Biology 105 
Midterm Exam 1 – Review Sheet

☆ The first midterm exam will cover the following lecture material (lectures 1, 2, 3, and 4): Introduction and Scientific Method, Chemistry, Biological Molecules, and Cells.

Lecture 1 (chapter 1) – Introduction and Scientific Method

- What are the seven characteristics of living organisms?
- Which domain and kingdom do humans belong in?
- What are the steps of the scientific method?
  - Be able to describe the steps in order.
- What is a hypothesis and how does it differ from a theory?
- Understand how to set-up an experiment using the scientific method and be able to identify the hypothesis, variable, test group, control group, and constants.

Important Vocabulary Terms:
Unicellular, multi-cellular, metabolism, anatomy, physiology, homeostasis, adaptive traits, variable, constant, control group, experimental group, population, community, ecosystem, placebo, double blind study, epidemiology, theory, hypothesis, function, produce, synthesis, synthesize, lack, inhibit, stimulate, dilate, constrict

Lecture 2 (chapter 2, pages 20-29) – Chemistry

- What are the three particles of an atom?
  - Where are they located in the atom, and what are their charges and masses?
- Be able to determine how many covalent bonds an element can form.
- Be able to read the “square” of an element in the periodic table to determine the number of protons, neutrons, and electrons in that element.
- What are the three most common elements in the human body?
- Be able to draw an atom of any biologically important element when given their “square” from the periodic table.
  - Your drawing should include the correct number of protons, neutrons, and electrons – and these particles should be in the correct locations in the atom!
  - Be able to draw the electrons in their correct shell(s).
- Be able to identify polar and nonpolar molecules.
- What are three electronegative elements found in biological molecules?
- Be able to describe the types of chemical bonds.
  - Which type of bond is the strongest/weakest?
  - What is the basis of the attraction between atoms in each of the bonds?
- Be able to draw a water molecule and hydrogen bonding between three water molecules.
- Be able to describe the four properties of water and their importance in living organisms.
- Understand the pH scale.
  - For example, if you were given a pH value, you should be able to say if the value is acidic/basic and whether it contains many/few hydrogen ions.
Important Vocabulary Terms:

Matter, atom, element, chemical bond, single bond, double bond, molecule, compound molecule, ion, ionic bond, covalent bond, nonpolar bond, polar bond, electronegativity, hydrogen bond, hydrophilic, hydrophobic, cohesion, acid, base, buffer, logarithmic, inverse, pH, solvent, solute, solution

Lecture 3 (chapter 2, pages 29-39) – Biological Molecules

- What are the functions of all the biological molecules?
- How are polymers synthesized and broken down (what are the names of these two processes)?
- What are the different types of carbohydrates?
  - What is the function of each of the different types of carbohydrates?
  - Know which types of organisms the complex carbohydrates are found in, and the digestibility of the different complex carbohydrates.
  - Know where glycogen is mainly stored in the body.
  - Know which monomers join to form the complex carbohydrates, know the structure of the complex carbohydrate (branched, tightly packed and stabilized by H-bonds, etc.)
- Know the cause and symptoms of lactose intolerance.
- Know the types of lipids, their functions, and their structures.
  - What is the general structure of triglycerides, and what are the molecules that make up the triglycerides?
  - Know the general structure of phospholipids, the molecules that make up the phospholipids, and the properties of phospholipids.
  - Know the general structure of a steroid (i.e. that it is a four ring structure) and be able to identify the structure – but you do not need to draw it.
  - What are the different types of fatty acids?
- What are the monomers that join to make proteins, and what is the type of bond that joins them?
  - What are the functions of proteins?
  - In particular, what are enzymes and what are their functions and properties?
- Be able to describe each level of structure (primary, secondary, tertiary, and quaternary) of proteins.
- Which monomer units comprise nucleic acids?
  - Know the general structure of nucleotides and the molecules that form nucleotides.
  - What are the differences between DNA and RNA?
  - What are the functions of DNA and RNA?
- Be able to identify from a picture any of the biological molecules.
- Which molecules join together to form what molecules (monomers and polymers)?
**Lecture 4 (chapter 3) – Cells**

- Why are most cells small?
  - Please be able to explain why with respect to surface-to-volume ratio. Why is there a limit to how much volume a cell can have?
- What are the main differences between prokaryotic cells and eukaryotic cells?
  - Know some examples of prokaryotic cells (bacteria) and eukaryotic cells (plants and animals).
- Major features of cells and their functions, including:
  - Plasma membrane, cytoplasm, nucleus, cytoskeleton, mitochondria, ribosomes, endoplasmic reticulum (smooth and rough), Golgi complex, vesicles, lysosomes
- What disorder is associated with a missing enzyme in lysosomes?
  - Understand why this disease is fatal within a few years of life (e.g. what is building up in nerve cells and what happens as a result?)
- What is cytoskeleton and what are the functions of cytoskeleton? What are the three different kinds of cytoskeleton?
- Know the functions of each of the three different kinds of cytoskeleton.
- What are cilia and flagella, and which kind of cytoskeleton makes up cilia and flagella?
- Which protein makes up microfilaments?
- Know the functions of the plasma membrane.
- Know the five main components of the plasma membrane and the function of each component.
- Be able to draw a membrane.
- Be able to identify what can pass freely through a membrane and what cannot pass freely.
- What is the difference between passive transport and active transport?
- Know the differences between simple diffusion, facilitated diffusion, and active transport.
  - Know which molecules each mode can transport.
- Know how things are transported in and out of a cell using a vesicle:
  - What are the differences between endocytosis, exocytosis, pinocytosis, and phagocytosis (e.g. what kinds of molecules do these processes move and in which direction)?

**Important Vocabulary Terms:**

Prokaryotic cells, eukaryotic cells, semi-permeable, osmosis, hypertonic, hypotonic, isotonic, hydrophobic compounds, nonpolar, hydrophilic compounds, polar, passive transport, active transport, simple diffusion, facilitated diffusion, exocytosis, endocytosis, phagocytosis, pinocytosis, nucleolus, nuclear envelope, nucleoplasm, chromatin, cristae, apoptosis