

LIQUIDS

A. PROPERTIES OF LIQUIDS

1. Practically incompressible
2. Have definite volume but no definite shape
3. Flow and diffuse
4. Have surface tension
5. Evaporate
6. Expand slightly when heated

B. SURFACE TENSION

1. Surface tension is the tendency of a liquid to minimize its surface area.
2. Factors that affect surface tension
 - a. Strength of interparticle attractions
 - b. Temperature

C. EVAPORATION

1. Evaporation is the change from liquid to vapor at a temperature which is below the boiling point of the liquid.
2. Factors that affect rate of evaporation
 - a. Temperature
 - b. Surface area
 - c. Strength of interparticle attractions

D. VAPOR PRESSURE

1. Vapor pressure is the pressure exerted by the vapor above a liquid in a closed container; the pressure exerted by a vapor when it is in equilibrium with its liquid; a measure of the tendency of a liquid to vaporize.

2. Factors that affect vapor pressure
 - a. Strength of interparticle attractions

 - b. Temperature

3. Critical Temperature and Pressure
 - a. Critical Temperature is the highest temperature at which a distinct boundary exists between liquid and vapor. (It is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.)

 - b. Critical Pressure is the vapor pressure at the critical temperature. (It is the pressure required to produce liquefaction at the critical temperature.)

4. Vapor pressure of liquid is independent of volume of vapor.

E. BOILING POINT

1. Boiling point of a liquid is the temperature at which the vapor pressure of the liquid is equal to external pressure (atmospheric or applied pressure).
2. Normal boiling point is the temperature at which the vapor pressure is equal to one standard atmosphere (760 torr)
3. Boiling point varies with external pressure.
4. Factors that affect boiling point
 - a. Strength of interparticle attraction
 - b. Molecular mass

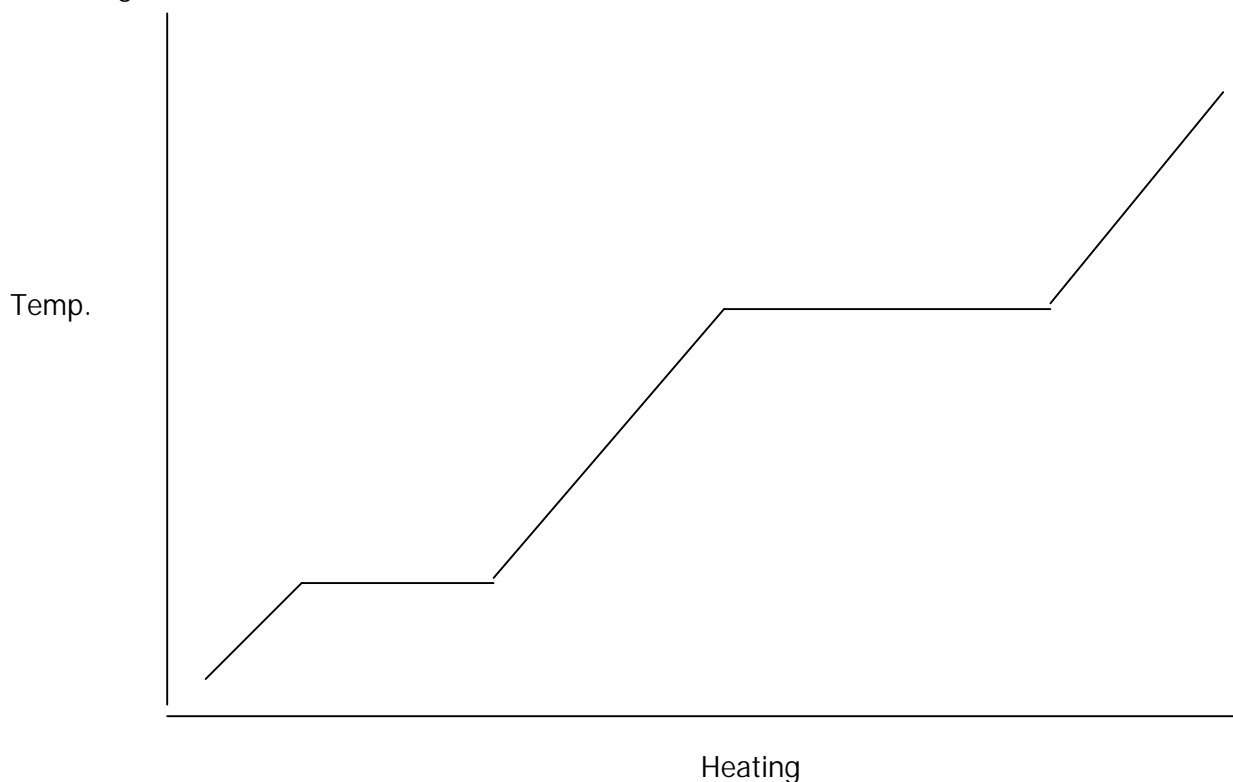
F. FREEZING POINT (MELTING POINT)

