

Investigation 2.D: Investigating the Properties of Water Answer Key

Answers to Analysis Questions

1. The stream of water is attracted to the acetate strip and the vinyl strip. The stream of oil is unaffected by either the acetate strip or vinyl strip. Therefore, the stream of water is attracted to both positive and negative charges. The oil is attracted to neither. Water must have negative charges that are attracted to the positively charged strip and positive charges that are attracted to the negatively charged strip. The oil has no apparent charges.
2. When the needles were touched, they sank to the bottom of the water. Therefore, the needles are denser than water. The needles floated on the surface of the water before the skin-like surface was broken. The positive and negative charges associated with the water molecules are strongly attracted to each other. A needle can appear to float because the water molecules are more strongly attracted to each other than they are to the atoms in the metal. You have to break these attractive forces before the needle will sink in the water.
3. The needles did not float on the ethanol. The attraction between ethanol molecules is not strong enough to support the weight of a needle.
4. The water rises above the rim of the glass in a dome-like shape because the positive and negative charges associated with water molecules are strongly attracted to each other and “hold each other together.” The water spills only after the weight of the water above the rim of the glass is great enough to pull the water molecules apart.
5. Ethanol did not rise above the rim of the glass. It began to spill as soon as it reached the rim since the attractive forces between ethanol molecules are not strong enough to support any ethanol above the rim of the glass.
6. When the detergent was added to the pepper-covered water, the pepper instantly moved to the outer edge of the water surface. Since the detergent molecules have a charged head (in this case negative), they will be attracted to the water molecules. The long non-polar dipoles of the detergent molecules will protrude upward because they are attracted to each other but not to the water molecules. This breaks the surface tension in the centre. The remaining surface tension in the water pulls the pepper to the outside of the dish.

Answer to Conclusion Question

7. Water molecules are strongly attracted to each other, resulting in a strong surface tension that can support small objects. Ethanol molecules are not as strongly attracted to each other and have a lower surface tension. Water molecules are polar since they are attracted to both positive and negative charges. From the structure of ethanol, C_2H_5OH , it can be deduced that ethanol molecules are also slightly polar, but much less so than water.