

**HELEN A. GUTHRIE  
KAREN SUE BRADDOCK**

# **Programmed nutrition**

**SECOND EDITION**



# Programmed nutrition

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**SECOND EDITION**

*with 49 illustrations*

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## **SECOND EDITION**

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## **Programmed nutrition**



# Preface

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The task of providing a maximum learning experience for the increasing numbers of students entering college has provided the impetus to seek effective alternatives or supplements to the traditional classroom lecture and textbook approach.

Programmed instruction is one such possible alternative. This book has developed from our recognition of the potential of that form of instruction in presenting the basic principles of nutrition. When used on a self-study basis, it provides direction and emphasis for students in identifying and learning the basic concepts. When used as a supplement to classroom lectures, it releases more classroom time for amplification of the basic principles. It is equally useful for those who wish to refresh their understanding of the basic principles of nutrition. In any case, it is structured for use either alone or in conjunction with an introductory nutrition text.

This linear programmed presentation of the fundamentals of nutrition is the result of the selection of the basic concepts, item construction, testing, revising, and retesting of the format and content of each frame over a period of 2 years. Students are presented with a concept; they practice the concept and are tested on it. They also receive periodic reviews of what they have learned.

The effectiveness of this program in enhancing learning was assessed in an introductory course in nutrition. One group of volunteers was given access to the programmed materials, while a carefully matched group of volunteers was asked to rely on the conventional method of instruction. An analysis of their performance showed that in two out of three tests and on a test 6 weeks after the end of the course the experimental group using programmed instruction scored significantly higher than the control group. This group, consisting primarily of college sophomores and juniors, was enthusiastic about this approach to learning.

We hope that this programmed presentation of the fundamentals of nutrition will make a significant contribution to the field of nutrition education. We hope also that it will be greeted with the same acceptance as expressed by those who served as subjects

during the various stages of testing the items and format. To these students we express our appreciation and the hope that they have profited through a more fundamental comprehension of the basic principles on which an understanding of the nutritional processes is so dependent. Special appreciation goes to Miss Catherine Wargo, who created the illustrations, and to Mr. Paul Alter and Dr. Einar Bredland, whose instruction helped make the book possible.

**Helen A. Guthrie**  
**Karen Sue Braddock**

# How to use this book

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This book consists of 12 chapters or 12 individual self-teaching programs. Each chapter is a separate unit to permit you, the student, to study one chapter at a time as you proceed through a course in nutrition, one subject area at a time.

The programs may be used in conjunction with *Introductory Nutrition* by Helen A. Guthrie, or they may be used alone to gain knowledge of the basic principles of nutrition. To get the most out of these programs, *do not* read the chapters in *Introductory Nutrition* first. Take the program first; then read the corresponding chapter.

Look at Chapter 1, "Carbohydrate." Notice that the first page of the chapter is labeled "Exhibit 1-A." You will use the exhibit later in this chapter when you are instructed to do so. This exhibit is used only in this chapter. Exhibits are used only in the chapter in which they are found. Notice that each frame has a number. If you glance through the top strip of the pages in the chapter, you will find that the frames are numbered from 1 to 13. Begin with frame 1 and, using the information or clues presented in the frame, fill in the blank to complete the sentence. Then turn the page and check your answer in box 1a. Next, answer frame 2 and check your answer on the next page at 2a. Proceed through the top strip of frames in this manner. When you have finished frame 13, turn back to the first page of the chapter and begin working with frame 14. Every time you reach the end of a strip of frames, turn back to the first page and begin with the next consecutively numbered frame. Keep working until you have finished the program for the chapter. Then read the corresponding chapter in *Introductory Nutrition*. If you are using the programmed text by itself, you may wish to continue with the next chapter.

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CHAPTER

# 1

# Carbohydrate

---

---

**EXHIBIT 1-A**

maltose  
↙ ↘  
glucose glucose

sucrose  
↙ ↘  
fructose glucose

lactose  
↙ ↘  
galactose glucose

---

---

Half of the 2200 calories in the diet of the average American woman come from lipids and protein. **1**  
Carbohydrate provides the other (fraction) \_\_\_\_\_.

---

complex carbohydrate + enzyme = simple carbohydrate  
To break down complex carbohydrates into simple carbohydrates during digestion, the body produces **14**  
\_\_\_\_\_.

---

Use words from the list to complete the formula. **27**  
maltose  
mannose  
salivary amylase  
pancreatic amylase  
dextrin + \_\_\_\_\_ = \_\_\_\_\_

---

Use Exhibit 1-A. **40**  
Lactase converts lactose to \_\_\_\_\_ and \_\_\_\_\_.

