

(1) when comparing free energy of pure solvent to free energy of solution formed by adding a solid solute to the solvent, free energy of solution is  
 - lower

X (2) which would have lowest vapor pressure?  
 - 1.5 M  $MgCl_2$  aqueous solution  
 $i=3$  so 4.5 M solution

(3) + 10 points poll  
 what will happen if I add more solid salt to a saturated solution?  
 - the concentration of salt will remain same.  
 (saturated means dissolved as much as will dissolve; if you add more solid, concentration will not change)

### Solubility

- amt of solute that will dissolve given amt of solvent or solution

Molar Solubility - max # moles of solute that will dissolve in 1 L solution at given temp

(4) + 10 points poll  
 How much of the rock dissolved?  
 - a tiny amount dissolved

(5) +10 points (roll)

WS-5) The molar solubility of  $\text{CaCl}_2$  is  
= 5.1 M

Given:  $\frac{64.7 \text{ g CaCl}_2}{100 \text{ g H}_2\text{O}}$

Molar solubility =  $\frac{\text{moles of solute}}{\text{Liter of solution}}$

g  $\text{CaCl}_2 \rightarrow$  mol  $\text{CaCl}_2$

g 100g  $\text{H}_2\text{O} \rightarrow$  solution  $\rightarrow$  L solution

64.7g $\text{CaCl}_2$	1 mol $\text{CaCl}_2$	114.35g $\text{CaCl}_2$	1000 mL
164.7g sol	111.07g $\text{CaCl}_2$	1 mL	1 L

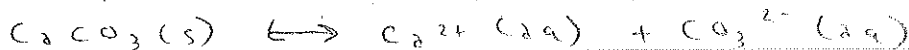
6 solution  
100+64.7

5.1 M

Practice w/ NaCl : Answer 5.40 M

(6) +10 points (roll)

$$K_{sp} = 8.7 \times 10^{-9}$$



Set up  $K_{sp}$  expression:

Solve for molar solubility of  $\text{CaCO}_3$

$$9.3 \times 10^{-5}$$

- same amount of  $\text{Ca}^{2+}$  as  $\text{CO}_3^{2-}$

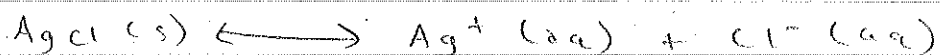
$$[\text{Ca}^{2+}] = x = [\text{CO}_3^{2-}]$$

$$\sqrt{K_{sp}} = \sqrt{x^2}$$

$$\text{Ca}^{2+} = x = 9.3 \times 10^{-5}$$

\* brackets indicate molar units!

what is the solubility of AgCl?



$$K_{sp} = [\text{Ag}^+][\text{Cl}^-] = 1.8 \times 10^{-10} = [x][x] = x^2$$



initial                      same                                      0                                      0

change                      -x                                      +x                                      +x

end /                      same -x                                      gain +x                                      gain +x

equilibrium

$$[x][x] = x^2$$

$$x = \sqrt{K_{sp}}$$

$$x = 1.3 \times 10^{-5}$$

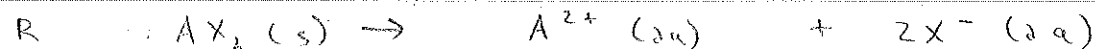
$$x = [\text{Ag}^+] = [\text{Cl}^-] = [\text{AgCl}]$$

(7) +10 points (poll)

Given a generic formula,  $\text{AX}_2$ , where A is cation and X is anion, and molar solubility has been determined to be  $1 \times 10^{-4}$  M. Calc value of  $K_{sp}$ .

$$= \boxed{4 \times 10^{-12}}$$

$$K_{sp} = [\text{A}^{2+}][\text{X}^-]^2 = [1 \times 10^{-4}][2 \times 10^{-4}]^2 =$$



I                      same                                      0                                      0

C                      -y                                      +y                                      +2y

E                      same -y                                      +y                                      +2y

(8) + 10 points (part)

which of the following has  
lowest molar solubility?



(9)