

# Review of Human Physiology

**WINTER  
AND  
SHOURD**

**A COMPANION TO**

**Guyton's TEXTBOOK OF MEDICAL PHYSIOLOGY  
and BASIC HUMAN PHYSIOLOGY**

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# Review of Human Physiology

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## PREFACE

The primary purpose of this review text is to provide a systematic means of review and self-evaluation of the student's comprehension of major concepts of Arthur C. Guyton's *Textbook of Medical Physiology*. The format is that of a series of cognitive objectives, followed by content review statements for each objective in the form of multiple choice questions and answers. Specific page references, included with the question answers, provide an efficient reference source for reinforcing or correcting concepts as difficulties are encountered.

We wish to extend our deep appreciation to Mr. Jeffrey H. Schneider for his painstaking efforts in producing many of the illustrations used in the text, Mary V. Heil for her assistance in the preparation of a typed manuscript, and the editorial staff at W. B. Saunders' Co. for their patient, cooperative, and productive attitudes.

We acknowledge, with special thanks and tribute, Arthur C. Guyton's superb style of writing and keen sense of organization, which have greatly facilitated the production of this review text and without which this effort would have not been feasible.

H. FRANK WINTER  
MELVIN L. SHOURD

Review of Human Physiology

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# NOTE TO THE STUDENT

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This review text has been specifically designed to provide a combined means of self-evaluation and content review of major concepts of physiology as contained in Arthur C. Guyton's *Textbook of Medical Physiology*. Cognitive objectives, arranged sequentially as they are encountered in the text, serve to identify major learning concepts. The series of questions following each objective is intended to test your level of comprehension, identify potential areas of weakness, and when answered correctly to provide a series of review statements for the corresponding objective.

It is suggested that you undertake to answer the test questions in the review text only after reading the corresponding chapters in Guyton's text. For those questions where difficulty is encountered, utilize the reference pages to Guyton's text to reread the information upon which the question was based in order to better understand the underlying concepts.

Students using Guyton's *Basic Human Physiology* will not find specific page references; however, the following list provides a chapter-by-chapter correlation between this review text and *Basic Human Physiology*.

W & S (Winter and Shourd – Review of Human Physiology)  
A.C.G. (A.C. Guyton – Basic Human Physiology)

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# 1

## Functional Organization of the Human Body and Control of the "Internal Environment"

### OBJECTIVE 1-1.

Recognize the scope of physiology.

1. Physiology, or the study of \_\_\_\_\_ (S, structure; F, function) in living matter, deals with the organization of life processes at \_\_\_\_\_ (C, only cellular; T, only tissue; M, many) levels of organization.
 

a. S, C	c. S, M	e. F, T
b. S, T	d. F, C	f. F, M
2. Physiology in its broadest scope deals with \_\_\_\_\_ (N, normal; P, pathological) aspects of tissues of \_\_\_\_\_ (M, only mammals; V, only vertebrates; A, all living organisms).
 

a. N, M	c. N, A	e. P, V
b. N, V	d. P, M	f. P, A

### OBJECTIVE 1-2.

Recognize cells as fundamental basic living units of the body, their numerical magnitude, and their general comparative characteristics.

3. The entire body is composed of about 75 \_\_\_\_\_ (M, million; B, billion; T, trillion) cells, of which perhaps the most abundant cell type is the \_\_\_\_\_ (N, neuron; RBC, erythrocyte).
 

a. M, N	c. T, N	e. B, RBC
b. B, N	d. M, RBC	f. T, RBC
4. \_\_\_\_\_ (O, oxidation; R, reduction) of carbohydrate, fat, or protein by \_\_\_\_\_ % of mammalian cell types provides for metabolic energy required for cell function.
 

a. O, 35	c. O, 100	e. R, 65
b. O, 65	d. R, 35	f. R, 100

### OBJECTIVE 1-3.

Identify and contrast the general composition and functional significance of intracellular and extracellular fluids.

5. The most abundant compound in the body, and the approximate percentage of the body weight that it represents, is:
 

a. Protein, 56%	d. Protein, 26%
b. Water, 56%	e. Water, 26%
c. Inorganic salts, 56%	f. Inorganic salts, 26%
6. The "milieu interieur," or "internal environment," of the body pertains to the \_\_\_\_\_ (E, extracellular; I, intracellular) fluid compartment located \_\_\_\_\_ (W, within; B, between) cells.
 

a. E, W	c. I, W
b. E, B	d. I, B
7. The highest intracellular to extracellular concentration ratio for generalized mammalian cells occurs for:
 

a. Glucose	d. Bicarbonate ions
b. Sodium ions	e. Calcium ions
c. Magnesium ions	f. Carbon dioxide
8. Intracellular, in contrast to extracellular, fluid contains higher concentrations of:
 

a. Na, Mg, & phosphate ions	d. K, Mg, & phosphate ions
b. Na, Mg, Ca, & Cl ions	e. K, Ca, Mg, & Cl ions
c. Na, Ca, K, & Cl ions	f. K, Na, & phosphate ions

**OBJECTIVE 1-4.**

Identify homeostasis, the major functional systems of the body, and their functional homeostatic mechanisms.

