Study Guide for Lab Exam # 1 – Laboratory Safety and Exercises 1 to 7

* NOTE: This is just a guide. It is not a comprehensive list of what may be on the test.

* Studying tips: For every test, including lab tests and the final exam, you should start studying early. If you start studying one or two days before a test, you will feel overwhelmed and you will be under too much stress. Study every day using your textbook, class notes and any other resources available. *** Study the figures and tables discussed in class as well as those that have not been discussed in detail as they might help you understand the concepts. Study with a friend and quiz each other. It is essential for you to be able to recognize, understand and apply the concepts, and use the scientific vocabulary learned in class.

* The lab test will be practical. In other words, there will be “stations” or items to be identified or to use as a reference to answer questions related to the activities performed in the laboratory. You will need to give short answers or fill the blanks. Of course, you do not need to memorize all the steps in any lab procedure; instead, have a general understanding of the procedure and its purpose. You will have to apply the concepts that you have learned during the laboratory activities and lecture.

PREFACE: Laboratory Safety

Understand the “General Laboratory Safety Guidelines” discussed in the first week of class. Do not attempt to memorize the guidelines word by word; just understand them and the importance of following them in lab; it is common sense. Pay particular attention to:

1. Proper techniques and protection when handling chemicals, for example: disposing of them in the assigned containers, wearing gloves when necessary, etc.
2. Proper handling and disposal of biohazardous waste, broken glass, and used sharps.
3. Proper use and cleaning of glassware and equipment.
4. Know what are the safety items or safety equipments (eyewash station, safety shower, etc.).

EXERCISE 1: Basic Chemistry * The Periodic Table of Elements will be provided in the test.

1. Be able to recognize or identify the atomic particles and their charges: electrons, protons, neutrons.
2. Understand and use atomic number and mass number, as practiced in the lab.
3. Understand the formation of an ionic bond and a covalent bond.
   • Know how to draw the electron configuration for each atom in these types of bond, indicating the transfer or sharing of electrons, as practiced in the laboratory exercise.
4. Understand the formation of a hydrogen bond and be able to show the hydrogen bond between two water molecules, showing the partial charges of each atom, as practiced in the lab.
5. Hydrogen bonds may be important in what biological macromolecules?

EXERCISE 2: Properties of Water

1. Understand the characteristics and properties of water that were analyzed in the lab.
   • Hydrogen bonding, polarity, cohesion, adhesion, surface tension, moderation of temperature (high heat capacity and heat of vaporization), density (of ice versus water), solubility.
2. Distinguish between hydrophilic and hydrophobic substances.
3. Understand pH and to measure it.
   • Distinguish between acidic and basic or alkaline solutions; buffering capacity of a solution; effect of adding acid (like HCl) to a solution; effect of adding base (like NaOH) to a solution.

EXERCISE 3: Biochemistry: Detection of Biological Molecules

1. Understand how to detect biological molecules by using test reagents.
   • Carbohydrates: monosaccharides with Benedict’s solution; polysaccharides with Lugol’s solution.
   • Proteins with Ninhydrin solution.
   • Lipids with Sudan IV.
2. Solubility of lipids in water and in petroleum ether (organic, nonpolar solvent).
EXERCISE 4: The Care and Feeding of the Microscope

1. How to carry and handle the microscope properly.
2. Parts of the microscope and their functions, as studied in class and lab.
3. How to determine the total magnification power with the microscope.
4. Focusing the microscope in the correct manner.
5. How to use and clean the objective lenses in the correct order and manner.
6. How to make a wet mount.
7. Understand resolution and field of vision.

EXERCISE 5: Cell Structure

1. Identify the main organelles or structures of a typical eukaryotic cell and their main function.
2. How to prepare a wet mount of a sample of plant cells such as the onion or Elodea, with and without stain.
3. Important differences between a plant cell and an animal cell.

EXERCISE 6: Diffusion and Osmosis

1. Solvent and solutes.
2. Understand the structure or composition of the plasma membrane (Fluid Mosaic Model), and be able to recognize or identify the parts or components of the plasma membrane.
4. Understand and distinguish between diffusion and osmosis.
   - Understand the use of a dialysis membrane to simulate the plasma membrane.
   - Understand the movement of glucose, starch, and water through the membrane (if any movement) according to the permeability of the membrane to these substances, and how to detect their movement.
5. Tonicity:
   - Isotonic, hypertonic, hypotonic.
   - Effect of these types of solutions on cells (such as plant cells of Elodea, or red blood cells).

EXERCISE 7: Enzymes

1. Enzyme, active site, substrate, enzyme-substrate complex, product.
3. Understand the general mechanism of action of enzymes.
4. Know and understand the factors that affect enzyme activity and how they affect it, as analyzed in the lab:
   - Enzyme concentration, substrate concentration, temperature (heat), pH, salt concentration, inhibitors.
5. Understand how to examine the rate of enzymatic reaction and detect changes in pH (for example, the conversion of urea to ammonia by the enzyme urease, analyzed in the lab).

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