

Name _____

Period _____

AP Biology

Date _____

REVIEW UNIT 1: BIOCHEMISTRY — “TOP TEN”

A. Top “10” — If you learned anything from this unit, you should have learned:

1. All living matter made up of CHONPS
2. Bonds
 - a. covalent bonds are strong
 - b. hydrogen bonds are weak
 - c. polar molecules (water) vs. non-polar molecules (hydrocarbons, lipids)
 - d. reaction with water (cytoplasm & extracellular solution) vs. cell membrane
 - hydrophobic vs. hydrophilic
3. Reactions of life
 - a. dehydration synthesis
 - releases water
 - synthesis: builds covalent bonds
 - anabolic, endergonic
 - b. hydrolysis
 - uses water
 - digestion: break covalent bonds
 - catabolic, exergonic
4. Water
 - a. polar molecule leads to special properties
 - cohesion, adhesion == transpiration
 - high specific heat == evaporative cooling. moderates local temperatures
 - less dense as solid == sustain life in frozen ponds & lakes
 - good solvent == water-based cellular fluids
5. Macromolecules
 - a. carbohydrates
 - sugar monomer
 - short term energy, structure
 - examples: glucose, starch, cellulose, chitin
 - b. lipids
 - phospholipids (cell membrane)
 - energy storage (fat, oils)
 - steroid hormones

- examples: phospholipids, fat, cholesterol, testosterone, estrogen
- c. proteins (amino acids)
- amino acid monomer
 - 4 levels of structure
 - bonding at each level: covalent, H bonds, hydrophobic interactions, van der Waals forces, ionic bonds, disulfide (covalent) bridges
 - many functions: enzymes, structure, regulatory molecules
 - examples: pepsin, myosin, actin, hemoglobin, insulin, ATP synthase, aquaporin
- d. nucleic acids
- nucleotide monomers
 - genetic information storage
 - examples: DNA, RNA

Name _____

Period _____

AP Biology

Date _____

REVIEW UNIT 1: BIOCHEMISTRY — SAMPLE QUESTIONS

A. Sample Multiple Choice Questions

Complete the multiple choice questions to review this unit.

1. Which of the following is an example of a hydrogen bond? (1990:9)
 - a. The peptide bond between amino acids in a protein
 - b. The bond between an oxygen atom and a hydrogen in the carboxyl group of a fatty acid.
 - c. The bond between Na^+ and Cl^- in salt
 - d. The attraction between a hydrogen of one water molecule and the oxygen of another water molecule.
 - e. The bond between carbon and hydrogen in methane
2. A feature of organic compounds NOT found in inorganic compounds is the presence of (1994:10)
 - a. ionizing chemical groups
 - b. electrons
 - c. carbon atoms covalently bonded to each other
 - d. oxygen
 - e. hydrogen bonds

Questions 3-7. Choose an item from the list below that is best associated with the following statements. (1994:86-90)

- A. Glycocalyx
 - B. Cholesterol
 - C. Triglyceride
 - D. Phospholipid
 - E. Protein
3. Carbohydrate-containing layer at the surface of the plasma membrane
 4. The major component of the fluid bilayer of a plasma membrane
 5. Carrier molecule in the plasma membrane
 6. Steroid affecting the fluidity of the plasma membrane
 7. ATP synthase (synthetase) in the inner mitochondrial and chloroplast membrane

8. The bonding of two amino acid molecules to form a larger molecule requires
- the release of a water molecule
 - the release of a carbon dioxide molecule
 - the addition of a nitrogen atom
 - the addition of a water molecule
 - an increase in activation energy
9. Which of the following best characterizes the reaction represented below (1999:14)
- $$\mathbf{A + B + \text{energy} \rightarrow AB}$$
- hydrolysis
 - catabolism
 - oxidation-reduction
 - exergonic reaction
 - endergonic reaction
10. Which of the following can be used to determine the rate of enzyme-catalyzed reactions (1994:37)
- rate of disappearance of the enzyme
 - rate of disappearance of the substrate
 - rate of disappearance of the product
 - change in volume of the solution
 - increase in activation energy

B. Sample Free Response Questions

Make an outline of the information you would include in each of these essays

1. 2003B:3

Water is important for all living organisms. The functions of water are directly related to its physical properties.

- a. Describe how the properties of water contribute to TWO of the following
 - transpiration
 - thermoregulation in endotherms
 - plasma membrane structure
- b. Water serves as a reactant and a product in the carbon cycle. Discuss the role of water in the carbon cycle.
- c. Discuss the impact of one human activity on the water cycle.

2. 2002B:3

The physical form of cells and organisms is often influenced by special structural polymers. Choose one polymer from each of the following three pairs of polymers:

- Pair 1: tubulin . . myosin
- Pair 2: cellulose . . chitin
- Pair 3: messenger RNA . . transfer RNA

For each of the three polymers you have chosen, describe its

- a. structure, and
- b. role in a cell or organism.

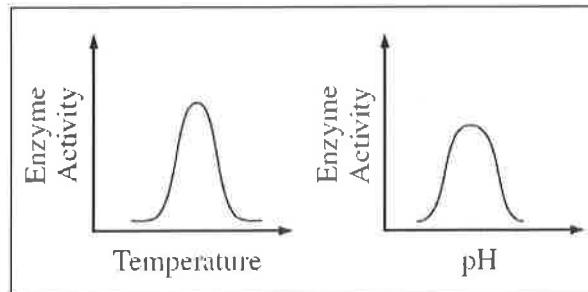
3. 2001:4

Proteins — large complex molecules — are building blocks of all living organisms. Discuss the following in relation to proteins.

- a. the chemical composition and levels of structure of proteins
- b. the roles of DNA and RNA in protein synthesis
- c. the roles of proteins in membrane structure and transport of molecules across the membrane

4. 2000:1

The effects of pH and temperature were studied for an enzyme-catalyzed reaction. The following results were obtained.



- How do (1) temperature and (2) pH affect the activity of this enzyme? In your answer, include a discussion of the relationship between the structure and the function of this enzyme, as well as a discussion of how structure and function of enzymes are affected by temperature and pH.
- Describe a controlled experiment that could have produced the data shown for either temperature or pH. Be sure to state the hypothesis that was tested here.

5. 2008:1

The physical structure of a protein often reflects and affects its function.

- Describe THREE types of chemical bonds/interactions found in proteins. For each type, describe the role in determining protein structure.
- Discuss how the structure of a protein affects the function of TWO of the following.
 - muscle contraction
 - regulation of enzyme activity
 - cell signaling
- Abnormal hemoglobin is the identifying characteristic of sickle cell anemia. Explain the genetic basis of abnormal hemoglobin. Explain why the sickle cell allele is selected for in certain areas of the world.