

# CWI Learning List for ANAT 111

## CHAPTER 2

### 2.1 Atomic Structure

1. Define matter, and list its three forms.
2. Describe and differentiate among the subatomic particles that compose atoms.
3. Explain the arrangement of elements in the periodic table based on atomic number.
4. Diagram the structure of an atom.
5. Describe an isotope.
6. Explain how radioisotopes differ from other types of isotopes.
7. Describe how elements are organized in the periodic table based on the valence electron number.
8. State the octet rule.

### 2.2 Ions and Ionic Compounds

1. Define an ion.
2. List some common ions in the body.
3. Differentiate between cations and anions.
4. Describe how charges are assigned to ions.
5. Define an ionic bond.
6. Describe an ionic compound of NaCl.
7. List other examples of ionic compounds.

### 2.3 Covalent Bonding, Molecules, and Molecular Compounds

1. Define a molecular formula.
2. Describe a structural formula, and explain its use in differentiating isomers.
3. Describe a covalent bond and explain its formation based on the octet rule.
4. List the four most common elements in the human body.
5. Distinguish between single, double, and triple covalent bonds.
6. Explain polar and nonpolar covalent bonds.
7. Describe the difference between a nonpolar molecule and a polar molecule.
8. Define an amphipathic molecule.
9. Describe hydrogen bonding between polar molecules.
10. List and define the intermolecular attractions between nonpolar molecules.

### 2.4 Molecular Structure of Water and the Properties of Water

1. Describe the molecular structure of water and how water molecules form four hydrogen bonds.
2. List the different properties of water and provide an example of the importance of each property within the body.
3. Compare substances that dissolve in water with those that both dissolve and dissociate in water. Distinguish between electrolytes and nonelectrolytes.
4. Describe the chemical interactions of nonpolar substances and water.
5. Explain how amphipathic molecules interact in water to form chemical barriers.

### 2.5 Acidic and Basic Solutions, pH, and Buffers

1. Describe what is formed when water dissociates.
2. Explain the difference between an acid and a base.
3. Define pH and explain the relative pH values of both acids and bases.
4. Explain the term neutralization, and describe how the neutralization of both an acid and a base occur.
5. Describe the action of a buffer.

### 2.6 Water Mixtures

1. Compare and contrast the three different types of water mixtures.
2. Explain how an emulsion differs from other types of mixtures.
3. Explain the different ways to express the concentration of solute in a solution.

## 2.7 Biological Macromolecules

1. Differentiate between an organic molecule and an inorganic molecule.
2. Describe the general chemical composition of biomolecules.
3. Define a monomer and polymer.
4. Describe the role of water in both dehydration and hydrolysis reactions in altering biomolecules.
5. Describe the general characteristics of a lipid.
6. Identify the four types of lipids and their physiologic roles.
7. Describe the distinguishing characteristics of carbohydrates.
8. Explain the relationship between glucose and glycogen.
9. Name some other carbohydrates found in living systems.
10. Describe the general structure of a nucleic acid.
11. Describe the structure of a nucleotide monomer.
12. Distinguish between DNA and RNA.
13. Name other important nucleotides.
14. List the general functions of proteins.
15. Describe the general structure of amino acids and proteins.

## 2.8 Protein Structure

1. Name the categories of amino acids.
2. Distinguish between nonpolar, polar, and charged amino acids.
3. Give examples of amino acids with special characteristics.
4. Describe the different types of intramolecular (or intermolecular) attractions that participate in both the folding of a protein and in maintaining its three-dimensional shape.
5. Distinguish between the four structural hierarchy levels of proteins.
6. Explain what is meant by denaturation and list factors that can cause it.

## CHAPTER 3

### 3.1 Energy

1. Describe the two classes of energy.
2. Describe chemical energy (one form of potential energy) and the various forms of kinetic energy.
3. List the three important molecules within the body that function primarily in chemical energy.
4. State the first law and second law of thermodynamics.
5. Explain why energy conversion is always less than 100%.

### 3.2 Chemical Reactions

1. Explain what occurs in a chemical reaction.
2. Distinguish between reactants and products.
3. Describe the three classifications of chemical reactions.
4. Distinguish between catabolism and anabolism.
5. Discuss the exchange that takes place in an oxidation-reduction reaction.
6. Explain ATP cycling.
7. Define chemical reaction rate.
8. Explain activation energy.

### 3.3 Enzymes

1. Describe the general function of enzymes.
2. Describe the key structural components of enzymes.
3. Identify places in the body where enzymes may be found.
4. Explain the steps by which an enzyme catalyzes a reaction.
5. Describe cofactors and their role in reactions.
6. Identify the six major classes of enzymes and the general functions of enzymes in each class.

7. Describe the naming conventions for enzymes.
8. Define how enzyme and substrate concentration affect reaction rates.
9. Explain the effect of temperature on enzymes.
10. Describe how pH changes affect enzymes.
11. Describe how competitive and noncompetitive inhibitors control enzyme action.
12. Distinguish between a metabolic pathway and a multienzyme complex.
13. Explain the role of negative feedback in enzyme regulation.
14. Identify and explain the processes involving phosphate that commonly are used to regulate enzymes.

