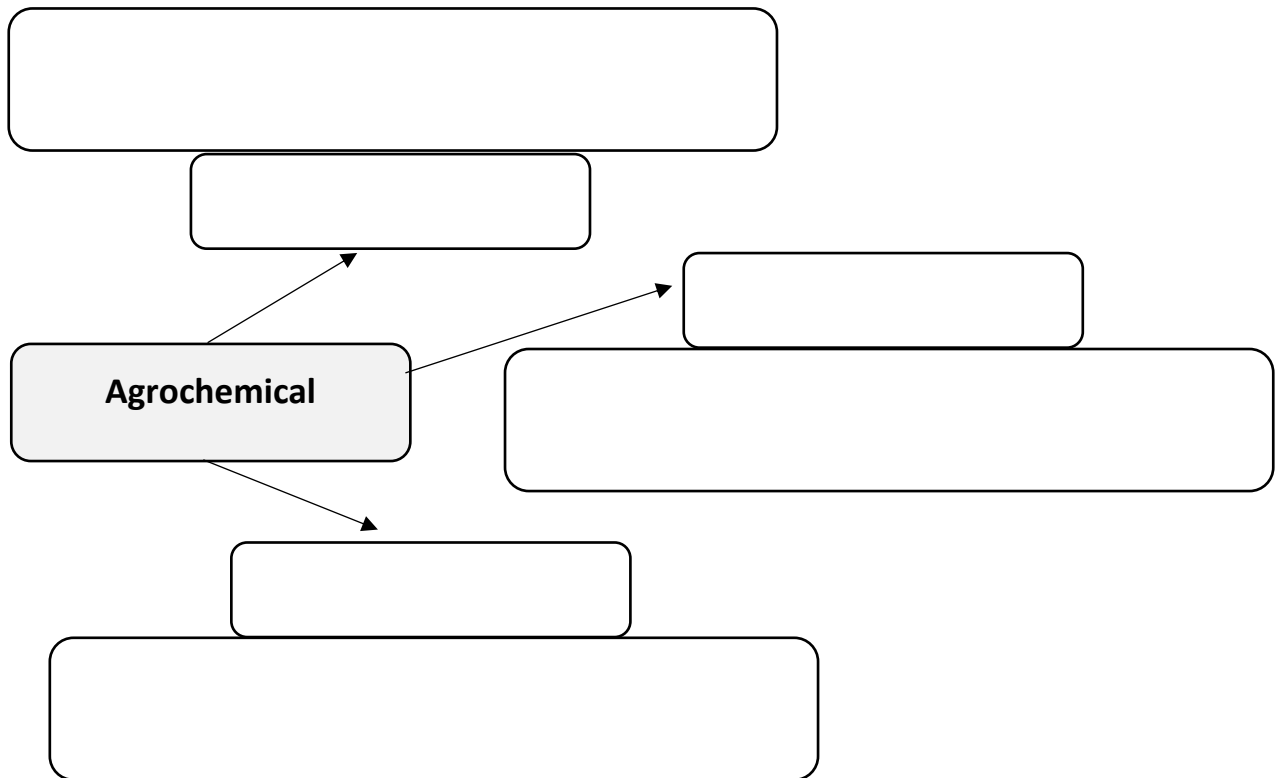


Figure 1: Agrochemical

EXERCISES 1.4

Explain THREE (3) advantages of using Pesticide, Fertilizer, plant hormone and hormone in animal.

Pesticide	Fertilizer

Plant Hormone	Hormone in Animal

EXERCISES 1.5

Explain THREE (3) disadvantages of using agrochemical.

EXERCISES 1.6

Differentiate organic agriculture and conventional agriculture.

Organic agriculture	Conventional agriculture

EXERCISES 1.7

Explain FIVE (5) major component in organic agriculture.

Major Component	Explanation

--	--

EXERCISES 1.8

Discuss THREE (3) advantages and disadvantages of organic and conventional agriculture.

Advantages	
Organic agriculture	Conventional agriculture

Disadvantages	
Organic agriculture	Conventional agriculture

TOPIC
2
MAIN COMPONENT OF CHEMISTRY

EXERCISES 2.1

Complete the Figure 2 below with the correct answer.

