Review – Liquids/Solutions Name KEY

1. 53g of ethanol(C_2H_5OH) are dissolved in 108g of water.
   a. What is the percent of ethanol by mass?

$\frac{53g}{(53+108)} \times 100 = 32.9\%$ ethanol by mass

   b. What is the mole fraction of ethanol? C. What is the percent by moles of ethanol?

C_2H_5OH: $(2\times12)+(1\times6)+16 = 46g/mol$

H_2O: $(1\times2)+16 = 18g/mol$

$53g \times \frac{1mol}{46g} = 1.15mol$

$108g \times \frac{1mol}{18g} = 6mol$

$\frac{1.15}{7.15} = 0.16$

$\frac{1.15}{7.15} \times 100 = 16\%$ mol ethanol

2. If 150 mL of a 0.5 M KBr solution is diluted to 1.5 L, what is the molarity of this solution?

$\frac{(150mL)(0.5M)}{1500mL} = \frac{(1500mL)M_2}{1500mL}$

$M_2 = 0.05M$ KBr solution

3. How many mL of a 0.43 M NaCl solution is needed to make 3.0 L of a 0.005 M NaCl solution.

$(x\,mL)(0.43M) = (3000mL)(0.005M)$

$V_1 = 34.9mL$

4. How many grams of sodium sulfide are needed to make a 75 mL of a 0.03M solution?

Na_2S: $2(23)+32 = 78g/mol$

$0.03M = \frac{x\,mol}{0.075L}$ $x = 0.00225$ mol

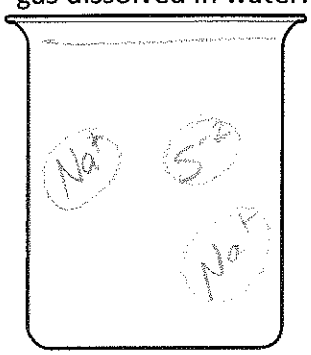
$0.00225mol \times \frac{78g}{1mol} = 0.176g$ Na_2S

5. What is the molarity of Na^{+1} and S^{-2} ions in a 0.5M sodium sulfide solution?

$Na_2S \rightarrow 2Na^{+1} + S^{-2}$

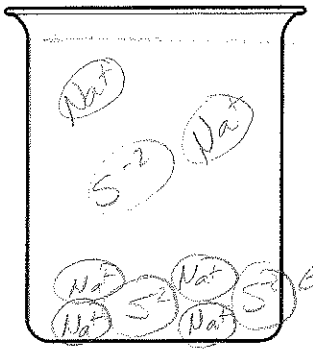
0.5M 1.0M 0.5M

6. Draw a model of an unsaturated and a saturated solution of sodium sulfide. Draw a model of oxygen gas dissolved in water.



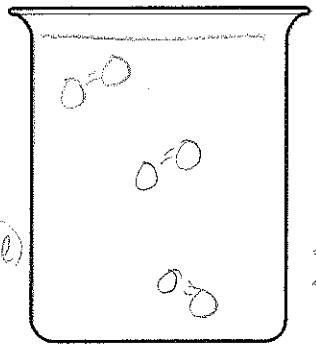
Unsaturated sodium sulfide

$Na_2S \rightarrow 2Na^{+1} + S^{-2}$



solid Na_2S (crystaline)

Saturated sodium sulfide



O_2 (g) ice

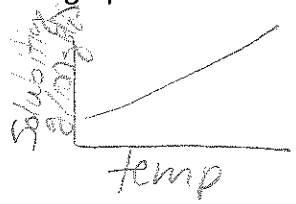
$\ddot{O}=\ddot{O}$

dissolved oxygen

covalent - does not break into ions

7. In what condition are solids more soluble in water? Draw a graph to show the relationship of this condition compared to the solubility.

