LIFE SCIENCE

SECONDARY EDUCATION
FIRST YEAR

EVISED EDITION

Center for Educational Research and Development
National Textbook
New Curricula

Republic of Lebanon

Ministry of Education and Higher Education

LIFE SCIENCE

Secondary Education

First year

Center for Educational Research and Development

National Textbook

New Curricula

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The English version of this text was reviewed and corrected by faculty members at the American University of Beirut.

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Secondary Education
First year

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Together We Build Through Education!

The Center for Educational Research and Development (CERD) has embarked on an extensive workshop for assessing and developing the educational framework and curricula which have been placed into effect more than three years ago. With full realization of the fact that the educational cycle must continue normally through its components, and until the development process attains its aspired objectives, we are placing in the hands of students, teachers and directors of public schools, this corrected version of textbooks issued by CERD as part of the National Textbook Series.

This version is an interim stage incorporating the corrected typographical and linguistic errors discovered by CERD specialists as well as teachers and students through their daily dealings with the books. The process of assessment and development of the framework and curricula will take into consideration all the comments that have been made, or will be made, in this regard.

It is expected that once the curricula are developed and aligned with the general and specific objectives set for them, the textbooks will be realigned with the new curricular and framework requirements, including tying the content of a course to the number of teaching hours set for it during the school year, taking into consideration vertical alignment within the same course as well as the horizontal alignment with the rest of the courses.

I take this opportunity to invite all school administrators, teachers and students and all officials concerned in public and private schools alike, to promptly send their comments on these curricula and books as their contribution to enrichment of this momentous national process.

This workshop, which was launched under the kind sponsorship of His Excellency the Minister of Education and Higher Education in implementation of Decree No. 10227 embodying the educational curricula and their objectives, fits in with CERD's proclaimed new motto "Together We Build Through Education".

It is our earnest desire to see this national, all-inclusive workshop attracting the greatest amount of interest and participation to define the safest and soundest educational options that directly affect our children, as we vow to continually modernize education and develop its ways and means to keep abreast of modern developments and progress in science and technology.

Dr. Leila MALEEHA
President CERD

PREFACE

The curriculum of the first year of the secondary cycle in Life Science focuses on the following themes:

- functional organization of living things
- plant production and environmental factors
- management and protection of the environment.

This textbook is conceived to put in the hands of the student a tool of work that he can use in class, as a source of documents for learning, and outside the class to carry out complementary work.

Our keen concern made us adopt a clear and logical presentation that includes:

- chapters that are activity centered
- rich illustrations that can be used as learning support.

A particular attention is paid to environmental and health education.

Organization of the textbook:

Each chapter includes:

- An opening page that poses very clearly the problems to be solved.
- "Activities" that include experiments and / or selected precise information (graphs, tables, drawings, concept maps, photographs, ...) that allow the student to find solutions to the problems posed.
- A "Summing-up" that represents the main ideas.
- The "Concept mapping" that relates the main concepts of the chapters.
- A "Solved exercise" that includes directions to help the student to answer correctly.
- "Exercises" that assess the acquired knowledge.
- "Supplementary information" that are in most of the times about current issues.

This book conforms with the desire of renovation of the new curriculum and respects its new spirit and trends.

We strongly hope that this textbook will gratify many of our colleagues. Many thanks to all those who helped us.

