

MODERN

INTEGRATED SCIENCE

新 综 合 科 学

牛津原版



W.L. CHENG M.S. YEUNG

上海远东出版社

牛津大学出版社

MODERN INTEGRATED SCIENCE

G634. 7/32

W.L. CHENG M.S. YEUNG

BOOK 3

江苏工业学院图书馆
藏书章

上海远东出版社 牛津大学出版社

图书在版编目(CIP)数据

新综合科学学生用书 第3册:英文/郑书皓,杨坚望
著.一影印版.一上海:上海远东出版社,1999
(牛津—远东学生新知文库)
据牛津大学出版社(OPL)原版影印
ISBN 7-80613-870-6

I.新… II.①郑… ②杨… III.理科(教育)-中学-教
学参考资料-英文 IV.G634.73

中国版本图书馆 CIP 数据核字(1999)第 30243 号

Originally Published by Oxford University Press (China) Ltd
This edition published by Shanghai Far East Publishers with kind permission of Oxford
University Press for sale in the People's Republic of China only and not for export therefrom
© Oxford University Press 1991
Oxford is a registered trademark of Oxford University Press

本书原系牛津大学出版社出版、香港等地区广泛使用的中学教材。应国内教学
改革之需,现影印出版,故本书主体部分繁体汉字暂未更动。1997年7月1日,
中国政府恢复对香港行使主权。书中有些地方(如行政机构的提法、为课程内
容而设置的示意图等)与现实可能有不尽相符之处,有待改编新版时修订,敬请
读者注意。

新综合科学3(英文)

郑书皓 杨坚望 著

出版	上海远东出版社 (上海冠生园路393号 邮编200233)	开本	850×1168 1/16
	牛津大学出版社	印张	15
发行	上海远东出版社	千字	365
经销	全国新华书店	版次	1999年8月第1版
印刷	上海市印刷七厂	印次	1999年8月第1次
		印数	1-2000

ISBN 7-80613-870-6/G·655

图字:09-1999-188号

定价:21.50元

Preface

Modern Integrated Science is a series of three textbooks written for junior secondary students. The course closely follows the latest Science syllabus (Forms I–III) recommended by the Hong Kong Education Department.

As students must be allowed to discover facts and ideas for themselves, we have formed the outline of the books with carefully selected experiments. However, experimental work is not sufficient to meet the needs of the students. Teachers and students have found that they need supplementary materials to the experimental work. Therefore, a text/activity combined approach is adopted in writing the books.

Throughout the series, we have designed an appropriate amount of individual work and group work to encourage students to find out how and why things happen. There are spaces for them to record the results. Discussion topics are also suggested to stimulate thinking. The students are asked questions and encouraged to ask their own questions in return. After each activity, essential additional materials are provided to enable the students understand the implication of and the background to their activities.

Great care has been taken to ensure the majority of students will be able to read the book. Throughout the course, simple sentences with vocabulary under control have been used. Colour illustrations and photographs are included to arouse the students' interest.

Sometimes, it is difficult for even an experienced teacher to determine at what level any particular topic is being assimilated. The summary at the end of each unit indicates what we think is an appropriate minimum level of attainment. An immediate conclusion 'What we have learnt' is for reinforcement. It collects together the ideas and concepts which should have arisen from the activities. The exercise book acts as further supplementary material. The teacher's guide contains suggestions for activities, equipment requirements, teaching strategies and extension work.

Overall, the books have been written for the students to use, to read, and above all to enjoy. Great effort has been made to demonstrate that science questions everything, reaches everyone. Finally, we wish to thank Mr Yau Hing-wah and Mr Chung Siu-cheong of St. Antonius Girls' College for their kind assistance in helping us to take photographs in their school.