---

The body converts and stores excess carbohydrate as (check your answer[s]): **53**  
1. \_\_\_\_\_ blood sugar.  
2. \_\_\_\_\_ glycerol.  
3. \_\_\_\_\_ fat (adipose tissue).

---

|        |  |                         |
|--------|--|-------------------------|
| Match: | 1. _____ only sugar found in the bloodstream           | A. hyperglycemia        |
|        | 2. _____ carbohydrate stored in the liver              | B. glucose              |
|        | 3. _____ body tissue containing converted carbohydrate | C. hypoglycemia         |
|        | 4. _____ low blood glucose level                       | D. diabetes mellitus    |
|        | 5. _____ high blood glucose level                      | E. glycogen             |
|        | 6. _____ body produces insufficient insulin            | F. fat (adipose tissue) |
|        |  | G. hyperinsulinism      |

---

Fiber helps (check your answer[s]): **79**  
1. \_\_\_\_\_ reduce resorption of sterols (cholesterol).  
2. \_\_\_\_\_ prevent loss of essential nutrients.  
3. \_\_\_\_\_ increase vitamin A absorption.

---

Now you will learn some characteristics of monosaccharides. The simplest carbohydrates are the **92**  
\_\_\_\_\_.

---

---

**1**  
**A** half

---

**14**  
**A** enzymes

---

**27**  
**A** pancreatic amylase  
maltose

---

**40**  
**A** galactose  
glucose

---

**53**  
**A** 1.  
2.  
3. ✓

---

**66**  
**A** 1. B  
2. E  
3. F  
4. C  
5. A  
6. D

---

**79**  
**A** 1. ✓  
2.  
3.

---

**92**  
**A** monosaccharides

---

---

Circle the formula that shows how to determine the number of calories provided by carbohydrate in a 2200 calorie diet.

$$2200 \times \frac{2}{3}$$

$$2200 \times \frac{1}{2}$$

$$2200 \times \frac{1}{3}$$

**2**

---

*Enzymes*

sucrase

amylase

All enzymes have the three-letter suffix \_\_\_\_\_.

**15**

---

Circle the true equations.

pancreatic amylase + starch = sucrose

pancreatic amylase + dextrin = maltose

salivary amylase + starch = dextrin

salivary amylase + dextrin = dextrose

**28**

---

Complete the formula using words from the list.

glucose

fructose

galactose

mannose

lactase + lactose = \_\_\_\_\_ + \_\_\_\_\_

**41**

---

Match:

1. \_\_\_\_\_ only sugar found in the bloodstream

2. \_\_\_\_\_ carbohydrate stored in the liver

3. \_\_\_\_\_ formed from excess carbohydrate and generally stored in the body

A. glucose

B. glycerol

C. fat (adipose tissue)

D. galactose

E. glycogen

**54**

---

Carbohydrates enter body cells in the form of monosaccharides, which are metabolized (or changed) to water, carbon dioxide, and energy inside the \_\_\_\_\_.

**67**

---

Two reasons for including fiber in the diet are (check your answers):

1. \_\_\_\_\_ human beings cannot digest it.

2. \_\_\_\_\_ it provides extra vitamins.

3. \_\_\_\_\_ it promotes normal motility in the colon.

4. \_\_\_\_\_ it reduces resorption of sterols (cholesterol).

**80**

---

“Hexoses” are six-carbon sugars. Most monosaccharides found in food are six-carbon sugars known as \_\_\_\_\_.

**93**

---

**2**  
**A**      $2200 \times \frac{1}{2}$

---

**15**  
**A**     *ase*

---

**28**  
**A**     salivary amylase + starch = dextrin  
         pancreatic amylase + dextrin = maltose

---

**41**  
**A**     galactose  
         glucose

---

**54**  
**A**     1. A  
         2. E  
         3. C

---

**67**  
**A**     cells

---

**80**  
**A**     1.  
         2.  
         3. ✓  
         4. ✓

---

**93**  
**A**     hexoses

---



---

Our diets include starches and sugars. Two generally recognized groups of carbohydrates are the \_\_\_\_\_ and the \_\_\_\_\_. **3**

---

Rewrite the name of the sugar to give an enzyme that acts on it. **16**

|              |               |
|--------------|---------------|
| <i>Sugar</i> | <i>Enzyme</i> |
| maltose      | _____         |

