Chem 1062

Note Title 7/10/2008

* Email Assignment
* D2L Quizzes – don't forget about scheduled downtime
* Tutors
* Exam on Monday – may start up to 15 minutes early – lecture resumes @ 9:10
* Labs – if you want to know if received, use the <u>exact</u> subject line specified in the lab (copy and paste, if needed). Also, <u>please</u> CC your lab partner if you are submitting a "group" report
* Any questions?

Read about types of solids on your own (ch 11.6)

unit cell – smallest portion of a lattice that may be used reconstruct the entire lattice

simple cubic (sc) ⟹ 1 atom per unit cell
body-centered cubic (bcc) ⟹ 2 atoms " "
face-centered cubic (fcc) ⟹ 4 atoms per " "

11.80) Ni has fcc unit cell ⟶ $4 \frac{\text{atoms}}{\text{unit cell}}$

$l = 352.4$ pm

$d = 8.91$ g/cm^3

$M_m = 58.61$ g/mol

$N_A = ?$ $\frac{\text{atoms}}{\text{mol}}$

$1\ \text{pm} = 10^{-12}\ \text{m}$ $\quad$ $1\ \text{cm} = 10^{-2}\ \text{m}$ $\quad$ $10^{12}\ \text{pm} = 10^{2}\ \text{cm}$

$10^{12}\ \text{pm} = 1\ \text{m}$ $\quad$ $10^{2}\ \text{cm} = 1\ \text{m}$ $\quad$ $\boxed{10^{10}\ \text{pm} = 1\ \text{cm}}$

or $\boxed{1\ \text{pm} = 10^{-10}\ \text{cm}}$

$$\frac{4\ \text{atoms}}{\text{unit cell}} \times \frac{\text{unit cell}}{4.376\times10^{-23}\ \text{cm}^3} \times \frac{\text{cm}^3}{8.91\ \text{g}} \times \frac{58.61\ \text{g}}{\text{mol}} = \boxed{6.01\times10^{23}\ \frac{\text{atoms}}{\text{mol}}}$$

$$\left(\frac{352.4\ \text{pm}}{\text{edge}}\right)^3 \times \left(\frac{1\ \text{cm}}{10^{10}\ \text{pm}}\right)^3 = 4.376\times10^{-23}\ \frac{\text{cm}^3}{\text{unit cell}}$$

(11.83) $\ell = 407.9\ \text{pm}$ $\quad$ $d = 19.3\ \text{g/cm}^3$

$N_A = 6.022\times10^{23}\ \frac{\text{atoms}}{\text{mol}}$ $\quad$ $M_m = 196.97\ \text{g/mol}$

sc, bcc, or fcc?

$$\frac{6.022\times10^{23}\ \text{atoms}}{\text{mol}} \times \frac{\text{mol}}{196.97\ \text{g}} \times \frac{19.3\ \text{g}}{\text{cm}^3} \times \frac{6.787\times10^{-23}\ \text{cm}^3}{\text{unit cell}} = \boxed{4.00\ \frac{\text{atoms}}{\text{unit cell}}}$$

$$\left(407.9\times10^{-10}\ \text{cm}\right)^3 = 6.787\times10^{-23}\ \frac{\text{cm}^3}{\text{unit cell}}$$

$\boxed{\text{fcc}}$

Ch. 12 - Solutions

Read 12.1 on own

saturated solution - a solution that contains the maximum amount of solute that will dissolve in a given amount of solvent at a specified temp

unsaturated solution - a solution that contains less solute than a saturated solution @ same temp

supersaturated solution - a solution that contains more solute than a sat solution @ same temp

~~Henry's Law~~

skip until Monday (Factors in Explaining Solubility) (pp 482-487)

Know for Exam
pp 479-482, 12.3 (except Henry's Law), 12.4

12.4 Solution concentrations

%-by-mass

%-by-volume

$$\text{molarity } (M) = \frac{\text{moles of solute}}{\text{Liters of solution}}$$

$$\text{molality} = \frac{\text{moles of solute}}{\text{Kg of solvent}}$$

mole fraction = $\frac{\text{moles of solute}}{\text{moles of solution}}$

What mass of Na_2SO_4 is needed to prepare 250.0 mL of 0.500 $\frac{mol}{L}$ Na_2SO_4?

$$250.0\,mL \times \frac{0.500\,mol\,Na_2SO_4}{1000\,mL} \times \frac{142.04\,g\,Na_2SO_4}{1\,mol\,Na_2SO_4} = \boxed{17.8\,g\,Na_2SO_4}$$

Solution is prepare by adding 17.8 g Na_2SO_4 to enough water to make 250.0 mL solution.

(12.47) Vanillin ⇒ $C_8H_8O_3$

39.1 mg sample of vanillin dissolved in 168.5 mg of diphenyl ether $(C_6H_5)_2O$. What is the molality of the vanillin?

$$39.1\,mg\,C_8H_8O_3 \times \frac{1\,g}{1000\,mg} \times \frac{1\,mol\,C_8H_8O_3}{152.1\,g\,C_8H_8O_3} = \frac{2.571\times10^{-4}\,mol\,C_8H_8O_3}{1.685\times10^{-4}\,kg\,(C_6H_5)_2O}$$

$$= \boxed{1.53\,m\,C_8H_8O_3}$$

$$168.5\,mg \times \frac{1\,g}{1000\,mg} \times \frac{1\,kg}{1000\,g} = 1.685\times10^{-4}\,kg$$

$1\,m = 1\,\text{molal} = 1\,\frac{mol}{kg}$

this is a 1.53 molal solution

(12.55) 1.00 mol HCl dissolved in 3.31 mol H_2O

mol fraction? molality?

$$X_{HCl} = \frac{\text{mol HCl}}{\text{mol solution}} = \frac{1.00\,mol\,HCl}{4.31\,mol\,solution}$$

$$= \boxed{0.232\ \text{mol fraction HCl}}$$

$$\text{molality} = \frac{\text{moles of solute}}{\text{Kg of solvent}} = \frac{1.00\ \text{mol HCl}}{0.05965\ \text{Kg } H_2O}$$

$$\boxed{16.8\ m\ HCl}$$

$$3.31\ \text{mol } H_2O \times \frac{18.02\ g\ H_2O}{1\ \text{mol } H_2O} \times \frac{1\ Kg}{1000\ g}$$