1. Freezing point is the temperature at which a solid is in equilibrium with liquid.
2. Freezing point varies with external pressure
3. Normal freezing point:

CHANGES OF STATE

A. HEATING AND COOLING CURVES.

1. Heating Curve



Heat of Fusion (ΔH_f): energy involved in changing a specified amount of solid to liquid (and vice versa) at the melting/freezing point.

EXAMPLE: heat of fusion of water = 80 cal/g = 335 J/g

Heat of Vaporization (ΔH_v): energy involved in changing a specified amount of liquid to gas (and vice versa) at the boiling point.

EXAMPLE: heat of vaporization of water = 540 cal/g = 2.26 kJ/g

Specific Heat: energy required to change one gram of a substance by one degree

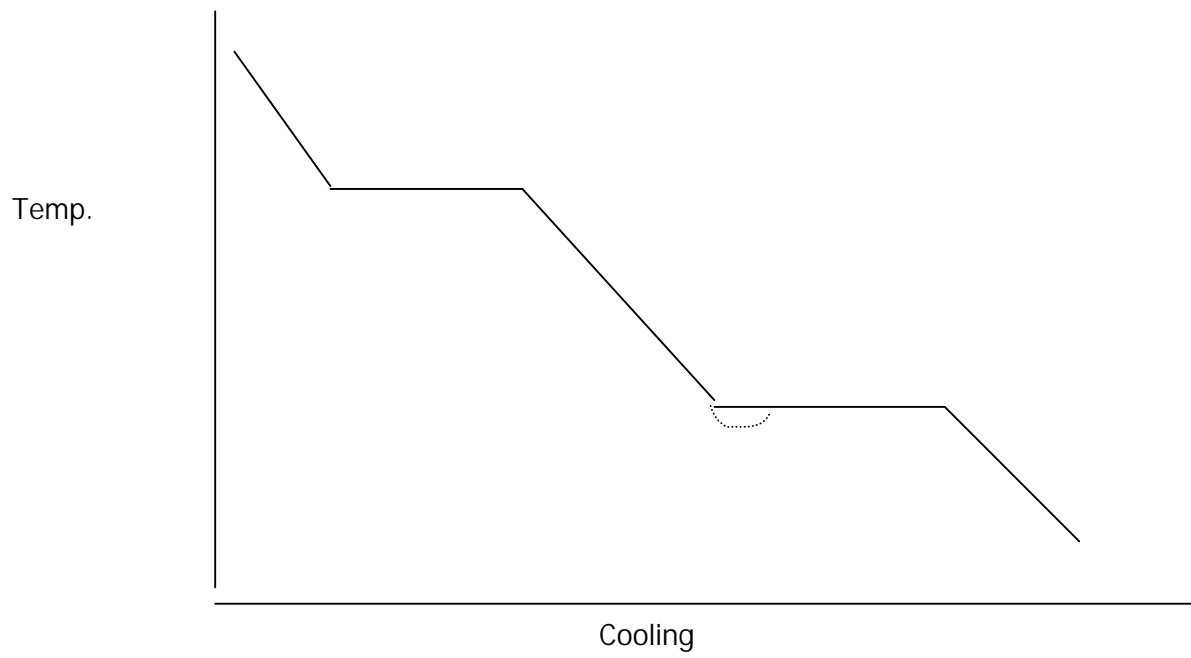
EXAMPLE: specific heats for water:

