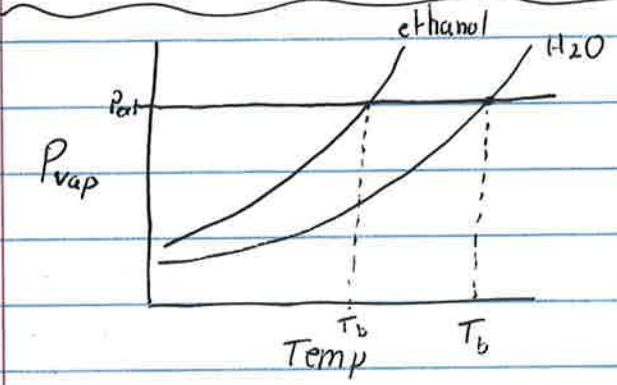
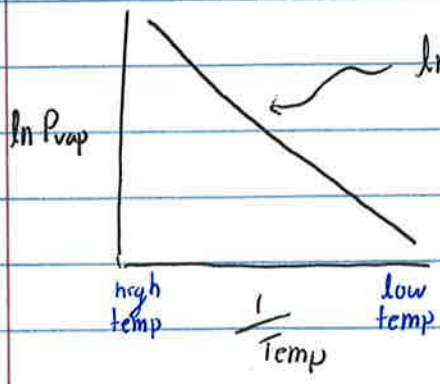
Today 11/28: Sections 11.4, 11.6, 11.7
Friday 11/30 finish ch 11
Sunday 12/2 problem club with Ali
Monday 12/3 Review
Tuesday 12/4 Problem club with Ali (last one)
Wednesday 12/5 CLS



P_{ext} = external pressure
T_b = boiling point

· Vapor pressure of alcohol is greater at all temperatures because it has weaker intermolecular forces

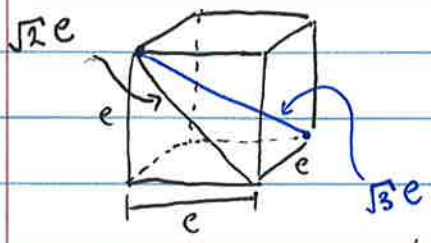


$$\ln P_{vap} = -\left(\frac{\Delta H_{vap}}{R}\right)\left(\frac{1}{T}\right) + b$$

ΔH_{vap}: J/mol
R: 8.314 $\frac{J}{mol \cdot K}$
T: K

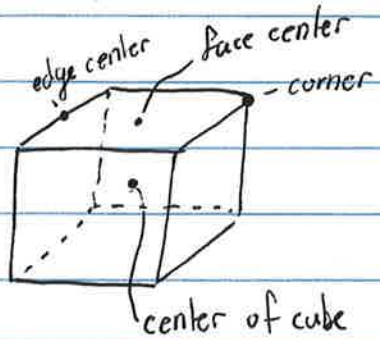
$\Delta H > 0$

$$\ln\left(\frac{P_1}{P_2}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$



$V = e^3$

$d = m/V$

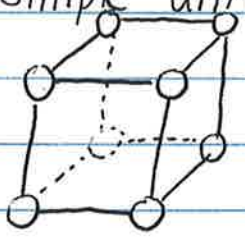


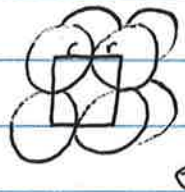
locatrons

- Corners = 8
- face center = 6
- center of cube = 1
- edge centers = 12

Unit cell

Simple unit cell: 1 atom/unit cell, $e = 2r$

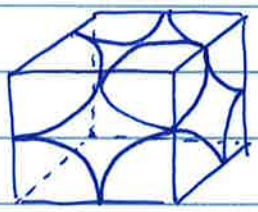




$e = 2r$

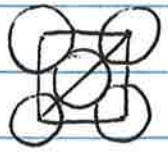
density + mass ↔ Vol ↔ e ↔ r

* each atom that makes up the simple unit cell is $\frac{1}{8}$ inside the unit cell



8 corner atoms * $\frac{1}{8}$ inside = 1 atom/unit cell

Face centered cubic unit cell "fcc"



$4r = \sqrt{2} \cdot e$

corner atoms: 8, each is $\frac{1}{8}$ inside unit cell = 1 atom

face center atoms: 6, each is $\frac{1}{2}$ inside unit cell = 3 atoms

4 atoms/unit cell

Aluminum ($d = 2.699\ g/cm^3$) uses fcc unit cell. What is the radius of Al?

$$d = \frac{m}{V} = \frac{2.699\ g}{cm^3} \text{ @ } \frac{4\ atoms}{} \left| \frac{26.98\ g}{mol} \right| \frac{mol}{6.02 \times 10^{23}} = m$$

$$m = 1.79 \times 10^{-22}\ g$$

$$V = \frac{m}{d} = \frac{1.79 \times 10^{-22}\ g}{2.699\ g/cm^3} = 6.64 \times 10^{-23}\ cm^3$$

$V = e^3$ $\qquad 6.64 \times 10^{-23}\ cm^3 = e^3$

$$e = 4.05 \times 10^{-8}\ cm$$

$4r = \sqrt{2} \cdot e$

$4r = \sqrt{2} \cdot 4.05 \times 10^{-8}\ cm$

$r = 1.43 \times 10^{-8}\ cm$

$$\frac{1.43 \times 10^{-8}\ cm}{} \left| \frac{1 \times 10^{-2}\ m}{cm} \right| \frac{1\ pm}{1 \times 10^{-12}\ m} = 143\ pm$$

body centered cubic "bcc"

$4r = \sqrt{3} \cdot e$

8 corners atoms, each is 1/8 inside unit cell = 1 atom

1 body center atom, totally inside unit cell = 1 atom

2 atoms / unit cell

	# atoms / unit cell	e + r relationship
simple	1	$e = 2r$
fcc	4	$4r = \sqrt{2}\, e$
bcc	2	$4r = \sqrt{3}\, e$

Tungsten $e = 317$ pm. It uses bcc.

Radius?

$e = 3.17 \times 10^{-8}$ cm

$4r = \sqrt{3} \cdot e$

$4r = \sqrt{3} \cdot 317\text{pm}$

$r = 137$ pm

density?

$$d = \frac{m}{V} = \frac{2\text{W atoms} \mid 183.8\text{ g} \mid \text{mol} \mid}{\text{mol} \mid 6.02\times10^{23} \mid (3.17\times10^{-8})^3\text{ cm}^3}$$

$d = 19\text{ g/cm}^3$