

Phases of Matter

liquid \rightleftharpoons solid
 L_f

liquid \rightleftharpoons vapor
 L_v

solid \rightleftharpoons vapor
sublimation

example: dry ice, frozen CO_2

Fig 18.24 in ch2 slides for phase diagram

also showed phase diagram for CO_2 (1 bar \approx 1 atm)

The melter s2.html

$Q = mc\Delta T$, and $C_{Al} > C_{iron} \Rightarrow$ requires more Q for a given ΔT and m

Demo pumped down an air chamber with a beaker of H_2O

1. dropping P resulted in phase transition liquid \rightarrow vapor
2. T drops b/c boiling requires energy

Concept Qs s8.html

#1 no; liquid CO_2 possible only down to 5.1 atm

#2 no; only H_2O in solid phase

Group Problem - exoplanets

	V_{esc} (km/s)	V_H (km/s)	V_{O_2} (km/s)	liquid H_2O ?	life?
β pic	163	6.54	1.49	X	X
51 peg	40.4	5.64	1.29	X	X
ρ Oph.	3.38	2.68	0.61	✓	✓
α Canis	3.48	3.89	0.88	✓	✓

$$V_{esc} = \sqrt{\frac{2GM}{R}}$$

$$V_H = \sqrt{\frac{3kT}{m_p}}$$

$$V_{O_2} = \sqrt{\frac{5kT}{32m_p}}$$