

Heating and cooling curve practice worksheet

Continue

Phase Change Review

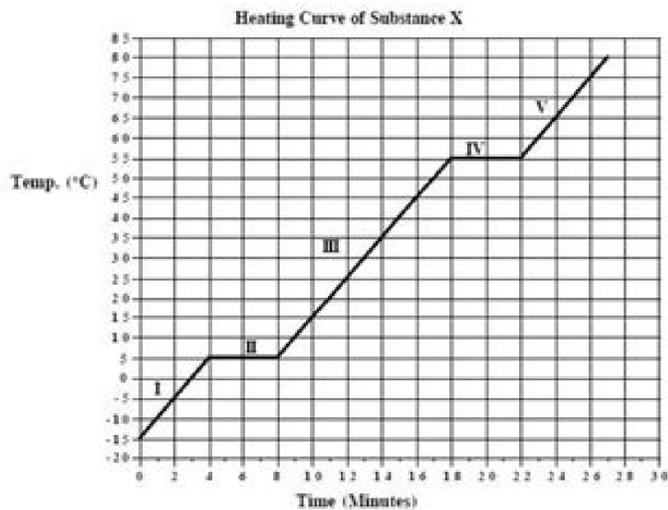
Label the graph with solid, liquid, and gas phases.

1. How does temperature change during heating?
2. During heating, the solid phase is at _____.
3. During heating, the liquid phase is at _____.
4. During heating, the gas phase is at _____.
5. How does the change in temperature during the phase change compare to the temperature change during the phase change?

Heating Curve of Substance X

1. At what temperature does substance X melt? _____ °C
2. What happens to the substance during melting? _____
3. What happens to the substance during boiling? _____
4. What happens to the substance during condensation? _____
5. During which section is energy being absorbed? _____

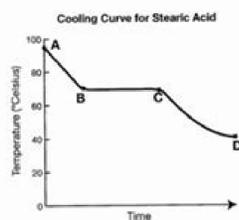
Heating Curve Worksheet 1



The heating curve shown above is a plot of temperature vs time. It represents the heating of substance X at a constant rate of heat transfer. Answer the following questions using this heating curve:

1. In what part of the curve would substance X have a definite shape and definite volume?
2. In what part of the curve would substance X have a definite volume but no definite shape?
3. In what part of the curve would substance X have no definite shape or volume?
4. What part of the curve represents a mixed solid/liquid phase of substance X?
5. What part of the curve represents a mixed liquid/vapor phase of substance X?
6. What is the melting temperature of substance X?
7. What is the boiling temperature of substance X?
8. In what part(s) of the curve would increasing kinetic energy be displayed?
9. In what part(s) of the curve would increasing potential energy be displayed?
10. In what part of the curve would the molecules of substance X be farthest apart?
11. In what part of the curve would the molecules of X have the lowest kinetic energy?
12. In what part of the curve would the molecules of X have the greatest kinetic energy?

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:



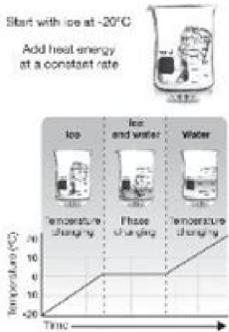
7. Between which two points on the graph did freezing occur?
8. What is the freezing temperature of stearic acid? What is its melting temperature?
9. Compare the melting temperature of stearic acid with the melting temperature of water. Which substance has stronger intermolecular forces? How do you know?
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.



10.3 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

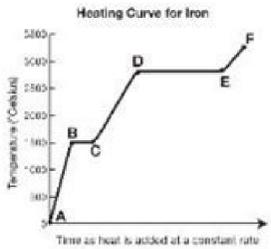
The heating curve at right shows the temperature change in a sample of iron as heat is added at a constant rate. The sample starts out as a solid and ends as a gas.

- 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

- In the heating curve for iron, describe the phase change that occurred between points D and E on the graph.
- Explain why the temperature stayed constant between points D and E.
- What is the melting temperature of iron?
- What is the freezing temperature of iron? How do you know?
- What is the boiling temperature of iron?
- Compare the boiling temperatures of iron and water (water boils at 100°C). Which substance has stronger intermolecular forces? How do you know?

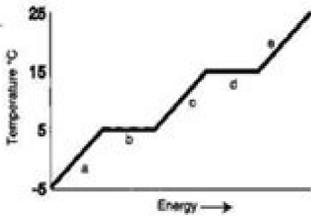


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HEATING CURVES QUESTIONS

PART A – HEATING CURVES. Use the heating curve to the right to answer the following questions:

- What is the melting point of the substance? **B/ 5 C**
- What is the boiling point of the substance? **D/ 15 C**
- Which letter represents heating of the solid? **A**
- Which letter represents heating of the gas? **E**
- Which letter represents melting of the solid? **B**
- Which letter represents boiling of the liquid? **D**
- At points b and d why doesn't the temperature change even though heat energy is added?

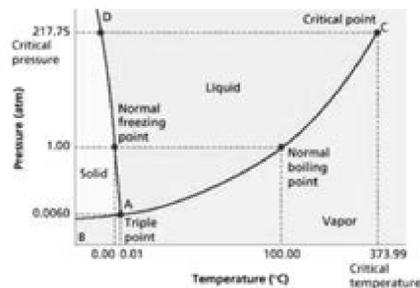


The Substance must absorb enough heat/ kinetic energy to escape the intermolecular actions/ bonds (i.e. hydrogen bonds) that keep them their current phase/ state

Refer to the phase diagram below when answering the questions on this worksheet

PART C – PHASE DIAGRAMS. Use the phase diagram for water below to answer the following questions.

- What is the state of water at 2 atm and 50°? **LIQUID**
- What phase change will occur if the temperature is lowered from 80°C to -5°C at 1 atm? **FREEZING**
- You have ice at -10°C and 1 atm. What could you do in order cause the ice to sublime? **Decrease the pressure to less than 0.060 atm**



Predict the physical state of each of these substances at the indicated temperature.

Use the melting point and boiling point data from the table below.

- phenol at 99°C
- ammonia at -25°C
- methanol in an ice-water bath
- methanol in a boiling-water bath
- ammonia at -100°C
- phenol at 25°C

- Liquid**
- Gas**
- Liquid**
- Gas**
- Solid**
- Solid**