Acknowledgements

The authors and the publisher would like to thank the following for providing photographs for the book:

Australian Tourist Commission
Brian S. Morton
China Light & Power Co. Ltd.
Dah Chong Hong, Ltd.
Eileen Tsang
Gordon Garrod and Science Photo Library
Graves Medical Audiovisual Library
Hong Kong Government Information Services
Hong Kong Health Department, Health Education Unit
Hong Kong Tourist Association
Hong Kong Trade Development Council
Hongkong Electric Co., Ltd.
Japan National Tourist Organisation, Hong Kong
Jenny Ridgwell
John Isaac and United Nations (photo 164658)
Judy Ridgway
Katty Law
Lourdes Lam
M.J. Atherton
Mass Transit Railway Corporation
Metallgesellschaft Far East Ltd.
National Panasonic Technics and Shun Hing Electronic Trading Co. Ltd.
Nissin Foods Company Ltd.
Oxford Scientific Films Ltd.
Park'N Shop Ltd.
Paul Brierley
Peter C. Harrison
Redland Concrete Ltd.
Regional Council
Ruth Marshall
S.P. Hou
Stephen H.Y. Wei
Tak Wan Motor Co. Ltd.
Titan Enterprises Co.
Tse Shu Ming
U.S. National Aeronautics and Space Administration
Urban Council
World Vision of Hong Kong

Contents

Unit 13 Food and Transport

Substances in food	2
Food tests	3
Functions of food	8
Balanced diet	13
Storing food	19
More about food chains and food webs	25
Teeth	27
Tooth decay	32
Digestion	36
Absorption of food	41
Digestive juices	43
A closer look at the digestive system	44
More about enzymes	45
Transport system in mammals	48
Pulse and pulse rate	56
Blood pressure	58
Water balance	58
The kidneys and their functions	61
Nutrients for plant growth	64
Absorption and transport of water in plants	68
Xylem and phloem	72
The main uses of water in plants	72
Summary	73
Difficult words	79



Unit 14 Materials from the Earth

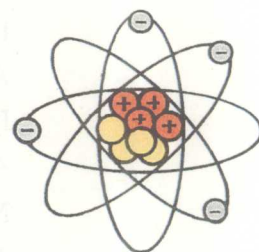
The Earth	82
The soil	91
Building materials	96
Metals from the Earth's crust	101
The pollution problem	107



Coal	111
Crude oil or petroleum	117
Materials from the sea	124
Water pollution	129
More materials from the sea	131
Chalk, limestone and marble	135
Summary	137
Difficult words	142

Unit 15 Electricity and Electronics

Electrostatics	144
The Van de Graaff generator	146
Looking at atoms — a revision	150
Pushing charges	152
Voltage and the voltmeter	154
Safety with the mains voltage	158
Dynamo effect	159
Alternating current and direct current	166
Transmitting electrical energy	166
Transformers	171
Power transmission	173
Using electricity	174
Power and energy	176
Current in gas	179
Lightning	180
Fluorescent lamps	185
Current in a vacuum	185
Diode	187
C.R.O. and TV	197
Some useful electronic components	197
Switches	205
Electronic logic	212
Applications of the AND gate	219
Summary	222
Difficult words	227

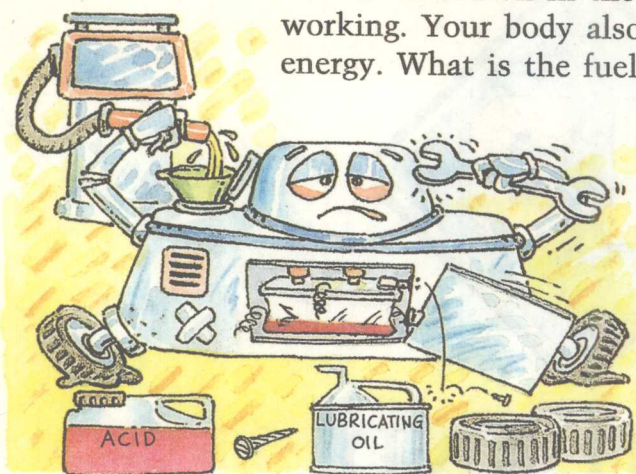


Index	228
-------	-----



FOOD AND TRANSPORT





The robot shown in the picture below needs fuel to keep it working. Your body also requires fuel to provide you with energy. What is the fuel you need?



The fuel comes from the food you eat.

But the robot needs something more to keep it running properly. It also needs metal for its body, acid for its battery, and oil for its engine. In fact, food supplies all chemicals for our growth and keeps our bodies healthy.

In this unit, we are going to learn more about different foods and how we make use of them.



Substances in food

Look at the following photograph. Do people in different countries eat the same kind of food? No, they do not. Why are they equally healthy?



