## Phase Changes

*The state of matter of a substance depends on the kinetic energy of the particles and the intermolecular attractions between those particles.*

*Heating Curves*

Consider the heating curve for water. Assume standard pressure conditions (1 atm).

a. What is the melting point (in Celsius) of water?:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. What is the boiling point (in Celsius) of water?:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Heating curve of water**

Kinetic energy measured in Temperature (®C)

Time (or heat added)

c. In your own words, describe what is happening to the molecules of a substance when the heating curved has a positive slope:

d. Describe what is happening to the molecules of a substance when the heating curved has a slope of zero (i.e. temperature remains constant over time as energy is supplied to the system):

*Phase Diagrams*

**Phase diagram of water**

External pressure

(atm)

Temperature

Vocabulary to know:

1. Match the phase change pairs and then write them onto your phase diagram above.

Condensation Melting

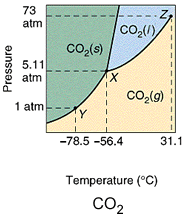
Sublimation Fusion (or freezing)

Vaporization Deposition

1. Phase changes that are ENDOthermic in nature (i.e. require KE) include:
2. Phase changes that are EXOthermic in nature (i.e release KE) include:
3. Triple point:
4. Normal boiling point:
5. Normal freezing point:

Example problems:

1. Tomorrow, we’ll be working with dry ice, which is frozen CO2. Using the phase diagram below, identify the different characteristics of this substance.



1. The point at which CO2 will sublime at 1 atm? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What state(s) does CO2 exist in at point X?
3. What state(s) does CO2 exist as when the system is at 73 atm and 10°C?
4. A sealed container of water vapor, whose internal temperature is 110°C, is subjected to an increase of pressure from 0.50 atm to 120 atm. What phase will water be in once the system has come to rest?