solid: 0.50 cal/g°C

liquid: 1.00 cal/g°C

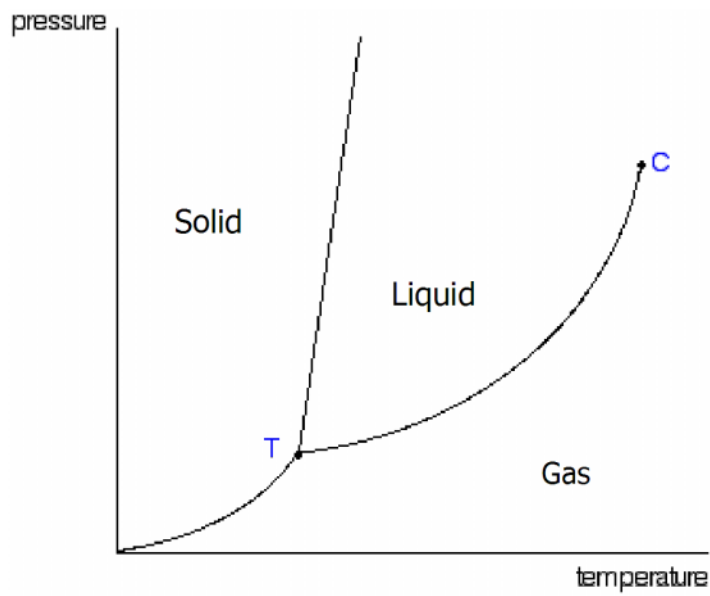
gas: 0.48 cal/g°C

2. Cooling Curve

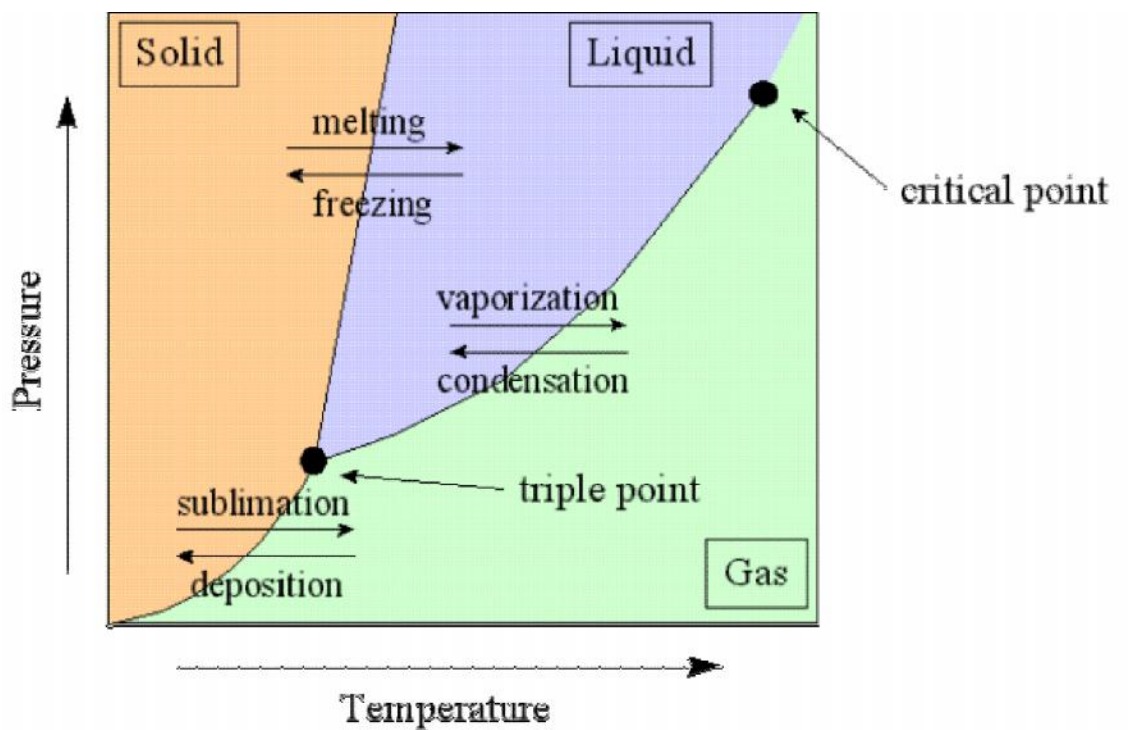


Problem: How much energy is required to change 5.0 grams of solid water at -15° to gas at 125°C ?