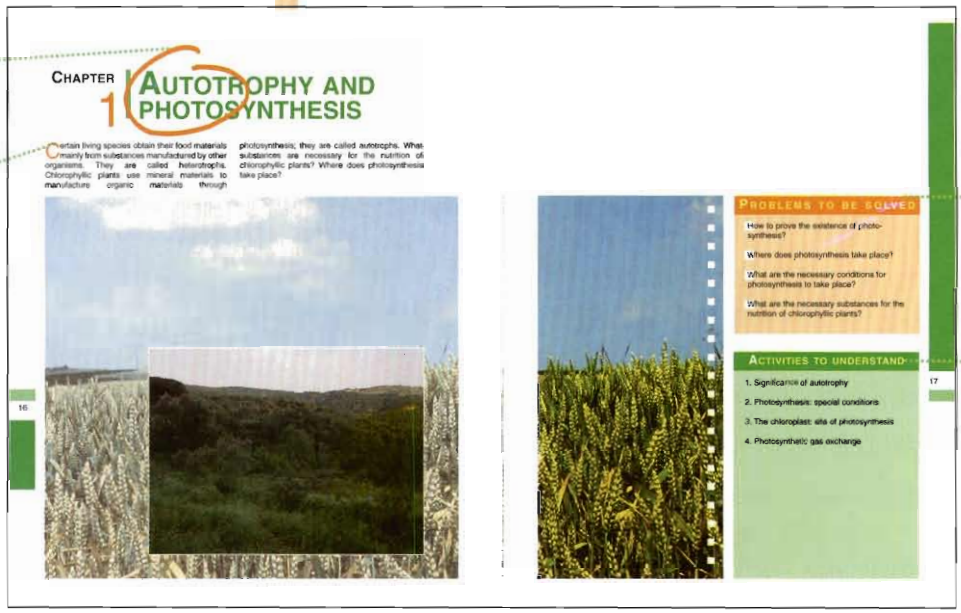
The authors

USING THIS TEXTBOOK

The chapter opening page

The chapter title

The chapter introduction


CHAPTER 1
AUTOTROPHY AND PHOTOSYNTHESIS
Certain living species obtain their food materials mainly from substances manufactured by other organisms. They are called heterotrophs. Chlorophyllic plants use mineral materials to manufacture organic materials through photosynthesis; they are called autotrophs. What substances are necessary for the nutrition of chlorophyllic plants? Where does photosynthesis take place?
PROBLEMS TO BE SOLVED
How to prove the existence of photosynthesis?
Where does photosynthesis take place?
What are the necessary conditions for photosynthesis to take place?
What are the necessary substances for the nutrition of chlorophyllic plants?
ACTIVITIES TO UNDERSTAND
1. Significance of autotrophy
2. Photosynthesis: special conditions
3. The chloroplast: site of photosynthesis
4. Photosynthetic gas exchange
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Problems to be solved

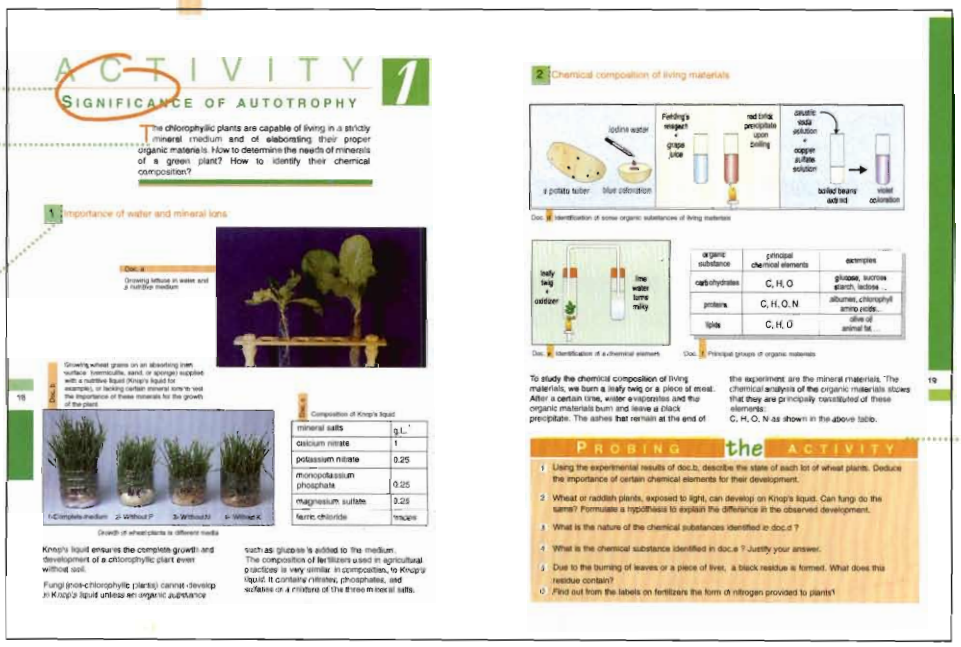
Activities to be done

Activities to deduce the important notions

The activity title

The activity introduction

Documents for a better understanding


ACTIVITY 1
SIGNIFICANCE OF AUTOTROPHY
The chlorophyllic plants are capable of living in a strictly mineral medium and of elaborating their proper organic materials. How to determine the needs of minerals of a green plant? How to identify their chemical composition?
1 Importance of water and mineral ions
Doc. a
Growing lettuce in water and a nutritive medium
Doc. b
Growing wheat grains on an absorbing inert surface (vermiculite, sand, or sponge) supplied with a nutritive liquid (Knop's liquid for example), or lacking certain mineral ions to test the importance of these minerals for the growth of the plant.
1-Complete medium 2- Without P 3- Without Ca 4- Without K
Growth of wheat plants in different media
Doc. c
Composition of Knop's liquid

	g.L⁻¹
mineral salts	
calcium nitrate	1
potassium nitrate	0.25
monopotassium phosphate	0.25
magnesium sulfate	0.25
ferric chloride	traces

Knop's liquid ensures the complete growth and development of a chlorophyllic plant even without soil.
Fungi (non-chlorophyllic plants) cannot develop in Knop's liquid unless an organic substance such as glucose is added to the medium.
The composition of fertilizers used in agricultural practices is very similar in composition, to Knop's liquid. It contains nitrates, phosphates, and sulfates or a mixture of the three mineral salts.
2 Chemical composition of living materials
a potato tuber
iodine water
blue coloration
Doc. d Identification of some organic substances of living materials
Doc. e Identification of a chemical element
lime water turns milky
Doc. f Principal groups of organic materials

organic substance	principal chemical elements	examples
carbohydrates	C, H, O	glucose, sucrose, starch, lactose ...
proteins	C, H, O, N	albumen, chlorophyll, amino acids...
lipids	C, H, O	olive oil, animal fat, ...

