

Chapter 14: Solids and Liquids Practice Problems

Vocab Problems:

1. What is the difference between inter and intramolecular forces?
2. Name one kind of intermolecular force.
3. What causes dipole-dipole attraction?
4. What is hydrogen bonding?
5. Name both London dispersion forces?
6. Draw out a heating cooling curve.
7. What is the boiling point of water at normal atmospheric pressure?
8. What is the freezing point of water at normal atmospheric pressure?
9. Define the molar heat of fusion.
10. Define the molar heat of vaporization.
11. What is the difference between vaporization and evaporation?
12. What causes condensation to occur?
13. True or false: Vapor pressure is common within open systems.
14. Define a crystalline solid.
15. What makes a crystalline solid an ionic solid?
16. Name one form of molecular solid.
17. True or false: graphite is NOT an atomic solid.
18. Define an alloy.
19. What happens within a substitutional alloy?
20. What happens to the interstices in an interstitial alloy?

Chapter Problems:

1. List the different types of intermolecular forces from least to greatest strength.
2. What happens to the boiling point of a liquid once the atmospheric pressure goes down?
3. Dry ice, frozen CO_2 , goes from solid to gas. What is this process called? Draw a heating cooling curve for CO_2 .
4. What type of reaction occurs when water evaporates? Why?
5. How much energy is required to heat up 25g water from 234 to 372 degrees Kelvin?
6. What do you need to do to a noble gas if you want to turn it into a liquid? What forces are occurring to cause such a reaction?
7. Discuss the types of intermolecular forces acting in the liquid state of each of the following substances:
 - a. H_2O
 - b. Ar
 - c. NH_3
 - d. N_2
8. Which of the following substances in each of the following sets would be expected to have the highest boiling point? Why?
 - a. NaCl, H_2O , N_2
 - b. He, NH_3 , KF
 - c. H_2 , O_2 , H_2O
9. What happens to the temperature of the water as it melts?
10. When a person has a severe fever, one therapy to reduce the fever is an “alcohol rub.” Explain how this evaporation of alcohol from the persons’s skin removes heat energy from the body.

Inter-chapter questions:

1. What causes metallic solids to be much more conductive than molecular or ionic solids?

2. Draw the lewis dot structure of water. What observations can you make from this model about how polar water is and how its intermolecular forces are so strong?
3. What causes polar substances to dissolve so easily in water?
4. What properties of carbon make it able to make chains of itself and into atomic solids?
5. How much energy is required to heat up 25g water from 1 to 76 degrees Kelvin?

Answer Key

Vocab Answers

1. Intermolecular forces are forces between molecules while Intramolecular forces deal with forces within molecules
2. Hydrogen bonding, Dipole-Dipole, London dispersion
3. Dipoles have a positive and negative charged end allowing positive ends of other molecules be able to attract to the negative end, and vice versa
4. When a hydrogen atom is attached to an extremely electronegative atom causing it to become a dipole, the hydrogen(s) become positively charged while the really electronegative atom becomes the negatively charged end since it has unshared electrons.
5. Dipole-induced Dipole, Induced Dipole- Induced Dipole
6. Refer to Figure 14.3 in textbook
7. 100 Degrees C
8. 0 Degrees C
9. The energy required to melt 1mol of a substance
10. The energy required to change 1mol of a substance from a liquid to a gas
11. There is no difference. Trick question ☺
12. When energy in vaporized molecule lose their energy and start to turn back into a liquid
13. False
14. Solids with regular arrangements of their components
15. It is when a solid is formed by ionic compounds
16. Water, Sugar
17. False
18. A substance that contains a mixture of elements and has metallic properties
19. Some of the host metal atoms are replaced by other metal atoms of similar size
20. they are filled with a similar atom than the host atom

Chapter Answers

1. London dispersion, Dipole-Dipole, Hydrogen Bonding
2. Boiling point goes down
3. Sublimation. Refer to figure 14.3 in the textbook. The graph should have a very small incline of energy during the liquid phase

4. it is a liquid to gas. It is because water molecules are being energized enough to break free of its intermolecular hydrogen bonding forces
5. Do heat change ($Q = mc\Delta T$), heat of fusion ($Q = m\Delta H_f$), then heat change from there ($Q = mc\Delta T$), and add: 22,784.8 Joules
6.
 - a. Hydrogen bonding
 - b. London Dispersion
 - c. Dipole-Dipole
 - d. London Dispersion
9.
 - e. NaCl, Ionic bonds are hundreds of times stronger than hydrogen bonds
 - f. KF, same as reason E
 - g. H₂O, Hydrogen bonding is much stronger than London Dispersion
9. Its temperature stays the same
10. When alcohol, a liquid with a substantially lower boiling point than water, is put on the skin of someone with a fever, the heat of the person's skin transfers to the alcohol, causing it to evaporate, taking the heat with it. Evaporation is an endothermic reaction

Inter-Chapter answers

1. Metals' open D-orbitals allow easier passage of electrons through them while molecular or ionic solids do not have the D-orbitals to do so because they are either non-existent, or completely filled.
2. Bent shape with two electrons unpaired on the Oxygen. Those two electrons on the Oxygen cause the end with the oxygen to be really negatively charged while the hydrogen, with no electrons around it most of the time due to its low electronegativity, becomes positive.
3. Water allows polar substances to go into their ionic form and have its negative ends, Oxygen, facing the positive ion, and the positive end, Hydrogen, facing the negative ion, due to their charges.
4. It has four valence electrons allowing it to covalently bond with each other. They can both take or give away electrons. It is in the "sweet spot" of the periodic table to do so.
5. $Q = mc\Delta T$; $25 \times 75 \times 4.184 = 7845.0 \text{ J}$