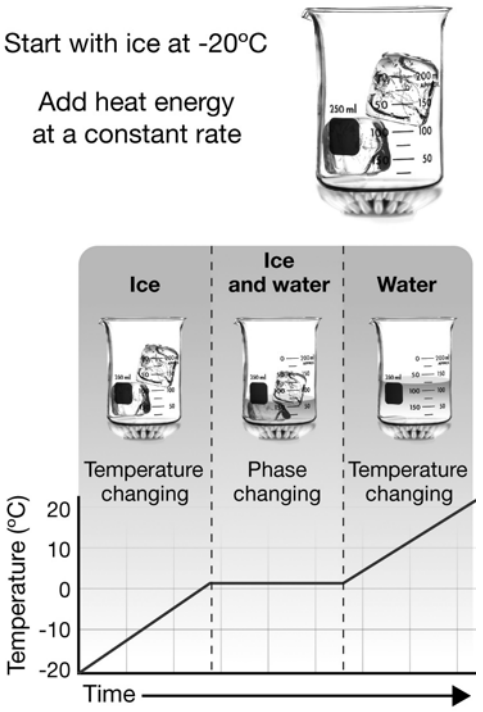
Name: _____ Date: _____

Skill and Practice

9B Reading a Heating/Cooling Curve

Read:

A heating curve shows how the temperature of a substance changes as heat is added at a constant rate. The heating curve at right shows what happens when heat is added at a constant rate to a beaker of ice. The flat spot on the graph, at zero degrees, shows that although heat was being added, the temperature did not rise while the solid ice was changing to liquid water. The heat energy was used to break the intermolecular forces between water molecules. Once all the ice changed to water, the temperature began to rise again. In this skill sheet, you will practice reading heating and cooling curves.



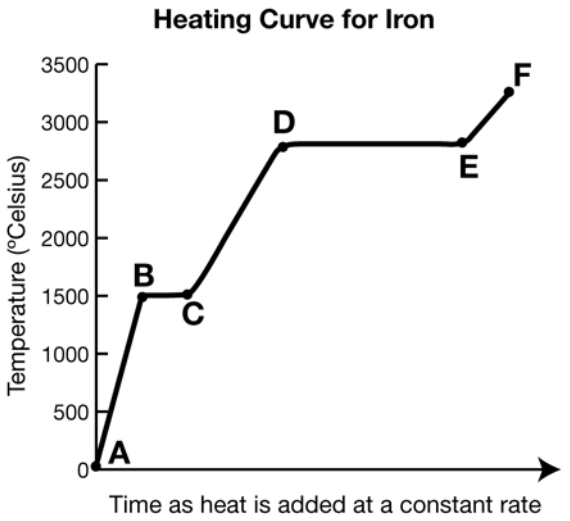
Example:

The heating curve at right shows the temperature change in a sample of iron as heat is added at a constant rate. The sample starts out as a solid and ends as a gas.

- Describe the phase change that occurred between points B and C on the graph.

Solution:

Between points B and C, the sample changed from solid to liquid.



Practice:

1. In the heating curve for iron, describe the phase change that occurred between points D and E on the graph.

_____

2. Explain why the temperature stayed constant between points D and E.

_____

_____

_____

3. What is the melting temperature of iron?

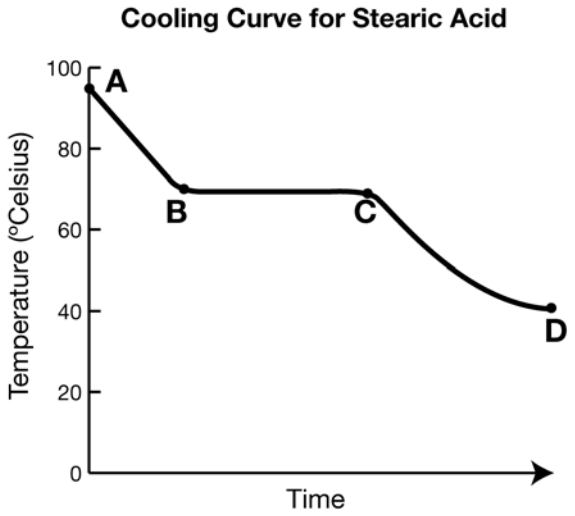
4. What is the freezing temperature of iron? How do you know?

5. What is the boiling temperature of iron?

6. Compare the boiling temperatures of iron and water (water boils at 100°C). Which substance has stronger intermolecular forces? How do you know?

Skill and Practice

The graph below shows a cooling curve for stearic acid. Stearic acid is a waxy solid at room temperature. It is derived from animal and vegetable fats and oils. It is used as an ingredient in soap, candles, and cosmetics. In this activity, a sample of stearic acid was placed in a heat-resistant test tube and heated to 95 °C, at which point the stearic acid was completely liquefied. The test tube was placed in a beaker of ice water, and the temperature monitored until it reached 40 °C. Answer the following questions about the cooling curve:



7. Between which two points on the graph did freezing occur?

8. What is the freezing temperature of stearic acid? What is its melting temperature?

9. Compare the melting temperature of stearic acid with the melting temperature of water. Which substance has stronger intermolecular forces? How do you know?

10. Can a substance be cooled to a temperature below its freezing point? Use evidence from any of the graphs in this skill sheet to defend your answer.