9. The term \_\_\_\_\_ (E, hemostasis; O, homeostasis) refers to the maintenance of static or constant conditions of the "internal environment" or \_\_\_\_\_ (X, extracellular; I, intracellular) fluid.
 

a. E, X	c. O, X
b. E, I	d. O, I
10. Fluid exchange between the cardiovascular system and the interstitial fluid of the \_\_\_\_\_ (I, intracellular; E, extracellular) fluid compartment occurs primarily at the level of \_\_\_\_\_ (A, arterioles; C, capillaries; V, venules).
 

a. I, A	c. I, V	e. E, C
b. I, C	d. E, A	f. E, V
11. Cells, generally located no more than 25 to 50 \_\_\_\_\_ (A, angstroms; M, microns; MM, millimeters) from a capillary, receive a rapid equilibration of fluid from capillaries by the process of \_\_\_\_\_ (AT, active transport; PD, passive diffusion).
 

a. A, AT	c. MM, AT	e. M, PD
b. M, AT	d. A, PD	f. MM, PD
12. All blood in the circulation traverses the entire circuit of the circulation an average of once every \_\_\_\_\_ when a person is \_\_\_\_\_ (R, at rest; A, extremely active).
 

a. Minute, R	c. 3 minutes, R
b. Minute, A	d. 3 minutes, A
13. The most abundant end-product of body metabolism, \_\_\_\_\_ (L, lactic acid; CO<sub>2</sub>, carbon dioxide; E, urea), is eliminated from the body through the \_\_\_\_\_ (U, urinary; R, respiratory; G, gastrointestinal) system.
 

a. L, U	c. E, U	e. CO <sub>2</sub> , U
b. CO <sub>2</sub> , R	d. L, R	f. E, G
14. The \_\_\_\_\_ (A, autonomic; S, somatic) nervous system operates largely at a subconscious level, and controls many functions of the internal organs including the gastrointestinal system \_\_\_\_\_ the heart.
 

a. A, and	c. S, and
b. A, but not	d. S, but not
15. The hormonal system is responsible for regulation of \_\_\_\_\_ (R, rapidly; S, slowly) reacting metabolic functions and mediates its effects predominately through the \_\_\_\_\_ (CV, cardiovascular; N, nervous) system.
 

a. R, CV	c. S, CV
b. R, N	d. S, N

**OBJECTIVE 1-5.**

Recognize the extensive use of homeostatic control systems by the body as exemplified by the control of oxygen and carbon dioxide concentrations in extracellular fluids and regulation of arterial pressure.

16. Control systems regulating interstitial fluid concentrations of constituents more directly involve the \_\_\_\_\_ for glucose and the \_\_\_\_\_ for electrolytes. (K, kidneys; L, liver and pancreas; G, gastrointestinal tract)
 

a. K, K	c. G, K	e. G, G
b. L, K	d. G, L	f. L, L
17. The regulatory mechanism of the oxygen concentration of extracellular fluid is dependent upon the chemical characteristics of the \_\_\_\_\_ (A, albumin; H, hemoglobin) content of \_\_\_\_\_ (P, plasma; R, red blood cells; W, white blood cells)
 

a. A, P	c. A, W	e. H, R
b. A, R	d. H, P	f. H, W



18. Elevated concentrations of the metabolic \_\_\_\_\_ (S, substrate; E, end-product) carbon dioxide are \_\_\_\_\_ (A, augmented; O, opposed) by the action of carbon dioxide of \_\_\_\_\_ (I, increasing; D, decreasing) respiration.
- a. S, A, D      c. S, O, I      e. E, A, I  
b. S, O, D      d. E, O, I      f. E, A, D
19. Reflex effects, resulting from a rise in arterial pressure, \_\_\_\_\_ (R, relaxation; S, stretch) of arterial walls, and \_\_\_\_\_ (A, activation; I, inactivation) of arterial baroreceptors, serve to \_\_\_\_\_ (G, augment; O, oppose) the rise in arterial pressure.
- a. R, A, G      c. S, A, G      e. S, I, G  
b. R, I, O      d. S, A, O      f. S, I, O

**OBJECTIVE 1-6.**

Identify the general characteristics of homeostatic control mechanisms and their underlying basic physical principles.