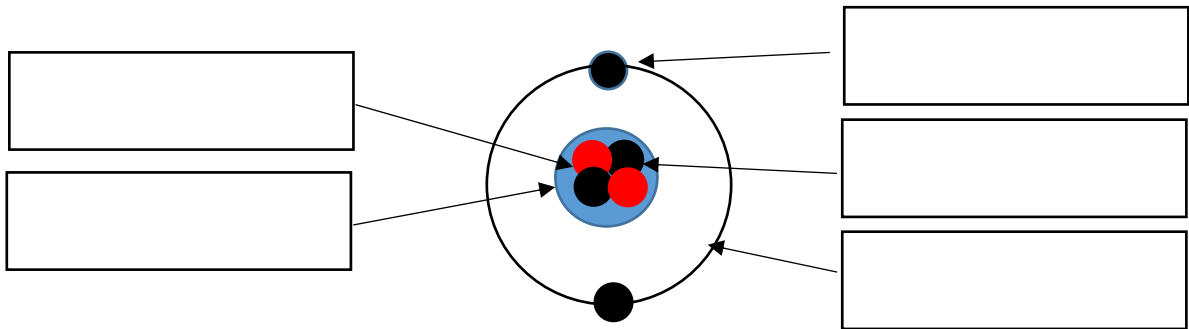


Figure 2: Atomic structure of helium, He

EXERCISES 2.2

Complete the Figure 3 below.

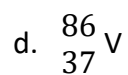
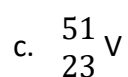
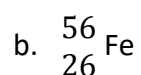
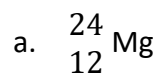


Figure 3: Sodium

EXERCISE 2.3

Find the number of proton and number of neutron isotope below.

I. Calculate the proton number, electron number and neutron of the following;



II. Calculate the charge and atomic mass of the following;

Elements	Proton	Electron	Neutron	Charge (+/-)___	Atomic mass
Ba	56	58	81		
Ca	20	20	20		
F	9	10	12		
K	19	18	20		
N	7	10	7		
O	8	10	8		

III. Define isotopes.

IV. Find the number of proton and number of neutron in isotope below.

Elements	Proton number	Neutron number
${}^1_1\text{H}$		
${}^2_1\text{H}$		
${}^3_1\text{H}$		
${}^{12}_6\text{C}$		
${}^{13}_6\text{C}$		
${}^{14}_7\text{N}$		
${}^{15}_7\text{N}$		
${}^{235}_{92}\text{U}$		
${}^{238}_{92}\text{U}$		

EXERCISE 2.4

I. How many moles are in 3.4×10^{23} molecules of H_2SO_4 ?

II. How many molecules are in 23 moles of N_2 ?

III. How many moles are in 2.5×10^{23} molecules of H_2CO_3 ?

EXERCISE 2.5

I. Find the relative atomic mass (A_r) of magnesium, Mg

II. Find the relative molecular mass (M_r) of carbon dioxide, CO_2

III. Find the relative molecular mass (M_r) of ammonia, NH_3

IV. Find the relative molecular mass (Mr) of the following compounds;

a. Barium sulphate, BaSO_4

b. Ammonium nitrate, NH_4NO_3

c. Aluminium oxide, Al_2O_3

d. Aluminium sulphate, $\text{Al}_2(\text{SO}_4)_3$

e. Copper (II) nitrate, $\text{Cu}(\text{NO}_3)_2$

b) 0.1 mol of carbon dioxide gas, CO_2

V. Calculate the mass of ammonia, NH_3 in 1.8 mol.

VI. Calculate the moles of 784 g of copper (I) sulphate, Cu_2SO_4 .

VII. How many moles of sodium chloride, NaCl in 245.7g solution.

VIII. Calculate the mass of Lead (II) oxide, PbO produced when it is burnt in 0.5 mol.

EXERCISE 2.7

Arrange the electron in atom

1. Hydrogen, H

2. Lithium, Li

3. Sodium, Na

4. Potassium, K

EXERCISE 2.8

Arrange the electron in atom

1. Beryllium, Be

2. Magnesium, Mg

3. Calcium, Ca

EXERCISE 2.9

1. Compare the concentrated solution and dilute solution.

Concentrated Solution	Dilute Solution
Diagram:	Diagram:

EXERCISE 2.10

1. Compare the saturated solution and unsaturated solution.

Saturated Solution	Unsaturated Solution
Diagram:	Diagram:

EXERCISE 2.11

A solution is prepared by dissolving 42.23 g of NH_4Cl into enough water to make 500.0 mL of solution. Calculate its molarity.

