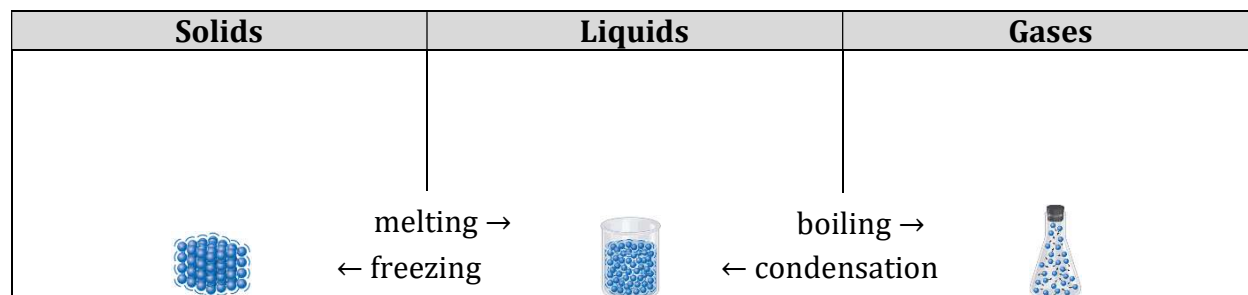


SPH3U 6.1 Warmth and Coldness

1. Vibrations of atoms and molecules

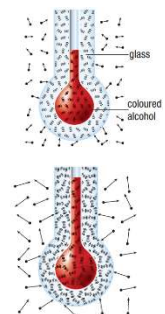
Kinetic molecular theory:	
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Thermal energy:	
transfer	

2. Temperature and thermometers

Temperature:	
thermometer	



Celsius scale	Fahrenheit scale	Kelvin scale

$$T_C = T_K - 273$$

$$T_K = T_C + 273$$

Ethyl alcohol boils at 78.3°C. What is this temperature in kelvins?

Ethyl alcohol freezes at 159 K. What is this temperature in degrees Celsius?

Homework: page 274: #1-2, 4

SPH3U 6.2 Heat

1. Thermal energy and temperature

Thermal energy:	
temperature	
heat	

Same temperature...	2.0 g, iron	1.0 g, iron
2.0 g, iron		
2.0 g, aluminum		

2. Methods of transferring thermal energy

Method	Description	Example

3. Thermal conductors and thermal insulators

Thermal conductors:	
Thermal insulators:	

Homework: page 280: #1-3, 5

SPH3U 6.3 Heat Capacity

3. Specific heat capacity

Specific heat capacity:	
-------------------------	--

Substance	Specific Heat Capacity, c	Substance	Specific Heat Capacity, c	Substance	Specific Heat Capacity, c
water	4.18×10^3	aluminum	9.2×10^2	copper	3.8×10^2
ethyl alcohol	2.46×10^3	glass	8.4×10^2	silver	2.4×10^2
ice	2.1×10^3	iron	4.5×10^2	lead	1.3×10^2

Quantity of heat:	
equation	

When 200.0 mL of water is heated from 15.0 °C to 40.0 °C, how much thermal energy is absorbed by the water?

An empty copper pot is sitting on the stove, with a mass of 1.2 kg and a temperature of 130.0 °C. If the pot cools down to 21.0 °C, how much thermal energy does it release?

A block of iron starts off at a temperature of 22.0 °C. It is heated to 100.0 °C by placing it in boiling water. The energy required is 4.91×10^5 J. Calculate the mass of the iron block.

4. The principle of thermal energy exchange

Principle of thermal energy exchange:	
equation	

A 60.0 g sample of metal is heated to 100.0 °C before being placed in 200.0 mL of water with an initial temperature of 10.0 °C. Together, they reach a final temperature of 15.6 °C. What is the metal?

A sample of iron is heated to 80.0 °C and placed in 100.0 mL of water at 20.0 °C. The final temperature of the mixture is 22.0 °C. What is the mass of the iron?

200.0 g of silver is heated to 90.0 °C. The hot silver is then placed into 300.0 g of ethyl alcohol with an initial temperature of 5.0 °C. What is the final temperature of the mixture?