Food from different countries

It is because what they eat contains all the necessary food substances to provide them with energy and to keep them healthy.

We usually classify food into six main types.

- 1 **Carbohydrates** (碳水化合物)
- 2 **Fats** (脂肪) **and oils**
- 3 **Proteins** (蛋白質)
- 4 **Mineral salts** (礦物鹽)
- 5 **Vitamins** (維他命)
- 6 **Water**

Carbohydrates are the starch and sugar in food.



Food tests

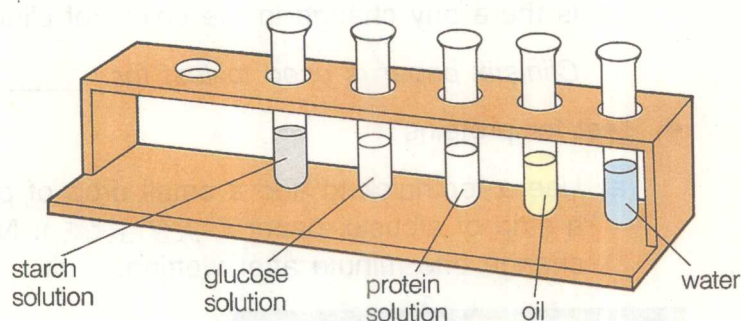
Which food that we eat contains carbohydrates? Proteins? Fats and oils?

Before we find out the contents of some common foods we eat, let us learn how to identify different food substances.

Activity 13.1

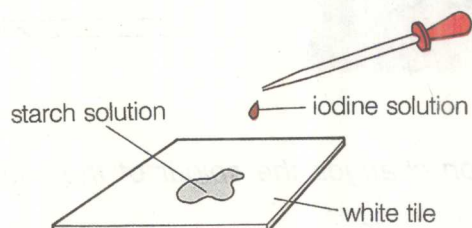
Test for glucose (葡萄糖), starch, proteins, fats and oils

- 1 Your teacher will give you five test tubes. Each test tube contains one type of food substance only.



2 Test for starch

- (a) Transfer a few drops of starch solution from the test tube to a white tile. Then add a few drops of iodine solution (碘液).



When iodine solution is added to starch solution, the colour of iodine solution turns from

_____ to _____.

- (b) Repeat the above activity using the other food substances. Is there any colour change in the iodine solution?

Iodine solution is used to test for _____.

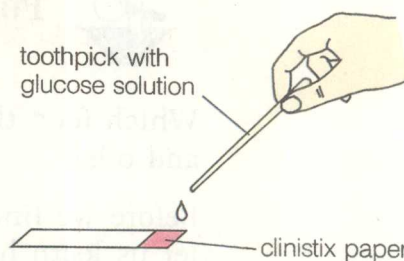
3 Test for glucose

Glucose is grape sugar.

- (a) Use a toothpick to add a small drop of glucose solution onto a strip of clinistix paper (尿糖试纸). Note the colour change 10 seconds after wetting.



Clinistix paper



The colour of clinistix paper turns from _____ to _____ with glucose solution.

- (b) Repeat the above activity with the other food substances. Is there any change in the colour of clinistix paper? _____

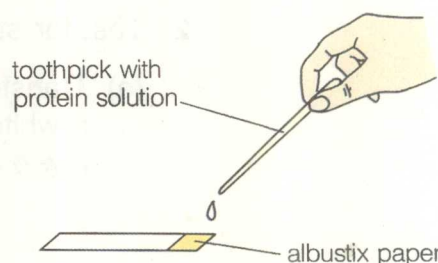
Clinistix paper is used to test for _____.

4 Test for proteins

- (a) Use a toothpick to add a small drop of protein solution onto a strip of albustix paper (尿蛋白試紙). Note the colour change one minute after wetting.



Albustix paper



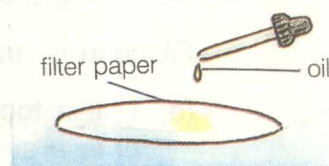
Protein solution changes the colour of the albustix paper from _____ to _____.

- (b) Repeat the above activity with the other food substances. Notice if there is any colour change in albustix paper.

Albustix paper is used to test for _____.