EXERCISE 2.12

Suppose that you have 200 mL of a 3.5 M solution of NaCl . You dilute the solution by adding enough water to make the solution volume 500 mL. Calculate new molarity of the solution.

EXERCISE 2.13

Nitric acid (HNO_3) is a powerful and corrosive acid. When ordered from a chemical supply company, its molarity is 16M. How much of the stock solution of nitric acid needs to be used to make 8.00L of a 0.50M solution?

EXERCISE 2.14

Calculate how much volume do you need to take from 5.0M of BaSO_4 solution to make a final 0.2M solution in 250ml.

EXERCISE 2.15

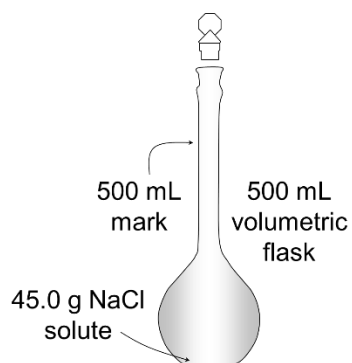
Calculate the final molarity if 40ml hydrochloric acid, HCl is taken from 8.0M to make a 250ml of new solution.

EXERCISE 2.16

How could 100 ml of 0.125M ammonium sulphate, $(\text{NH}_4)_2\text{SO}_4$ solution be made from 0.6M its master solution?

EXERCISE 2.17

How to prepare 500 mL of 1.54M NaCl Solution. Show your calculation work.



TOPIC

3

CHEMICAL EQUATION AND
REACTION

EXERCISES 3.1

Complete the prefixes below.

Carbon No., C	1	2	3	4	5	6	7	8
Name								

EXERCISES 3.2

- I. Complete the table below with the correct answer

Alkane	
General formula	
n= (start with)	
Functional group	

- II. What is the name of an alkane with 8 carbon atoms?

- III. What is the molecular and structure formula of butane?

IV. What is structural formula and molecular formula of following compound:

a) Hexane

b) Pentane

c) Octane

EXERCISES 3.3

I. Complete the table below with the correct answer

Alkene	
General formula	
n= (start with)	
Functional group	

II. What is the name of an alkene with 6 carbon atoms?

III. What is the molecular and structure formula of Octene?

IV. What is structural formula and molecular Formula of following compound:

a) Butane

b) Pentene

c) Heptane

EXERCISES 3.4

Give types of group and nomenclature of the following compound.

$C_5 H_{12}$	$C_4 H_8$	$C_6 H_{14}$
$C_8 H_{18}$	$C_3 H_8$	$C_8 H_{16}$
$C_7 H_{14}$	$C_2 H_4$	$C_3 H_6$

EXERCISES 3.5

- I. Complete the table below with the correct answer

Alcohol	
General formula	
n= (start with)	
Functional group	
Uses of alcohol	1.
	2.
	3.

- II. What is the name of an alcohol with 6 carbon atoms?

- III. What is the molecular and structure formula of octanol?

IV. What is structural formula and molecular Formula of following compound:

a) Butanol

b) Pentanol

c) Heptanol

V. Determine the name of the following compounds:

Compound	Name
$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	
$ \begin{array}{cccccc} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\ & & & & & \\ \text{H} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{OH} \\ & & & & & \\ & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array} $	

VI. Discuss three importance of alcohol

EXERCISES 3.6

I. Complete the table below with the correct answer

Carboxylic acid	
General formula	
n= (start with)	
Functional group	
Uses of carboxylic acid	1.
	2.
	3.

