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 ___________. Oxygen _____________.

acquires a partial ____________ charge, while hydrogen acquires a partial ____________ charge. Because the H—O—H bond angle is 105°, the water molecule as a whole is _____________.

Water molecules are attracted to each other by intermolecular ____________ bonds. This bonding accounts for many properties of water, such as its ____________ vapor pressure and ____________ boiling point. Hydrogen bonding is also responsible for the high ____________ tension of water. Liquids tend to minimize their surface area and form ____________ droplets because of their surface tension.

The surface tension of water can be reduced by adding a ____________. ____________ floats in liquid water. This is because it is less ____________ than water. Ice has a rigid open structure, which is also due to ____________.
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.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. surface tension</td>
<td>a. inward force that tends to minimize the surface area of a liquid</td>
</tr>
<tr>
<td>20. surfactant</td>
<td>b. intermolecular attraction between a hydrogen atom and a highly electronegative atom such as oxygen, on an adjacent molecule</td>
</tr>
<tr>
<td>21. hydrogen bond</td>
<td>c. a wetting agent</td>
</tr>
</tbody>
</table>

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

   ________________________________