### 3.4 Cellular Respiration

1. Write the overall formula for glucose oxidation.
2. Name the two pathways that generate ATP.
3. List the four stages of glucose oxidation and where each stage occurs within a cell.
4. Summarize the metabolic pathway of glycolysis, including (a) where it occurs in a cell, (b) if it requires oxygen, (c) the initial substrate and final product, and (d) the molecules formed during energy transfer.
5. Explain the enzymatic reaction of the intermediate stage, including (a) where it occurs in a cell, (b) if it requires oxygen, (c) the initial substrate and final product, and (d) the molecules formed during energy transfer.
6. Define decarboxylation.
7. Summarize the metabolic pathway of the citric acid cycle including (a) where it occurs in a cell, (b) if it requires oxygen, (c) the initial substrate and final product, and (d) the molecules formed during energy transfer.
8. Describe the importance of NADH and FADH<sub>2</sub> in energy transfer.
9. Explain the actions that take place in the electron transport system.
10. Calculate the number of ATP molecules produced in cellular respiration if oxygen is not available and if oxygen is available.
11. Explain the fate of pyruvate when oxygen is in short supply.
12. Describe the impact on ATP production if there is insufficient oxygen.
13. Describe the entry point in the metabolic pathway of cellular respiration for both fatty acids and amino acids.

## CHAPTER 4

### 4.1 Introduction to Cells

1. Distinguish among light microscopy, transmission electron microscopy, and scanning electron microscopy.
2. Describe the range in size of human cells.
3. Name some of the shapes cells may exhibit.
4. Describe the three main structural features of a cell.
5. Identify the membrane-bound and non-membrane-bound organelles.
6. Distinguish between organelles and cell inclusions.
7. Explain the general functions that cells must perform.

### 4.2 Chemical Structure of the Plasma Membrane

1. List the lipid components of the plasma membrane, and explain the actions of each component.
2. Differentiate between the two types of membrane proteins based upon their relative position in the plasma membrane.
3. Name the six major roles played by membrane proteins.

### 4.3 Membrane Transport

1. Summarize the general concept of diffusion.
2. Distinguish between the cellular processes of simple diffusion and facilitated diffusion.
3. Define osmosis.
4. Define osmotic pressure.

5. Describe the relationship of osmosis and tonicity.
6. Compare and contrast primary and secondary active transport.
7. Explain the difference between exocytosis and endocytosis.
8. Describe the endocytotic processes of phagocytosis, pinocytosis, and receptor-mediated endocytosis.

#### 4.4 Resting Membrane Potential

1. Define a resting membrane potential.
2. Describe the cellular conditions that are significant for establishing and maintaining a resting membrane potential.
3. Explain the role of both  $K^+$  and  $Na^+$  in establishing an RMP.
4. Discuss how  $Na^+/K^+$  pumps are necessary in maintaining an RMP.

#### 4.5 Cell Communication

5. Explain how cells communicate through direct contact.
6. Describe the three general mechanisms of response to the binding of a ligand with a receptor.

#### 4.6 Cellular Structures

7. List the membrane-bound organelles of a typical human cell.
8. Describe the structure and main function(s) of each.
9. List the non-membrane-bound organelles of a typical human cell.
10. Describe the structure and main function(s) of each.
11. Distinguish between cilia and flagella in terms of both structure and function.
12. Describe the structure and function of microvilli.
13. Compare and contrast the structure and function of the three major types of membrane junctions.

#### 4.7 Structure of the Nucleus

14. Describe the nuclear envelope.
15. Explain the structure and function of a nucleolus.
16. Describe the relationship of DNA, chromatin, and genes.

#### 4.8 Function of the Nucleus and Ribosomes

17. List the required structures for transcription.
18. Explain the three steps of transcription.
19. List the required structures for translation.
20. Name the three functional forms of RNA, explain what is meant by codon, and identify three types of codon sequences.
21. Describe the three steps of translation.
22. Explain why DNA is considered the cell's control center.

#### 4.9 Cell Division

23. Explain the structure and function of centrioles in cell division.
24. Describe the structural difference between chromatin and chromosomes, and note when each is present in a cell.
25. Summarize the phases of the cell cycle and the activities that occur in each phase.
26. Name and explain the four main stages of mitosis.
27. Explain the function of cytokinesis.

#### 4.10 Cell Aging and Death

28. Define apoptosis.
29. List the actions that occur in a cell during apoptosis.

## Math

### 5.1 Simple math without a calculator

1. Be able to perform simple arithmetic
2. Be able to perform simple subtraction
3. Be able to work simple fractions
4. Be able to use decimals
5. Be able to convert between simple fractions and decimals
6. Be able to use orders of operation when working math problems
7. Be able to understand and use the metric system
8. Be able to work simple geometry problems