---

|                     | <b>DIGESTION OF STARCH</b>  |            |        |            |       |          |          |         |       |       |                 |          |          |           |
|---------------------|---|------------|--------|------------|-------|----------|----------|---------|-------|-------|-----------------|----------|----------|-----------|
| Complete the chart. | <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 33%; padding: 5px;">Place</th> <th style="width: 33%; padding: 5px;">Enzyme</th> <th style="width: 33%; padding: 5px;">End result</th> </tr> <tr> <td style="padding: 5px; vertical-align: top;">mouth</td> <td style="padding: 5px; vertical-align: top;">1. _____</td> <td style="padding: 5px; vertical-align: top;">2. _____</td> </tr> <tr> <td style="padding: 5px; vertical-align: top;">stomach</td> <td style="padding: 5px; vertical-align: top;">*****</td> <td style="padding: 5px; vertical-align: top;">*****</td> </tr> <tr> <td style="padding: 5px; vertical-align: top;">small intestine</td> <td style="padding: 5px; vertical-align: top;">3. _____</td> <td style="padding: 5px; vertical-align: top;">4. _____</td> </tr> </table> | Place      | Enzyme | End result | mouth | 1. _____ | 2. _____ | stomach | ***** | ***** | small intestine | 3. _____ | 4. _____ | <b>29</b> |
| Place               | Enzyme  | End result |        |            |       |          |          |         |       |       |                 |          |          |           |
| mouth               | 1. _____  | 2. _____   |        |            |       |          |          |         |       |       |                 |          |          |           |
| stomach             | *****   | *****      |        |            |       |          |          |         |       |       |                 |          |          |           |
| small intestine     | 3. _____  | 4. _____   |        |            |       |          |          |         |       |       |                 |          |          |           |

---

Lactase converts lactose to \_\_\_\_\_ and \_\_\_\_\_. **42**

---

Carbohydrates are stored in the liver as \_\_\_\_\_, released in the bloodstream as \_\_\_\_\_, and an excess is converted and stored generally in the body as \_\_\_\_\_. **55**

---

Energy is an end product of carbohydrate metabolism. Cells metabolize (or change) glucose to obtain \_\_\_\_\_. **68**

---

List two reasons for including fiber in the diet. **81**

1. \_\_\_\_\_
2. \_\_\_\_\_

---

Monosaccharides found in food are six-carbon sugars known as (check your answer[s]): **94**

1. \_\_\_\_\_hexoses.
2. \_\_\_\_\_pentoses.

---

---

**3**     sugars  
**A**     starches

---

**16**  
**A**     maltase

---

**29**     1. salivary amylase                      2. dextrin  
**A**     3. pancreatic amylase                  4. maltose

---

**42**     galactose  
**A**     glucose

---

**55**     glycogen  
**A**     glucose  
       fat (adipose tissue)

---

**68**  
**A**     energy

---

**81**     1. It promotes normal intestinal motility.  
**A**     2. It reduces the resorption of sterols (cholesterol).

---

**94**     1. ✓  
**A**     2.

---

Complete the chart.

| Food            | Type of carbohydrate |
|-----------------|----------------------|
| chocolate fudge | 1. _____             |
| macaroni        | 2. _____             |
| flour           | 3. _____             |
| gumdrops        | 4. _____             |

4

Enzymes have the suffix \_\_\_\_\_.

17

food containing sucrose

↓  
mouth (sucrose)

↓  
stomach (sucrose)

↓  
small intestine (sucrose → glucose, fructose)

Enzymes break down sugars for absorption only when they reach the \_\_\_\_\_.

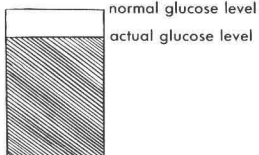
30

Match:  
(may have more than one answer)

1. \_\_\_\_\_ derived from lactose
2. \_\_\_\_\_ acts on lactose
3. \_\_\_\_\_ derived from maltose
4. \_\_\_\_\_ acts on maltose
5. \_\_\_\_\_ derived from sucrose
6. \_\_\_\_\_ acts on sucrose

- A. sucrase
- B. maltase
- C. lactase
- D. glucose
- E. fructose
- F. galactose

43



Actual blood glucose levels may be above or below the \_\_\_\_\_.

56

Carbohydrates provide cells with (energy, amino acids) \_\_\_\_\_.

69

fruits  
vegetables  
whole-grain cereals

To get fiber in your diet, you must eat \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

82

Most monosaccharides found in food are six-carbon sugars known as \_\_\_\_\_.

95