

TABLE OF CONTENTS

UNIT I

Introduction to Physiology: The Cell and General Physiology

CHAPTER 1

Functional Organization of the Human Body and Control of the "Internal Environment"	3
Cells as the Living Units of the Body	3
Extracellular Fluid—The "Internal Environment"	3
"Homeostatic" Mechanisms of the Major Functional Systems	4
Homeostasis	4
Extracellular Fluid Transport and Mixing System—The Blood Circulatory System	4
Origin of Nutrients in the Extracellular Fluid	5
Removal of Metabolic End Products	5
Regulation of Body Functions	5
Reproduction	6
Control Systems of the Body	6
Examples of Control Mechanisms	6
Characteristics of Control Systems	7
Summary—Automaticity of the Body	9

CHAPTER 2

The Cell and Its Functions	11
Organization of the Cell	11
Physical Structure of the Cell	12
Membranous Structures of the Cell	12
Cytoplasm and Its Organelles	14
Nucleus	17
Nuclear Membrane	17
Nucleoli and Formation of Ribosomes	18
Comparison of the Animal Cell with Precellular Forms of Life	18
Functional Systems of the Cell	19
Ingestion by the Cell—Endocytosis	19
Digestion of Pinocytotic and Phagocytic Foreign Substances Inside the Cell—Function of the Lysosomes	20
Synthesis and Formation of Cellular Structures by Endoplasmic Reticulum and Golgi Apparatus	20
Extraction of Energy from Nutrients—Function of the Mitochondria	22
Locomotion of Cells	24
Ameboid Movement	24
Cilia and Ciliary Movement	24

CHAPTER 3

Genetic Control of Protein Synthesis, Cell Function, and Cell Reproduction	27
Genes in the Cell Nucleus	27
Genetic Code	29

The DNA Code in the Cell Nucleus Is Transferred to an RNA Code in the Cell Cytoplasm—The Process of Transcription	30
Synthesis of RNA	30
Assembly of the RNA Chain from Activated Nucleotides Using the DNA Strand as a Template—The Process of "Transcription"	31
Messenger RNA—The Codons	31
Transfer RNA—The Anticodons	32
Ribosomal RNA	33
Formation of Proteins on the Ribosomes—The Process of "Translation"	33
Synthesis of Other Substances in the Cell	35
Control of Gene Function and Biochemical Activity in Cells	35
Genetic Regulation	35
Control of Intracellular Function by Enzyme Regulation	36
The DNA-Genetic System Also Controls Cell Reproduction	37
Cell Reproduction Begins with Replication of DNA	37
Chromosomes and Their Replication	38
Cell Mitosis	38
Control of Cell Growth and Cell Reproduction	39
Cell Differentiation	40
Apoptosis—Programmed Cell Death	40
Cancer	40

UNIT II

Membrane Physiology, Nerve, and Muscle

CHAPTER 4

Transport of Substances Through the Cell Membrane	45
The Lipid Barrier of the Cell Membrane, and Cell Membrane Transport	45
Proteins	45
Diffusion	46
Diffusion Through the Cell Membrane	46
Diffusion Through Protein Channels, and "Gating" of These Channels	47
Facilitated Diffusion	49
Factors That Affect Net Rate of Diffusion	50
Osmosis Across Selectively Permeable Membranes—"Net Diffusion" of Water	51
"Active Transport" of Substances Through Membranes	52
Primary Active Transport	53
Secondary Active Transport—Co-Transport and Counter-Transport	54
Active Transport Through Cellular Sheets	55