

15.1

WATER AND ITS PROPERTIES

Section Review

Objectives

- Explain the high surface tension and low vapor pressure of water in terms of the structure of the water molecule and hydrogen bonding
- Describe the structure of ice

Vocabulary

- surface tension
- surfactant

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

- Each O—H bond in a water molecule is highly 1. Oxygen **1.** _____
 acquires a partial 2 charge, while hydrogen acquires a **2.** _____
 partial 3 charge. Because the H—O—H bond angle is 105° , **3.** _____
 the water molecule as a whole is 4. **4.** _____
- Water molecules are attracted to each other by intermolecular **5.** _____
5 bonds. This bonding accounts for many properties **6.** _____
 of water, such as its 6 vapor pressure and 7 **7.** _____
 boiling point. Hydrogen bonding is also responsible for the high **8.** _____
8 tension of water. Liquids tend to minimize their surface **9.** _____
 area and form 9 droplets because of their surface tension. **10.** _____
 The surface tension of water can be reduced by adding a 10. **11.** _____
11 floats in liquid water. This is because it is less **12.** _____
12 than water. Ice has a rigid open structure, which is also **13.** _____
 due to 13.

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 14. Hydrogen bonding is responsible for the polar nature of the water molecule.
- _____ 15. The water molecule is a straight molecule.
- _____ 16. Detergents lower the surface tension of water by interfering with the formation of hydrogen bonds.
- _____ 17. Ice is more dense than water.
- _____ 18. Water becomes more dense as it is cooled.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 19. surface tension
- _____ 20. surfactant
- _____ 21. hydrogen bond

Column B

- a. inward force that tends to minimize the surface area of a liquid
- b. intermolecular attraction between a hydrogen atom and a highly electronegative atom such as oxygen, on an adjacent molecule
- c. a wetting agent

Part D Question

Answer the following in the space provided.

22. State whether each of the following properties of water is higher or lower than compounds of similar size and molecular mass.

a. vapor pressure

b. surface tension