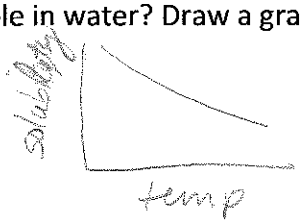
As temperature ↑, solubility ↑

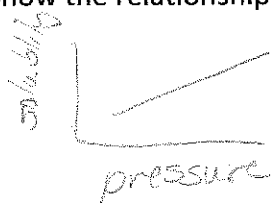


8. In what conditions are gases more soluble in water? Draw a graph to show the relationship of each condition compared to the solubility.

if ↑ temp, ↓ solubility

if ↑ pressure, ↑ solubility



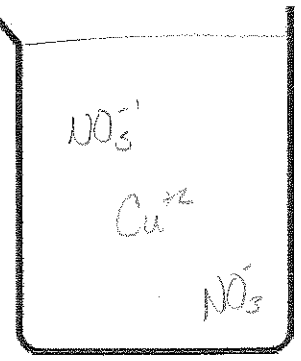


9. Review phase diagrams and solubility charts. → be able to read + determine molarity of a saturated solution

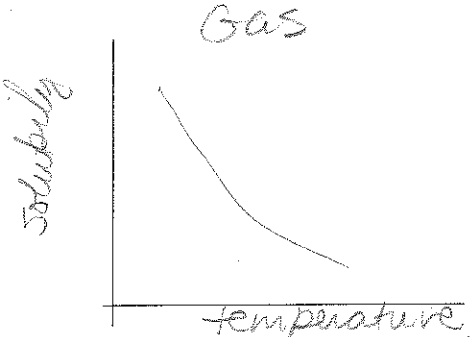
See notes + page 17-18

Solutions: Preview

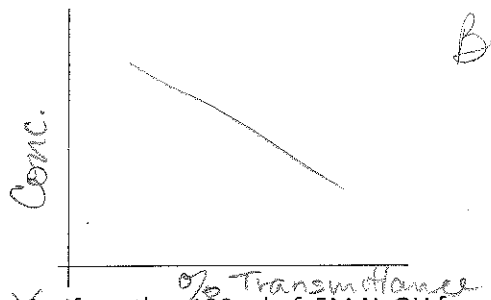
1. In the beaker 93.6g of $Cu(NO_3)_2$ is being dissolved in 100mL of water. Draw a rough sketch of the solution. $Cu(NO_3)_2 \rightarrow Cu^{+2} + 2NO_3^{-1}$

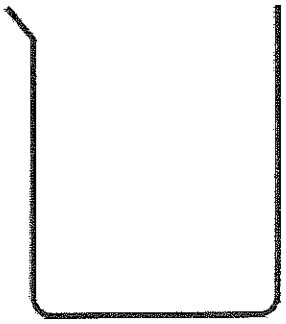


2. What is the molarity of the $Cu(NO_3)_2$? $\frac{93.6g}{187.5g} \times \frac{1mol}{1} = 0.5mol$ $\frac{0.5mol}{0.1} = 5M$
3. What is the percent mass of $Cu(NO_3)_2$ in the solution? $\frac{93.6g}{193.6g} \times 100 = 48.3\%\ Cu(NO_3)_2$ by mass
4. What would be the actual number of moles of NO_3^{-1} ions floating in the solution? $Cu(NO_3)_2 \rightarrow Cu^{+2} + 2NO_3^{-1}$ 0.5mol → 0.5mol → 1.0mol (1mol NO_3^{-1})
5. What is the molarity of the NO_3^{-1}? $\frac{1mol}{0.1L} = 10M\ NO_3^{-1}$
6. If you keep adding more and more $Ca(NO_3)_2$ to the solvent the solution will eventually become saturated
7. What is the only factor that would allow you to actually add more solute per solvent? increase temperature ($Cu(NO_3)_2$ is a solid)
8. In the second chart sketch the relationship between a gas dissolving (molarity) and temperature. Label the axis.



9. In the chart given, sketch out the relationship between Concentration and % T of light. Label the axis.





10. If another 100 ml of .5M NaOH forming solid $Cu(OH)_2$. Draw a picture of the aftermath.
    a. What ion is totally removed from the solution?
    b. What is the concentration of the Cu ion in the new 200mL solution?