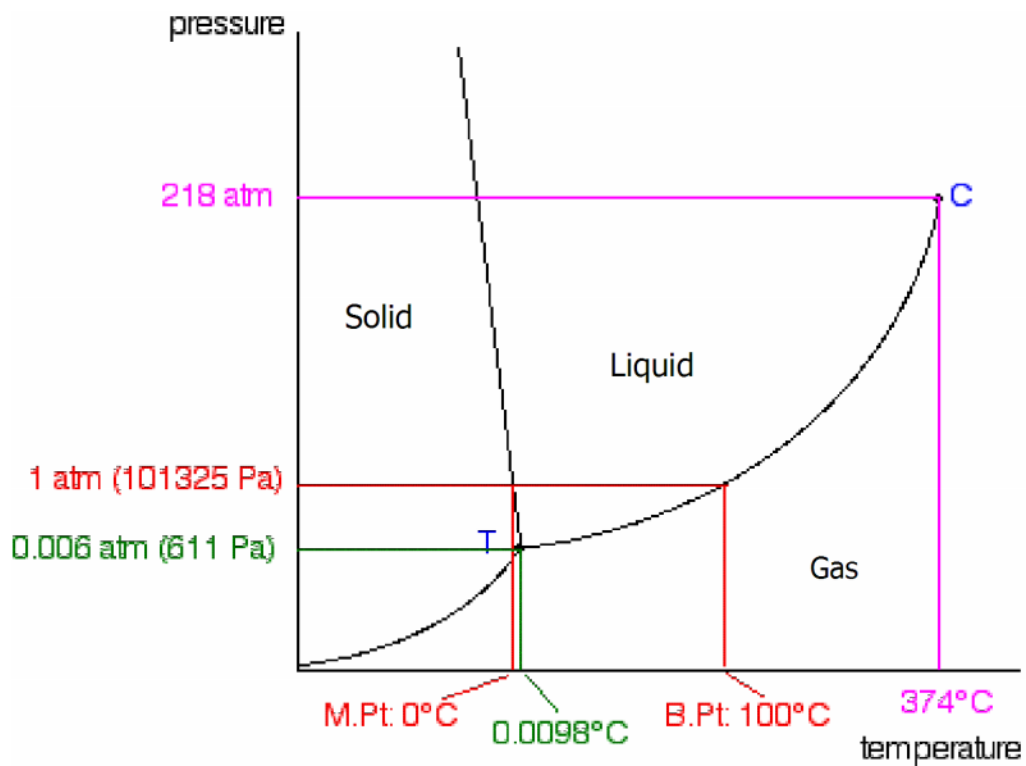
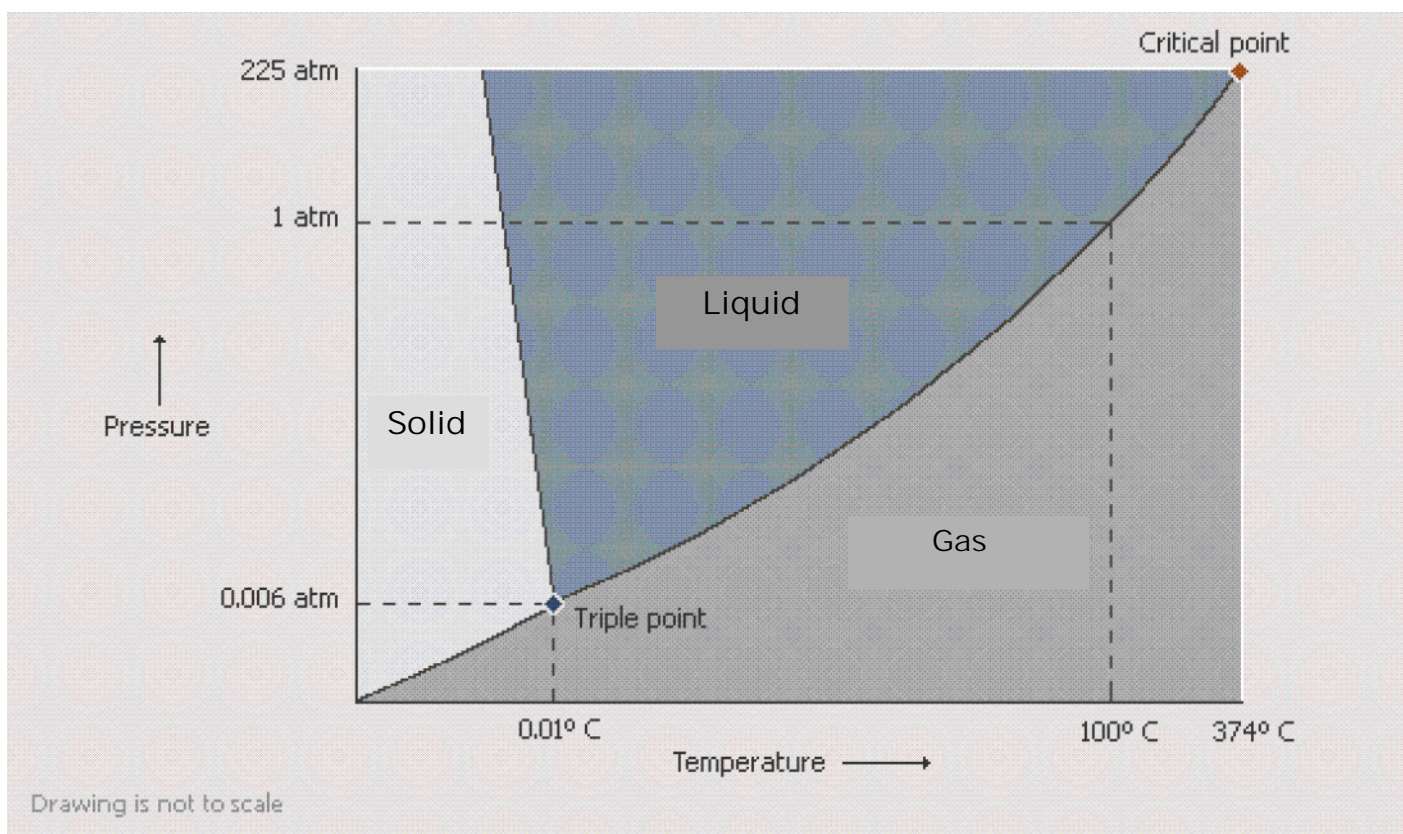
B. PHASE DIAGRAMS



1. Solid-Gas Equilibrium curve
2. Liquid-Gas Equilibrium curve
3. Solid-Liquid Equilibrium curve
4. Triple Point



Phase Diagrams for Water



Phase Diagram CO₂