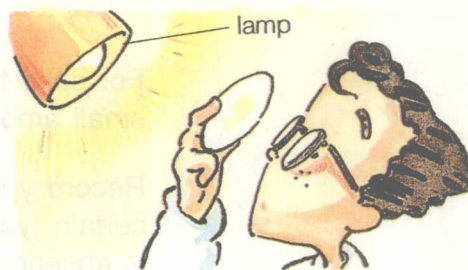
5 Test for oils and fats

- (a) Put a drop of oil on a piece of filter paper.



- (b) Hold the filter paper to the light.

Does the spot of oil appear light/dark? _____



- (c) Your teacher may give you a small piece of butter. Rub it on a piece of filter paper. Hold the filter paper to the light.

Does the spot of butter appear light/dark? _____

- (d) Repeat (a) and (b) using the other food substances. Which of them leaves a light spot on filter paper?

_____ and _____ form permanent translucent (透光的) marks on filter paper.

What we have learnt

_____ solution is used to test for starch. A

_____ colour is formed.

_____ can be used to test for glucose.

It turns _____ with sugar solution.

_____ is used to test for proteins. It

turns _____ with protein solution.

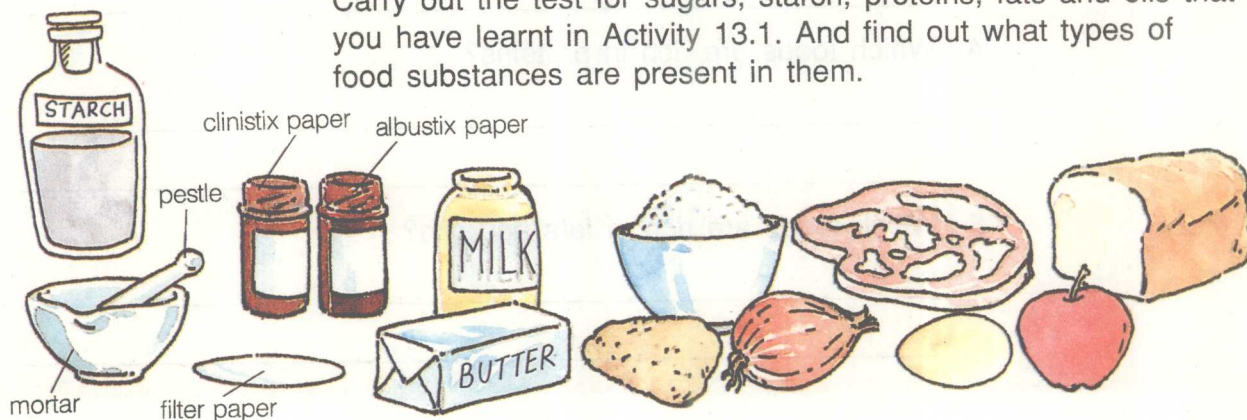
_____ and _____ form a translucent mark on filter paper. This is the test for _____.

Activity 13.2

What are foods made of?

- 1 Your teacher will give you different kinds of food.

Carry out the test for sugars, starch, proteins, fats and oils that you have learnt in Activity 13.1. And find out what types of food substances are present in them.



For solid foods, grind them to small pieces in a mortar with a small amount of water before doing the tests.

- 2 Record your results in the following table. Put a tick '√' if a certain type of food substance is present and a cross 'X' if it is absent.

Food	Types of food substances			
	Carbohydrates		Proteins	Fats and oils
	Starch	Sugar		
Apple				
Cooked rice				
Bread				
Egg				
Butter				
Milk				
Meat				
Potato				
Onion				
Bacon				

- 3 Which foods are rich in carbohydrates?