To study the chemical composition of living materials, we burn a leafy twig or a piece of meat. After a certain time, water evaporates and the organic materials burn and leave a black precipitate. The ashes that remain at the end of the experiment are the mineral materials. The chemical analysis of the organic materials shows that they are principally constituted of these elements: C, H, O, N as shown in the above table.
PROBING the ACTIVITY
1 Using the experimental results of doc.b, describe the state of each lot of wheat plants. Deduce the importance of certain chemical elements for their development.
2 Wheat or radish plants, exposed to light, can develop on Knop's liquid. Can fungi do the same? Formulate a hypothesis to explain the difference in the observed development.
3 What is the nature of the chemical substances identified in doc.d ?
4 What is the chemical substance identified in doc.e ? Justify your answer.
5 Due to the burning of leaves or a piece of liver, a black residue is formed. What does this residue contain?
6 Find out from the labels on fertilizers the form of nitrogen provided to plants?
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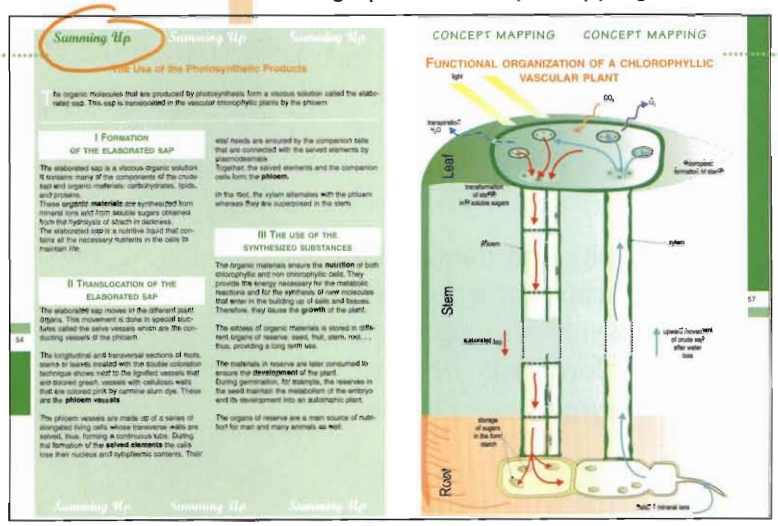
Probing the activity

Summing up and concept mapping

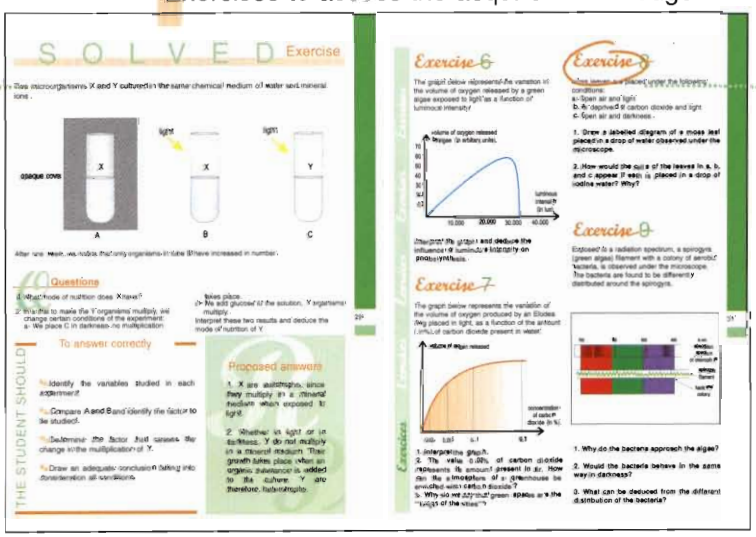
Main ideas to retain



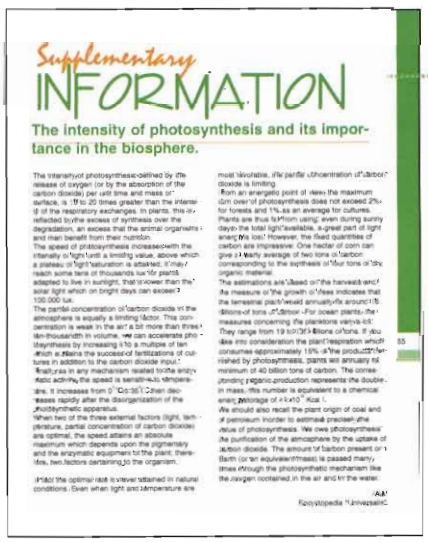
Schematic concept mapping relating the main concepts

Exercises to assess the acquired knowledge

Solved exercise to help the student answer correctly



Exercises



Suplementary information of selected current issues

CONTENTS

PART ONE

FUNCTIONAL ORGANIZATION OF LIVING THINGS

A. FUNCTION OF NUTRITION AND ORGANIZATION IN A CHLOROPHYLLIC VASCULAR PLANT

B. Communication and organization in an animal

PART TWO

PLANT PRODUCTION AND ENVIRONMENTAL FACTORS

PART THREE

MANAGEMENT AND PROTECTION OF THE ENVIRONMENT