20. Regulatory processes of the body functioning in homeostasis usually may be described as processes of:
- a. Adaptation      c. Positive feedback  
b. Accommodation      d. Negative feedback
21. A homeotherm with a normal temperature of 100° F moves from an environment of 90° F to 110° F with only a 1° F rise in body temperature. The amplification of the control system is:
- a. -1      c. -20  
b. -19      d. -21
22. \_\_\_\_\_ feedback is better known as a "vicious cycle" because it leads to \_\_\_\_\_ cycles of instability that may lead to the death of the organism.
- a. Positive, diminished      d. Negative, progressive  
b. Positive, progressive      c. Negative, diminished
23. A natural consequence of the organization of many regulatory systems of the body is the innate capability under appropriate conditions to develop:
- a. Fasciculations      d. Convulsions  
b. Fibrillations      e. Rebound  
c. Oscillations      f. None of the above
24. A high degree of damping of a control system causes \_\_\_\_\_ oscillation and greater \_\_\_\_\_ within the system.
- a. Diminished, instability      d. Greater, stability  
b. Diminished, stability      c. Greater, instability

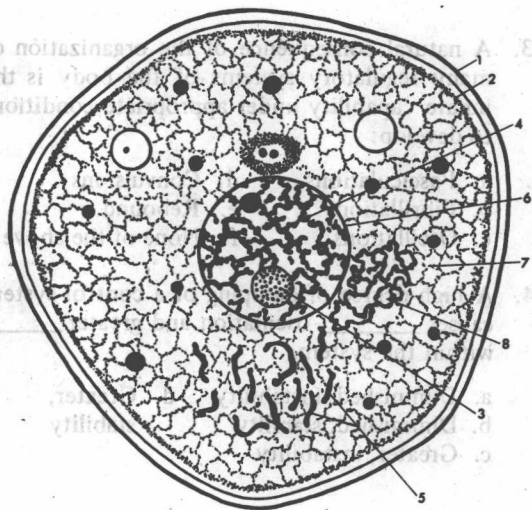
## 2

## The Cell and Its Function

## OBJECTIVE 2-1.

Using the following diagram, identify the various structural components of a typical cell.

**Directions:** Match the lettered headings with the diagram and numbered list of descriptive words and phrases.



- a. Cytoplasm
- b. Chromatin material
- c. Cell membrane
- d. Mitochondrion

1. \_\_\_\_\_ Boundary separating intracellular and extracellular fluids.
2. \_\_\_\_\_ Outer layer of ectoplasm immediately beneath the cell membrane.
3. \_\_\_\_\_ A vacuole-like body within the nucleus, rich in RNA.
4. \_\_\_\_\_ Network of nuclear fibrils, rich in DNA.
5. \_\_\_\_\_ Infolded organelles found in cytoplasm; principal sites of the generation of energy (ATP).
6. \_\_\_\_\_ Condensed double layer of lipids and proteins that enclose the nucleoplasm.
7. \_\_\_\_\_ The protoplasm of a cell exclusive of that of the nucleus.
8. \_\_\_\_\_ Continuous system of membrane-bound cavities that ramify throughout the cytoplasm.
- e. Endoplasmic reticulum
- f. Nuclear membrane
- g. Nucleolus
- h. Cortex

## OBJECTIVE 2-2.

Identify cellular protoplasm, its general chemical constituents, and their general functional characteristics.

9. Next to water, present in cells in a concentration of \_\_\_\_\_ %, the second most abundant compound in most cells is \_\_\_\_\_ (C, carbohydrate; L, lipid; P, protein).
  - a. 40-55, C      c. 40-55, P      e. 70-85, L
  - b. 40-55, L      d. 70-85, C      f. 70-85, P
10. Enzymes, controlling metabolic functions of the cell, are composed primarily of \_\_\_\_\_ (P, protein; S, steroids) of the \_\_\_\_\_ (F, fibrillar; G, globular) type.
  - a. P, F      c. S, F
  - b. P, G      d. S, G
11. Lipids typically comprise \_\_\_\_\_ % of the cell weight, of which the most abundant lipid of animal tissues is \_\_\_\_\_ (P, phospholipid; C, cholesterol; T, triglyceride).
  - a. 2-3, P      c. 2-3, T      e. 10-15, C
  - b. 2-3, C      d. 10-15, P      f. 10-15, T
12. The larger percentage of carbohydrates of cells, present in the form of \_\_\_\_\_ (C, cellulose; G, glycogen; L, glucose), functions in a \_\_\_\_\_ (S, structural; M, metabolic) functional role.
  - a. C, S      c. L, S      e. G, M
  - b. G, S      d. C, M      f. L, M