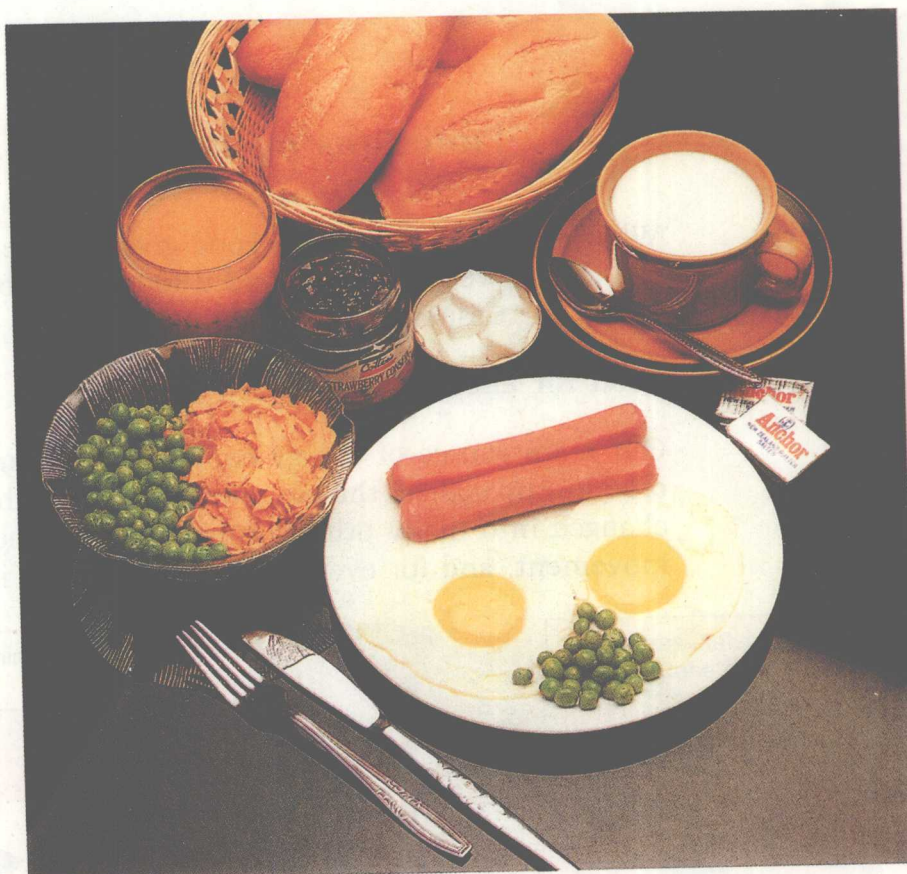
- 4 Which foods are rich in proteins?

- 5 Which foods are rich in fats and oils?

6 Which food(s) is/are made up of all these three types of food substances: carbohydrates, proteins, fats and oils?

7 Look at the foods we eat at breakfast.

Which foods contain mostly carbohydrates, or proteins, or fats and oils?



The food we eat at breakfast

<i>Contains mostly</i>	<i>Food</i>
Carbohydrates	
Proteins	
Fats and Oils	

What we have learnt

Different foods are made up of _____ (the same/different) food substances.

Some food contains mostly _____, or _____, or _____.



Functions of food

What does food do for us? Food gives us the energy to do all the things we do. We also need food to enable us to grow and repair our tissues, and to keep us healthy.

Food for energy

Our main source of energy comes from **sugars, starch, fats and oils**. In our bodies, the chemical energy in these foods is changed into many other forms. We need energy for growth and movement, and for everything that happens inside our bodies.

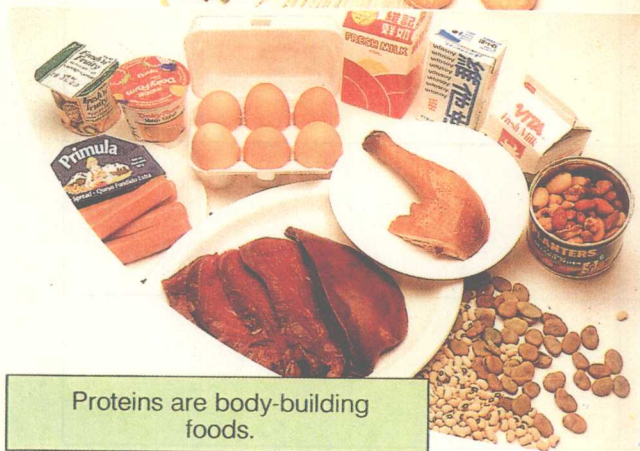
Carbohydrates, fats and oils supply us with energy.



