Free-Response Questions for Topic 1: Chemistry of Life

Directions: Read each question. Then, compose a complete answer to each question. Use the formula sheet in this book for this section. Some free-response questions are shorter and worth four points. The longer questions can be worth eight or ten points. All answers must be written in paragraph format. Never bullet or outline. No points are awarded for those formats. Please do not simply restate the stem of the question. Pay close attention to the action word in each free-response. Follow the guidelines of the action prompts very closely. You may use a calculator.

1. Ten points are possible on this question.
Proteins are complex molecules with very advanced folding patterns directed by the chaperone proteins in the cell. The folding is due to the interactions between the amino acids and the R groups of the amino acids. Proteins have many diverse functions in cells.

a. **Describe** FOUR functions of proteins in a cell.
b. **Describe** the FOUR levels of folding in protein structure.
c. **List** TWO examples of proteins and provide the function for that protein in a cell.

2. Four points are possible in this question.
Hydrogen bonding is biologically important.

a. Explain how hydrogen bonds are responsible for ice being less dense than liquid water.
b. Explain how hydrogen bonding is responsible for the high specific heat of water.

3. Four points are possible in this question.
Dehydration synthesis is very important in forming large macromolecules. Select two molecules from the list and explain how dehydration synthesis is involved in its formation. What kind of bonds form in this process?

a. Collagen
b. Chitin
c. Sucrose
d. Phospholipid

4. Four points are possible in this question.
Carbon is the central atom in organic molecules.

a. Explain how carbon allows for much variation in molecular shapes.
b. Explain how carbon adds strength to organic molecules.

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