II. What is the name of a carboxylic acids with 6 carbon atoms?

III. What is the molecular and structure formula of octanoic acid?

IV. What is structural formula and molecular Formula of following compound:

a) Hexanoic acid

b) Pentanoic acid

c) Heptanoic acid

V. Determine the name of the following compounds:

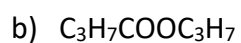
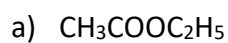
Compound	Name
$ \begin{array}{cccc} & \text{H} & \text{H} & \text{H} & & \text{O} \\ & & & & & // \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & - & \text{C} \\ & & & & & \backslash \\ & \text{H} & \text{H} & \text{H} & & \text{O} - \text{H} \end{array} $	
$ \begin{array}{ccc} & \text{H} & & \text{O} \\ & & & // \\ \text{H} & - \text{C} & - & \text{C} \\ & & & \backslash \\ & \text{H} & & \text{OH} \end{array} $	

EXERCISE 3.7

- I. Complete the table below with the correct answer

Ester	
General formula	
n= (start with)	
m= (start with)	
Functional group	
Uses of ester	1.
	2.
	3.
	4.
	5.

- II. Give the nomenclature of the following ester



- III. Draw the structural formula for reaction between the following compounds and its products;

Ester production			
Carboxylic acid	Alcohol	Products	
		Ester	Water
Pentanoic acid	Ethanol		
Butanoic acid	Methanol		
Ethanoic acid	Ethanol		
Propanoic acid	Methanol		

EXERCISES 3.8

Define pH and pOH

pH	pOH
Diagram:	Diagram:

EXERCISES 3.9

Explain pH scale with the aid diagram.

EXERCISES 3.12

Explain the important of pH in agriculture.

EXERCISES 3.13

Explain Aluminium toxicity with appropriate diagram.

EXERCISES 3.14

Explain the effect of acidic soils and alkaline soils on plant growth

Acidic Soils	Alkaline Soils

EXERCISES 3.15

Explain the method of managing soil pH

Acidic Soils	Alkaline Soils

EXERCISES 3.16

Discuss Cation Exchange Capacity (CEC) and its implication in agriculture fields.

EXERCISES 3.17

Explain the acidification potential for phosphorus (P) fertilizer with appropriate diagram.

EXERCISES 3.18

Explain the acidification potential for nitrogen (N) fertilizer with appropriate diagram.

TOPIC

4

AGROCHEMICALS APPLICATION IN AGRICULTURE

EXERCISES 4.1

State essential macronutrients and micronutrients needed by the soil.

Macronutrients	Micronutrients

EXERCISES 4.2

Identify symptoms of nitrogen (N), phosphorus (P) and potassium (K) deficiency in plant leaves respectively.

Plant Nutrients	Deficiency Symptoms
Nitrogen (N)	
Phosphorus (P)	
Potassium (K)	

EXERCISES 4.3

Compare organic and inorganic fertilizer.

Organic Fertilizer	Inorganic Fertilizer

EXERCISES 4.4

Explain advantages and disadvantages of chemical fertilizer.

Advantages	Disadvantages

EXERCISES 4.5

State types of pesticide.

EXERCISES 4.6

Explain class of pesticides with hazard statement and band colour.

EXERCISES 4.7

Explain mode of action of pesticide.

EXERCISES 4.8

Explain THREE (3) functions of auxins as a plant hormone.

EXERCISES 4.9

Discuss THREE (3) functions of gibberellins as a growth regulator.

EXERCISES 4.10

Cytokinin is a chemical messenger of plant. Discuss THREE (3) functions of cytokinin.

EXERCISES 4.11

Discuss THREE (3) functions of ethylene as a phytohormones of plants.

EXERCISES 4.12

Discuss THREE (3) functions of abscisic acid as a growth regulator.

EXERCISES 4.13

Explain importation, augmentation and conservation in biological control with appropriate example.

EXERCISES 4.14

List SIX (6) classification hazard of agrochemical with appropriate diagram.

Classification Hazard	Diagram

EXERCISES 4.15

List SIX (6) personal protective equipment (PPE)

AGRICULTURAL CHEMISTRY

Supplementary Exercise

Exercise Make Perfect **BOOK**
First Edition

Politeknik Sandakan Sabah

Education Hub, Batu 10,

Jalan Sungai Batang,

90000 Sandakan Sabah

Tel: 089-228351

Fax: 089-228325

<http://www.pss.edu.my>

eISBN 978-967-17957-0-5



9 789671 795705