



**High School Science Virtual Learning**

**Chemistry**

**Phase Change Diagrams**

**May 7, 2020**



# High School Chemistry

## Lesson: [5/7/20]

### **Objective/Learning Target:**

Students will be able to explain phase change diagrams.



## Let's Get Started:

1. Determine the number of grams of  $\text{BaCl}_2$  in 750 mL of a 4.6 M solution.
2. Using a 6.0 M solution of  $\text{K}_2\text{SO}_4$ , determine how to make 500 mL of a 1.7 M dilution.

## Let's Get Started: Answer Key

1.

$$\text{Molarity} = \frac{\text{moles solute}}{\text{Liters of solution}}$$

$$4.6 \text{ M} = \frac{\text{moles AlCl}_3}{0.750 \text{ L of solution}} \quad \text{so...} \quad \text{moles AlCl}_3 = (4.6 \text{ M})(0.750 \text{ L}) = 3.45 \text{ moles}$$

$$3.45 \text{ mol AlCl}_3 \times \frac{133.33 \text{ g}}{1 \text{ mol AlCl}_3} = 459.99 \text{ g} \rightarrow \text{sig fig } 460 \text{ g AlCl}_3 \text{ needed.}$$

## Let's Get Started: Answer Key

2.

$$M_1V_1 = M_2V_2$$

$$6.0 \text{ M} \times V_1 = 1.7 \text{ M} \times 500. \text{ mL}$$

$$V_1 = \frac{1.7 \text{ M} \times 500 \text{ mL}}{6.0 \text{ M}} = 141.67 \text{ mL} \rightarrow \text{sig fig } 140 \text{ mL}$$



## Lesson Activity:

### Directions:

1. Answer the questions on the handout as you watch the video.
2. Record definitions on slide 6.

### Links:

- Video: [Phase Diagrams](#)
- Handout: [Phase Diagram Video Worksheet](#)

## Definitions:

- *Phase diagram* - graph showing the relationships among the solid, liquid, and vapor states (or phases) of a substance in a sealed container
  - The conditions of pressure and temperature at which two phases exist in equilibrium are indicated on a phase diagram by a line separating the phases.
- *Triple point* - describes the only set of conditions at which all three phases can exist in equilibrium with one another
- *Critical Point* - state where distinct liquid and gas phases do not exist
- *Supercritical fluid* - when the substance conditions are beyond critical point. It can effuse through solids like a gas, and dissolve materials like a liquid.



# Practice

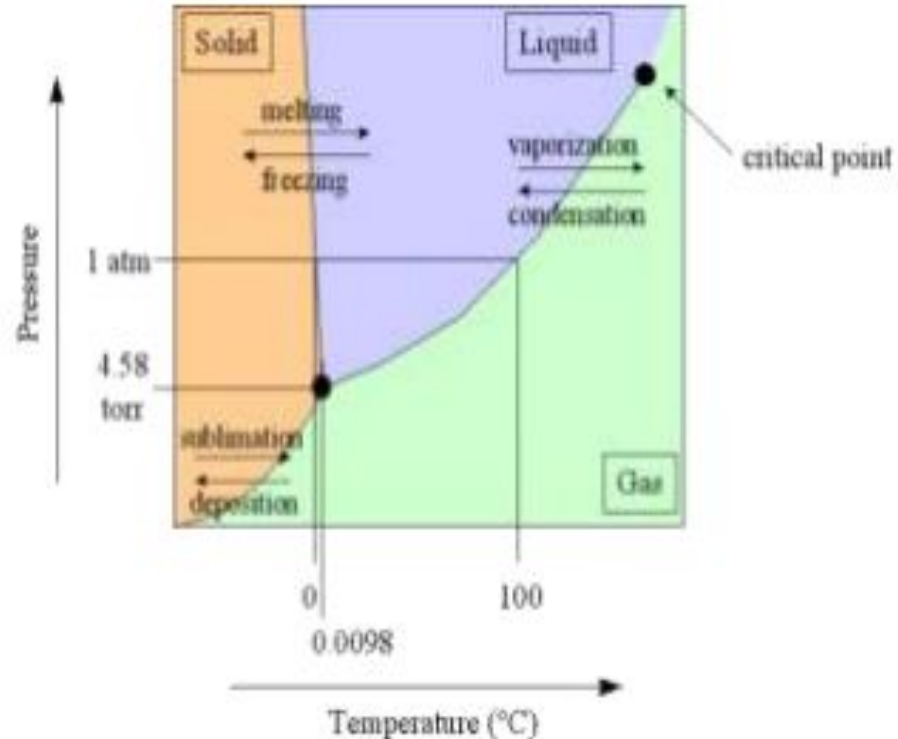
*Complete the following questions using the information you learned during the lesson activity.*



## Questions:

Use the water phase diagram on the right to answer the following questions.

1. At a pressure of 1 atmosphere, what is the normal freezing point?
2. What is the normal boiling point at 1 atmosphere of pressure?
3. Dever, CO is approximately 5,280 ft above sea level, which means the normal atmospheric pressure is less than 1 atm. In Denver, will water boil at a higher or lower temperature?
4. Water is an unusual substance because the slope of the boundary between solid and liquid is negative. What happens to solid water at 0°C if you increase the pressure?





Once you have completed the practice questions check with the **answer** key.

1. The normal freezing point of water is  $0\text{ }^{\circ}\text{C}$ .
2. The normal boiling point of water is  $100\text{ }^{\circ}\text{C}$ .
3. In Denver, the water will boil at a temperature below the normal boiling point.
4. If you increase the pressure, the solid water will melt to a liquid. Usually a pressure increase will freeze, not melt the substance.



## More Practice:

Follow the links below to do more practice.

1. [Phase Diagrams](#)
2. [Phase Diagram Worksheet](#)



Additional Practice:  
Click on the link below for additional practice.

[Quiz](#)