

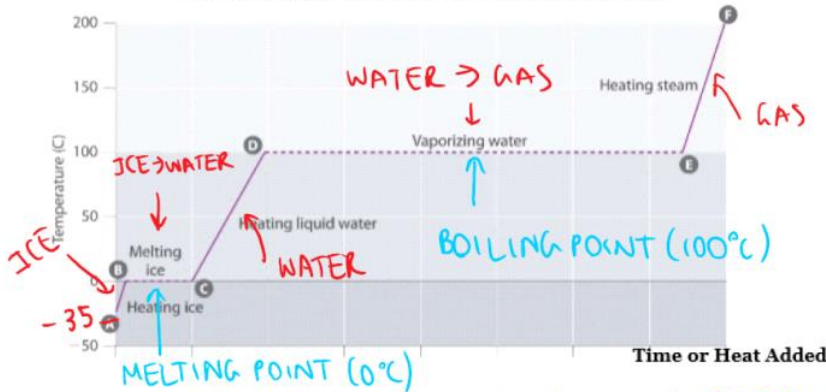
PART D: CHANGES IN STATE

Changes in State

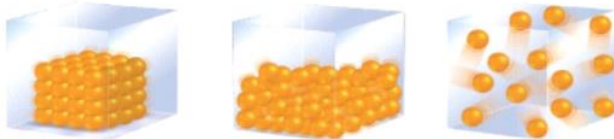
The kinetic molecular theory explains how matter changes state. Let's look at an example:

1. Solid gold – particles are stuck together but vibrate in place
2. As we add thermal energy the particles begin to move further apart
3. Liquid gold – particles are still close, but have enough room to slide past each other
4. As the temperature increases the particles move further apart and some have enough energy to break free
5. Gaseous gold – particles are far apart and spread out freely into the container

A Phase Change Diagram for Water at Standard Pressure:



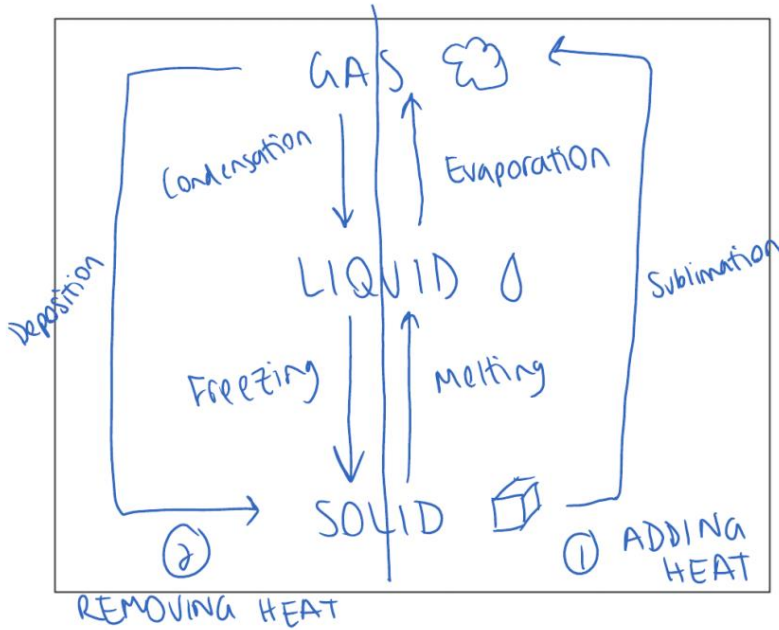
- Between A and B: Solid ice is warming (heating) (-35°C → 0°C)
- Between B and C: Ice is melting (energy melting NOT increasing temp) (0°C)
- Between C and D: Liquid water is warming (0°C → 100°C)
- Between D and E: Liquid water is evaporating (100°C)
- Between E and F: Water vapour (gas) is warming



Define the Following & Draw a Diagram:

Freezing is the change of state from	liquid	to	solid
Melting is the change of state from	solid	to	liquid
Condensation is the change of state from	gas	to	liquid
Evaporation is the change of state from	liquid	to	gas

Sublimation is the change of state from	solid	to	gas
Deposition is the change of state from	gas	to	solid



PRACTICE

Let's Stretch Our Thinking:

Consider the phase change diagram shown to the right.

1. The **vertical** axis on the graph might be:

- A. Time
- B. Temperature
- C. Viscosity
- D. Density

2. The **horizontal** axis on the graph might be:

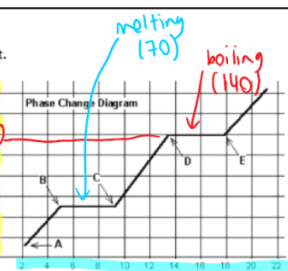
- A. Time
- B. Energy
- C. Temperature
- D. Time or energy

3. The most amount of liquid will be found at:

- A
- B
- C
- D
- E

4. Between B and C _____ is happening.

- A. Freezing
- B. Evaporating
- C. Increasing temperature
- D. Melting (solid → liquid)



6. How do you know that this pure substance is not water?

The pure substance charted in the phase change diagram is not water because...

it does not have the same melting point as water (its MP is 70, water is 0), and boiling point (its BP is 140, water is 100)

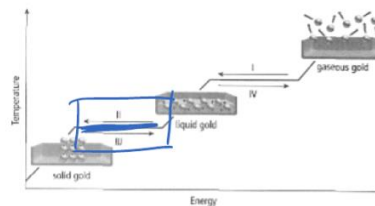
Homework

ASSIGNMENT #5: Changes of state in gold

This assignment is to be completed below in the space provided.

Changes of state in gold

Use the graph to help you answer the questions that follow.



1. What do points I, II, III, and IV on the graph shown above represent?

change of state

2. What is removed from gaseous gold to cause it to change to a liquid?

heat (temperature)

3. What change of state occurs at point I on the graph?

gas → liquid (condensation)

4. What change of state occurs at point II on the graph?

liquid → solid (freezing)

5. What is added to solid gold to cause it to change to a liquid?

heat (temperature)

6. What happens to the temperature as solid gold turns to a liquid?

heat is added BUT temperature stays the same

7. Describe the change in the kinetic energy as the temperature increases.

moving faster → kinetic energy increases.

8. Describe the change in the arrangement of the gold particles as heat energy is added.

moving further apart, could turn to a gas, start to bounce off walls (creating pressure)