NorthWest Arkansas Community College
BIOLOGICAL CONCEPTS PROFICIENCY TEST
Study Guide

Prepared by Carey Chaney
September 12, 2000

NWACC Anatomy & Physiology faculty believe that a good understating of basic chemistry, cell structure and function is important in successfully completing anatomy and physiology (A&P). Our careful comparison of student background and student success in A&P has supported this belief. About half of the under prepared students are not successful (receive a D, F or withdraw). On the other hand, almost half of the prepared students earn an A or B in A&P. Students may show that they have proficient knowledge of these key biological concepts by scoring 23 or higher on the Biological Concepts Proficiency Test (BCPT). One retake is allowed. Students who do not pass this test should take Principles of Biology, Introduction to Life Science or Basic Chemistry prior to enrolling in A&P. To prepare for the BCPT, use the following learning objectives as a study guide:

I. Organization of Matter

1. Relate elements to atoms, recognize the primary elements that compose living things and match each to its chemical symbol.
2. Draw or describe a simplified structure of an atom and label the location and give the charge (if any) for these components: proton, neutron, electron, nucleus, orbital.
3. Differentiate between atomic weight and atomic number and relate them to the term isotope.

II. Chemical Bonding

1. Recognize the significance of the octet rule to chemical reactions.
2. Compare and contrast ionic, covalent and hydrogen bonds.
3. Distinguish between polar and nonpolar covalent bonds.
4. Contrast polar (hydrophilic) and nonpolar (hydrophobic) substances.

III. Chemical Reactions

1. Define and recognize examples of anabolic, catabolic and exchange chemical reactions.
2. Define energy and describe its significance to chemical reactions.
3. Contrast endergonic and exergonic chemical reactions.
4. List the factors that influence the rate of chemical reactions.
5. Define "catalyst"; identify the importance of biological catalysts in living things.
6. Define oxidation and reduction and recognize the role these reactions play in living things.
7. Predict the changes in equilibrium reactions when altering concentrations of reactants or products.

IV. Solution Chemistry

1. Relate the structure of water to its character and identify significant functions of water in living things.
2. Contrast a solution, suspension and colloid and recognize examples of each.
3. Define solute and solvent.
4. Define electrolyte and recognize the symbols and charges of these electrolytes:

sodium		potassium	calcium
bicarbonate	chloride	sulfate	
phosphate	magnesium		

5. Define acid and base; recognize the difference between a strong acid and a weak acid.
6. Relate the pH scale to acidity.
7. Recognize the behavior of a buffer.

V. Organic Chemistry

1. Recognize the formula, structure, function and examples of carbohydrates.
2. Recognize the components, structure, function and examples of proteins.
3. Recognize the components, structure, function and examples of lipids.
4. Recognize the components, structure, function and examples of nucleic acids.
5. Describe the action of an enzyme and list the factors that affect enzyme action.

VI. Cell Membrane

1. From a diagram or description, identify the elements of the cell membrane and their function.
2. Identify the factors that influence permeability of the cell membrane.
3. Contrast the passive and active material movement across the cell membrane.
4. Recognize a description of the major membrane transport processes.
5. Predict the movement of molecules across membranes by diffusion or osmosis.
6. Identify the conditions and recognize the behavior of a cell in a hypo-, iso- and hypertonic solutions.

VII. Cellular Organelles

1. From a drawing or description, identify these cellular components:

cytosol	nucleus	ribosome
endoplasmic reticulum	Golgi complex	mitochondrion
cytoskeleton	vesicle	nucleolus

2. Match each of the above to its function.

VIII. Cell Respiration

1. Define cell metabolism and describe the relationship of metabolism and heat.
2. Identify the purpose of cellular respiration.
3. Relate the structure of ATP to its significance in the cell.
4. Relate glycolysis, Kreb's cycle and the electron transport chain to cellular respiration and identify where each takes place in the cell.
5. Recognize the inputs into and outputs from glycolysis, Kreb's cycle and the electron transport chain.

IX. Protein Synthesis

1. Describe how the structure of DNA represents information.
2. Contrast the structure of RNA and DNA.
3. Outline the process of protein synthesis and relate genes to proteins.
4. Recognize how DNA is transcribed into RNA.
5. Recognize how RNA is translated into protein.
6. Define mutation and relate it to protein structure and function.

X. Cell Division

1. Recognize the phases of the cell cycle.
2. Describe how DNA is replicated.
3. Compare and contrast mitosis and meiosis.
4. Define these terms: chromosomes, chromatids, chromatin.
5. Describe the difference between identical and homologous chromosomes.

NorthWest Arkansas Community College
BIOLOGICAL CONCEPTS PROFICIENCY TEST
Study Guide

Prepared by Carey Chaney
September 12, 2000

Here are possible resources to use to study:

An anatomy & physiology textbook. Almost any anatomy and physiology textbook contains chapters that review basic chemistry and the cell in (usually chapters 2 and 3). An A&P text will provide a complete and condensed review of the objectives.

A general biology textbook. Any general biology textbook will provide the most detailed information in answering the learning objectives.

Interactive CD tutorials. These CDs are available in the learning lab. You will need to ask for them by name. Going through these tutorials are effective means for mastering the content of the BCPT. We do not have tutorials that cover sections VI, IX and X very extensively.

The chemistry of Life Cell Structure and function Cell respiration

Video presentations. Videocassettes are available in the library. Here is a list of titles that cover some of the learning objectives. In many cases, the presentations may be more advanced than is necessary for passing the BCPT.

Introducing Biology:	Atoms & Molecules	QH 308.2.I58 VHS
	The Cell	
	Diffusion	
	DNA and Genes	
Mitosis and Meiosis		QH 605.M58 VHS
The Outer Envelope		QH 601.098 VHS
The Cell, Unit of Life		QH 578.C46 VHS
The Genetic Code and its Translation	QH 436.646 VHS	
DNA and Cell Reproduction		QH 605.D53 VHS
Cells and Molecules		QH 587. C45 VHS
The World of Chemistry:		
The Atom		QD 3.W673 VHS
The PeriodicTable and Chemical Bonds		QD 3.W674 VHS
The Driving Forces and Molecules in Action		QD 3.W766 VHS
The Busy Electron		QD 3W678 VHS
Proteins and the Genetic Code		QD 3.W682 VHS
Understanding the Cell Membrane	QH 601.U53 VHS	
The Cell and Energy		QH 633.C45 VHS
Protein Synthesis Series:	Protein, Stuff of Life	QP 551.P76 VHS
	DNA Molecule	QP 624.D53 VHS
	DNA Replication	QP 624.D54 VHS
	RNA Synthesis	QP 623.R53 VHS
	Ribosomal RNA	QP 623.R52 VHS
	Transfer RNA	QP 623. T73 VHS
How Cells Reproduce		QH 605.H69 VHS
Introduction to Living Cells		QH 587.I58 VHS
Cell Movement and Transport		QH 611.C45 VHS
The Molecular Building Blocks of Life	QH 506.M65 VHS	
The Genetic Code:Transcription and Protein synthesis		QH 436.G465 VHS
The Mitochondrion and ATP Synthesis	QH 611. M58 VHS	
DNA Replication and Mitosis		QH 605.D54 VHS