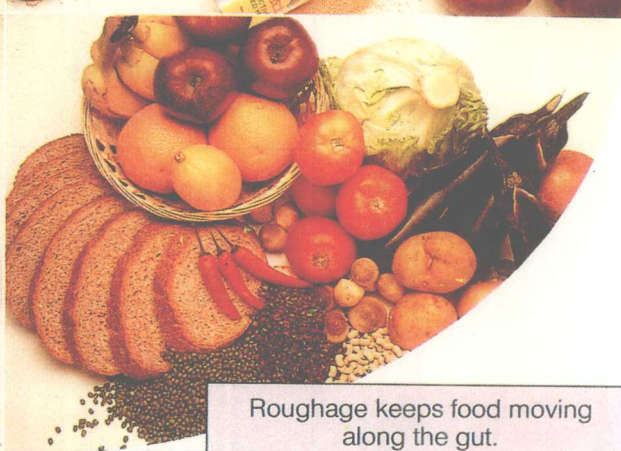
Vitamins and minerals keep us healthy.



Proteins are body-building foods.



Roughage keeps food moving along the gut.



If we do not have enough of these foods we will become weak and inactive. If we eat too many of these foods, they will be stored under our skin as fat.

Carbohydrates, fats and oils are called energy-giving foods.

Foods for growth and repair

Proteins also provide us with energy, but they are usually used in other ways.

Proteins supply the materials needed to build cells and keep cells joined together as tissues (組織) and organs (器官). If the body is damaged, proteins are needed for repair.

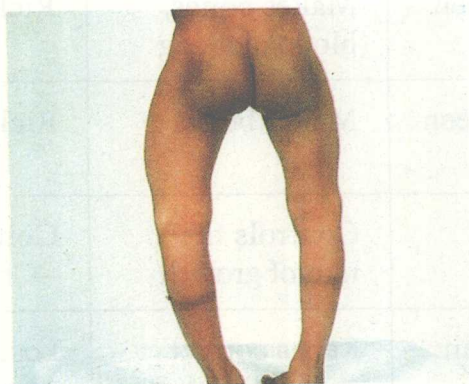
We cannot store proteins in our bodies, so we need a regular supply of them.

Foods for health

Vitamins and mineral salts are also essential in our diets. They are important to regulate the chemical reactions in our bodies. These substances are needed only in small amounts, but if they are missing from our diets we shall soon become ill. They are also important for healthy growth. Deficiency (缺乏) of these substances affects children more easily than adults.

Roughage (基糠) is plant fibre which is not digested by human beings. It is important because it helps food to move along the gut easily. A person will suffer from **constipation** (便秘) if there is not enough roughage in his meal.

Wholemeal bread, cereals, fresh fruits and vegetables usually contain a lot of fibre.



Rickets, due to deficiency of vitamin D



Kwashiorkor, due to deficiency of protein

The main vitamins you need

<i>Vitamin</i>	<i>Food rich in the vitamin</i>	<i>Function</i>	<i>Effect of deficiency</i>
A	Fresh green vegetables, milk and butter, cod-liver oil, liver	Keeps skin, bones and eyes healthy Helps prevent nose and throat infections	Night-blindness (夜盲症), skin diseases, poor growth
B	Yeast, meat, whole-meal bread, eggs, liver, milk and green vegetables	Growth, release of energy from food, health of blood, eyes, and skin	Beri-beri (腳氣病) — the person loses the power to move his limbs Anaemia (貧血) — the person is pale and has no energy
C	Fresh fruits and vegetables	For healthy skin and gums, and to heal wounds quickly	Scurvy (壞血病) — gums swell and bleed easily
D	Cod-liver oil, cream, egg yolk, fish, butter	For strong bones and teeth	Rickets (佝僂病) — bones become soft and bent

The main minerals you need

<i>Minerals</i>	<i>Obtained from</i>	<i>Function</i>	<i>Effect of deficiency</i>
Iron	Green vegetables, meat, potatoes	Makes blood	Anaemia
Calcium	Milk, eggs, green vegetables	Makes bones, blood clotting	Rickets
Phosphorus	Milk, meat, green vegetables	Makes bones	Rickets
Iodine	Fish, iodized table salt	Controls the rate of growth	Goitre (甲狀腺腫) — the neck swells
Sodium chloride	Table salt, green vegetables	Keeps correct composition of body fluids	Loss of weight and nervous disorder