**BIOLOGY: UNIT 2 EXAM REVIEW & STUDY GUIDE**

**Text Readings:**

* *Modern Biology:* Chapter 2 & 3

**Labs**

* Penny Lab

**Vocabulary:**

Use your notes, handouts, book, and other sources to study the definitions of the following words. Although there are several provided words in this list, the list is NOT comprehensive. Add vocabulary to the list if appropriate.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Matter | Mass | Element | Atom | Nucleus |
| Proton | Neutron | Atomic number | Mass number | Electron |
| Orbital | Isotope | Compound | Chemical bond | Polar covalent bond |
| Nonpolar covalent bond | Molecule | Ion | Ionic bond | Hydrogen bond |
| Van der Waals interactions | Electronegativity | Energy | Chemical reaction | Reactant |
| Product | Metabolism | Acid | Base | pH |
| Cohesion | Adhesion | Surface tension | Capillary action | Solution |
| Solvent | Solute | Concentration | Saturated solution | Aqueous solution |
| Hydroxide ion | Hydronium ion | Buffer | Organic compound | Functional group |
| Monomer | Polymer | Macromolecule | Condensation reaction | Hydrolysis |
| Adenosine triphosphate (ATP) | Carbohydrate | Monosaccharide | Disaccharide | Polysaccharide |
| Protein | Amino acid | Peptide bond | Polypeptide | Enzyme |
| Substrate | Active site | Lipid | Fatty acid | Phospholipid |
| Wax | Steroid | Nucleic acid | Deoxyribonucleic acid (DNA) | Ribonucleic acid (RNA) |
| Nucleotide | Activation energy |  |  |  |
|  |  |  |  |  |

**Practice Questions from *Modern Biology Textbook*.** *Answer on a separate sheet of paper.*

* Pg 46 #5-19, 21-23
* Pg 47 #1-7
* Pg 62 #5-22, 25-29
* Pg 63 #1-8

**Multiple Choice Sample. Answer the following on a separate sheet of lined paper. Include your reasoning for the answer you choose.**

1. Enzymes that break down DNA catalyze the hydrolysis of the covalent bonds that join nucleotides together. What would happen to DNA molecules treated with these enzymes?
   1. The two strands of the double helix would separate.
   2. The phosphodiester linkages of the polynucleotide backbone would be broken.
   3. The purines would be separated from the deoxyribose sugars.
   4. They pyrimidines would be separated from the deoxyribose sugars.
   5. All bases would be separated from the deoxyribose sugars.
2. The molecular formula for glucose is C6H12O6. What would be the molecular formula for a polymer made by linking ten glucose molecules together by dehydration reactions?
   1. C60H120O60
   2. C6H12O6
   3. C60H102O51
   4. C60H100O50
   5. C60H111O51

*Answer the following questions about the molecule depicted below:*



1. What type of biological molecule is shown above?
   1. protein
   2. lipid
   3. carbohydrate
   4. nucleic acid
2. What is likely the function of this molecule?
   1. short-term energy storage
   2. long-term energy storage
   3. regulation of molecules entering a cell
   4. catalyzing chemical reactions
3. Does the above molecule dissolve in water? Why or why not?
   1. No, it is made up of long chains of nonpolar carbon-hydrogen bonds, making it a nonpolar molecule.
   2. No, it had polar hydroxyl functional groups.
   3. Yes, it is made up of long chains of nonpolar carbon-hydrogen bonds, making it a nonpolar molecule.
   4. Yes, it had polar hydroxyl functional groups.

**Answer the following in complete sentences on a separate piece of lined paper.**

1. How are elements on the periodic table arranged?
2. For Ge, Sn, and Si on the periodic table:
   1. Write the electron configuration
   2. Draw the atom
   3. Write the atomic number, number of neutrons, atomic mass, number of electrons, and number of valence electrons
3. What is an isotope? What are some applications for radioactive isotopes in science?
4. Explain how polar covalent bonding between atoms in a water molecule contribute to the properties of water i.e. surface tension, cohesion, adhesion, capillary action, high specific heat, etc. Include a discussion of electronegativity in your answer.
   1. How do the properties of water contribute to how humans cool down by sweating?
5. What factors influence electronegativity of an atom?
6. What is an aqueous solution?
   1. You have a mixture of table salt and water. What is the solvent? What is the solute?
   2. What happens to table salt when it is added to water? Why?
7. Compare and contrast covalent and ionic bonds. How do they differ from hydrogen bonds? Give examples of where hydrogen bonds occur in the human body.
   1. Know that ionic bonds typically occur between metals and nonmetals whereas covalent bonds typically occur between nonmetals. Is KCl an ionic or covalent? Is CO2 an ionic or covalent compound? Find the atomic mass of KCl.
8. Describe how Van der Waals interactions occur and the impact of these forces on large biological molecules.
9. Fill in the following table:

|  |  |  |
| --- | --- | --- |
| **Biomolecule** | **Monomer** | **Atoms in the molecule** |
| Protein |  |  |
| Carbohydrate |  |  |
| Lipid |  |  |
| Nucleic Acid |  |  |

1. What are the seven most important functional groups in biological systems? Explain the impact phosphate, amino, hydroxyl, and carboxyl groups have on molecules and which macromolecules they are typically found in.
2. Why is carbon so versatile? Why is it considered the backbone of life?
3. Know that sugars usually end in the suffix “ose” while enzymes typically end in the suffix “ase”.
4. What kind of biomolecule is an enzyme? How are enzymes involved in chemical reactions?
5. Draw a dehydration synthesis reaction between glucose and fructose. Draw a hydrolysis reaction between two generic amino acids.
6. What complex carbohydrate stores energy in plants? In animals? What complex carbohydrate is structural in plants? In animals?
7. Give examples of different types of lipids. How do the chemical structures of steroids, waxes, and triglycerides differ?
8. Draw a dehydration synthesis reaction between two amino acids to form a dipeptide.
   1. What kind of bond occurs between the two amino acids forming a dipeptide?
9. List and describe some of the common functions of proteins in the human body.
10. Discuss the primary, secondary, tertiary, and quaternary structures of a protein and how they are formed.
11. Why are phospholipids unique? How does their chemical structure contribute to their function in forming the plasma membrane of eukaryotic cells? What kinds of molecules easily cross the membrane? Why?
12. Be able to apply chemical properties and macromolecules to real-world examples.
13. Know how nucleic acids are formed and be able to differentiate between DNA and RNA. How do these molecules replicate? How is the DNA double helix held together?