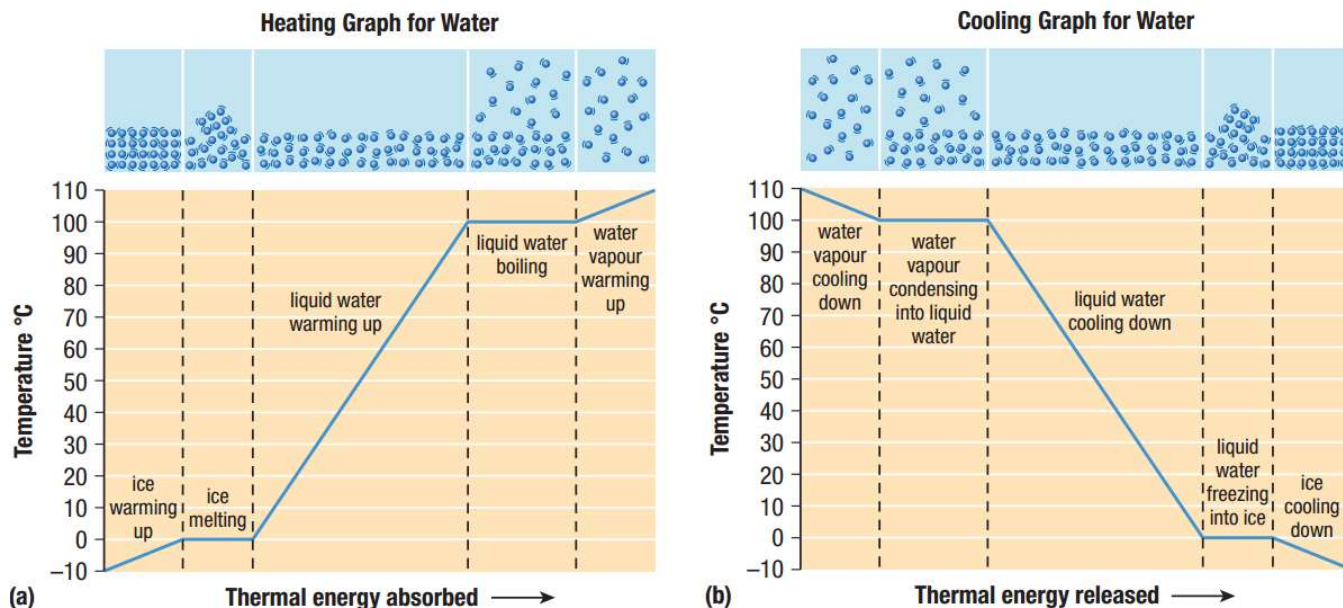
Homework: page 287: #2, 5, 6, 8

SPH3U 6.4 States of Matter and Changes of State

5. Changes of state

Fusion:	Vaporization:	Sublimation:
Condensation:	Freezing:	

6. Heating and cooling graphs



7. Latent heat

Latent heat:	
specific latent heat	

Substance	Specific latent heat of fusion, L_f (J/kg)	Melting point (°C)	Specific latent heat of vaporization, L_v (J/kg)	Boiling point (°C)
aluminum	6.6×10^5	2519	4.0×10^5	10900
ethyl alcohol	1.1×10^5	-114	8.6×10^5	78.3
carbon dioxide	1.8×10^5	-78	5.7×10^5	-57
gold	1.1×10^6	1064	6.4×10^4	2856
lead	2.5×10^4	327.5	8.7×10^5	1750
water	3.4×10^5	0	2.3×10^6	100

Latent heat during a change of state:	Melt/freeze:	Boil/condense:
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How much thermal energy is released by 652 g of molten lead when it changes into a solid?

Ethyl alcohol is a liquid at room temperature. How much thermal energy is absorbed when 135 g of ethyl alcohol at 21.5 °C is heated until all of it boils and turns into vapour?

