

## Advanced Biology Practice Exam:

### 4. Which of the following statements is false?

- a. Electrons are unequally shared in polar covalent bonds.
- b. Electrons are equally shared in nonpolar covalent bonds.
- c. Hydrogen bonds are weak bonds based on electrostatic forces.
- d. In solution, ionic bonds are generally stronger than covalent bonds.

### 9. Explain why the bonds within a water molecule are described as polar covalent bonds.

- a. Hydrogen is more electronegative than oxygen, generating a partial negative charge near the hydrogen atom.
- b. Hydrogen is more electronegative than oxygen, generating a partial positive charge near the hydrogen atom.
- c. Oxygen is more electronegative than hydrogen, generating a partial negative charge near the oxygen atoms.
- d. Oxygen is more electronegative than hydrogen, generating a partial positive charge near the oxygen atoms.

### 20. Why are hydrogen bonds and van der Waals interactions necessary for cells?

- a. Hydrogen bonds and van der Waals interactions form weak associations between and/or within molecules, providing the necessary shape and structure of DNA and proteins to function in the body.
- b. Hydrogen bonds and van der Waals interactions form strong associations between molecules, providing the necessary shape and structure of DNA and proteins to function in the body.
- c. Hydrogen bonds and van der Waals interactions form weak associations between different molecules, providing the necessary shape and structure for acids to function in the body.
- d. Hydrogen bonds and van der Waals interactions form strong associations between same molecules, providing the necessary shape and structure for acids to function in the body.

### 22. Why can some insects walk on water?

- a. Insects can walk on water because of its high heat of vaporization.
- b. Insects can walk on water because water is a polar solvent.
- c. Insects can walk on water because they have hydrophobic hairs on their legs.
- d. Insects can walk on water because they are denser than water.

### 24. What are three examples of how the characteristics of water are important in maintaining life?

- a. First, the lower density of water as a solid versus a liquid allows ice to float, forming an insulating surface layer for aquatic life. Second, the high specific heat capacity of water insulates aquatic life or bodily fluids from temperature changes. Third, the high heat of vaporization of water allows animals to cool themselves by sweating.
- b. First, the higher density of water as a solid versus a liquid allows ice to float, forming an insulating surface layer for aquatic life. Second, the high specific heat capacity of water insulates aquatic life or bodily fluids from temperature changes. Third, the low heat of vaporization of water allows animals to cool themselves by sweating.

- c. First, the lower density of water as a solid versus a liquid allows ice to float, forming an insulating surface layer for aquatic life. Second, the low specific heat capacity of water insulates aquatic life or bodily fluids from temperature changes. Third, the high heat of vaporization of water allows animals to cool themselves by sweating.
- d. First, the lower density of water as a solid versus a liquid allows ice to float, forming an insulating surface layer for aquatic life. Second, the low specific heat capacity of water insulates aquatic life or bodily fluids from temperature changes. Third, the low heat of vaporization of water allows animals to cool themselves by sweating.

**29. Why can water be a good insulator within the body of endothermic (warm-blooded) animals?**

- a. adhesive properties
- b. surface tension
- c. heat of vaporization
- d. specific heat capacity

**30. The unique properties of water are important in biological processes. For the following three properties of water, define the property and give one example of how the property affects living organisms:**

- 1. cohesion
- 2. Adhesion
- 3. high heat of vaporization

- a. Cohesion is the attraction between the water molecules, which helps create surface tension. Insects can walk on water because of cohesion. Adhesion is the attraction between water molecules and other molecules. Water moving up from the roots of plants to the leaves as a result of capillary action is because of adhesion. Heat of vaporization is the amount of energy required to convert liquid into gas. This property helps humans maintain homeostasis of body temperature by evaporation.
- b. Cohesion is the attraction between water and other molecules, which help create surface tension. Insects can walk on water because of cohesion. Adhesion is the attraction between water molecules. Water moving up from the roots of plants to the leaves as a result of capillary action is because of adhesion. Heat of vaporization is the amount of energy required to convert liquid into gas. This property helps humans maintain homeostasis of body temperature by evaporation.
- c. Cohesion is the attraction between the water molecules, which helps create surface tension. Insects can walk on water because of cohesion. Adhesion is the attraction between water molecules and other molecules. Water moving up from the roots of plants to the leaves as a result of capillary action is because of adhesion. Heat of vaporization is the amount of energy required to convert solid into gas. This property helps humans maintain homeostasis of body temperature by evaporation.
- d. Cohesion is the attraction between the water molecules, which helps create surface tension. Water moving up from the roots of plants to the leaves as a result of capillary action is because of cohesion. Adhesion is the attraction between water molecules and other molecules. Some insects can walk on water because of adhesion. Heat of vaporization is the amount of energy required to convert solid into gas. This property helps humans maintain homeostasis of body temperature by evaporation.

Free Response:

1. For any **one** life supporting property of water, such as *high heat of vaporization, cohesion and adhesion, versatile solvent, surface tension*, **among others**, briefly summarize

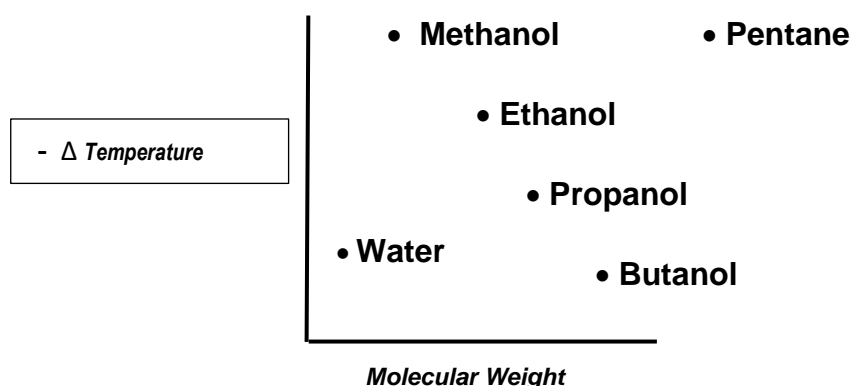
- how the **polarity** of the water molecule's covalent bonds, and
- how **hydrogen bonding** between water molecules contributes to the life supporting property you have chosen.

Be sure to include **one example of how the life-supporting property benefits life**.

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2. Regarding our **lab examining water as an evaporative coolant**, examine the graph of the data:

**The Evaporation Rates of Water, 4 Alcohols, and Pentane**



Answer the following 3 questions:

- Why does **water** have a much *slower* evaporation rate than **methanol**, even though their molecular weights are similar?
- Why does **pentane** have a much *faster* evaporation rate than **butanol**, even though their molecular weights are similar?
- Why do **water** and **propanol** have *similar* evaporation rates, even though their molecular weights are so different?

In your answer

- *Specific numerical values need not be known.*
- *Both **H-bonds** and **LDFs** should be included as you describe the different data generated by the 2 molecules.*