8. Water: A special liquid

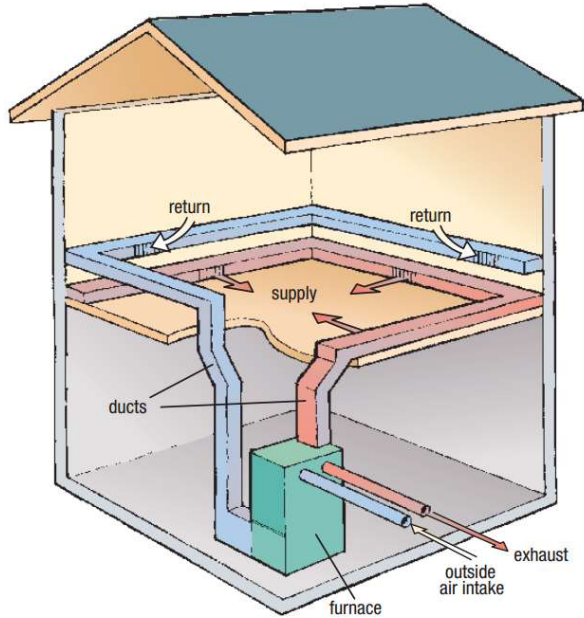
Most solids:	
solid water	
water molecule shape	

Homework: page 295: #1-2, 5, 7

SPH3U 6.5 Heating and Cooling Systems

9. Conventional heating systems

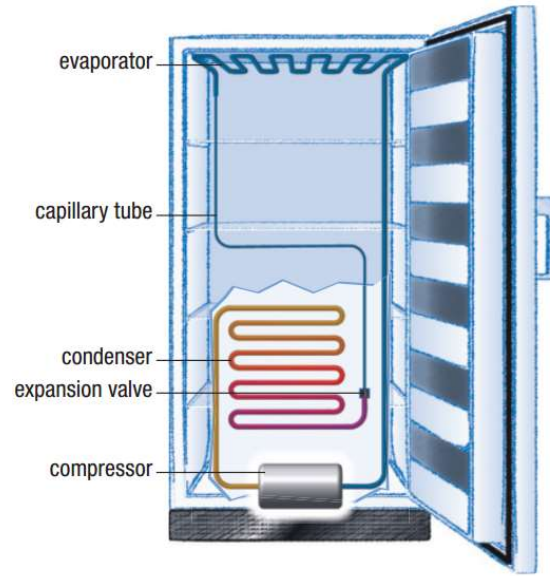
3 conventional heating systems:



10. Conventional heating systems

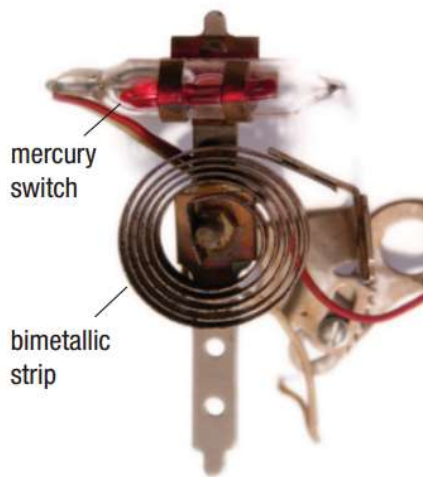
Condenser:

Evaporator:



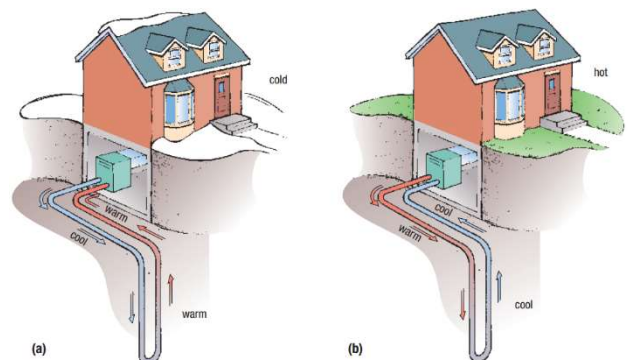
11. Controlling heating and cooling

Bimetallic strip:



12. Geothermal systems

Temperature 3 m below ground:



Homework:

page 299:

#1, 4