SOLUTIONS WALK AROUND PRACTICE PROBLEMS

1 A saturated 100 mL solution of ammonium chloride at 80°C is cooled to 40°C .
How many grams of solute precipitate out? 66g - 47g = 19 grams (about)

2 A saturated 325 mL solution of ammonia at 20°C is warmed up to 40°C .
How many grams of solute precipitate out?

20°C $\frac{NH_3}{water}$ $\frac{55\ g}{100\ mL}$ = $\frac{X\ g}{325\ mL}$ X = 179 grams

40°C $\frac{NH_3}{water}$ $\frac{36\ g}{100\ mL}$ = $\frac{X\ g}{325\ mL}$ X = 117 grams

179 grams
- 117 grams
61 grams

precipitates

3 A 100 mL solution of HCl at 40°C contains 20 g of solute. How much more solute can fit into this solution?

At 40°C this solution can hold about 63 grams of HCl. If it has 20 grams already dissolved, there is room for about 43 grams more.

4 A pond of 34,560 L contains 247 g of water strider bug urine. What's the PPM of bug urine in this solution?

$$PPM = \frac{\text{Mass of solute}}{\text{mass of solvent}} \times 1{,}000{,}000 = \frac{247\ \text{grams}}{34{,}560{,}000\ \text{grams}} \times 1{,}000{,}000 = 7.15\ PPM$$

5 What is the molarity of a saturated solution of sodium nitrate at 30°C?

This solution holds 95 g in 100 mL. Using the molarity formula (but converting) we can figure this out.

$$\frac{95\ g\ NaNO_3}{1} \times \frac{1\ mole\ NaNO_3}{85\ grams} = 1.12\ moles\ NaNO_3$$

$$M = \frac{\#\ moles}{Liters} \times \frac{1.12\ moles}{0.100\ Liters} = 11.2\ M\ NaNO_{3(AQ)}$$

6 A 3475 mL solution contains 573 grams of $CuCl_2$, what is the molarity of this solution?

$$\frac{573\ g\ CuCl_2}{1} \times \frac{1\ mole\ CuCl_2}{134\ grams} = 4.28\ moles\ CuCl_2$$

$$M = \frac{\#\ moles}{Liters} \times \frac{4.28\ moles}{3.475\ Liters} = 1.23\ M\ CuCCl_{2(AQ)}$$

7 What is the freezing point of a 1.0 Liter 2.25 M $Ca(NO_3)_{2(AQ)}$ solution?

Normal FP	minus	FP Depression	=	New FP		*2.25 X 3 = 6.75 moles*
273 K	–	(6.75 X 1.86 K)	=			
273 K	–	12.555	=	260.445 K	=	260. K to nearest whole number Kelvin

8 What is the boiling point of one liter of 4.25 M $KNO_{3(AQ)}$ solution?

Normal BP	plus	BP Elevation	=	New BP		*4.25 X 2 = 8.50 moles*
373 K	+	(8.50 X 0.50 K)	=			
373 K	+	4.25 K	=	377.25 K	=	377 K to nearest whole number Kelvin

9 How many moles of NaCl are in 375 mL of saturated solution at 90°C?

$$90°C \quad \frac{\text{NaCl}}{\text{water}} \quad \frac{40\text{ g}}{100\text{ mL}} = \frac{X\text{ g}}{375\text{ mL}} = 150 \text{ grams NaCl} \rightarrow \frac{150\text{ g NaCl}}{1} \times \frac{1 \text{ mole NaCl}}{58\text{ g NaCl}} = 2.57 \text{ moles}$$

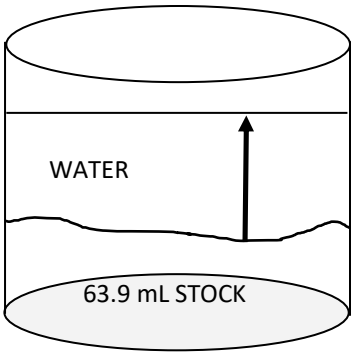
$$M = \frac{\text{moles}}{\text{Liter}} \quad \frac{2.57}{0.375 \text{ Liters}} = 6.85 \text{ M } NaCl_{(AQ)}$$

10 Name the best and worst electrolyte. All are 1.0 liter solutions: A is BEST C is worst

A. 3.0 M $Sr(NO_3)_2$ [9 moles of ions] B. 1.0 M $(NH_4)_3PO_4$ [4 moles of ions]
C. 2.5 M $SrSO_4$ [no moles of ions!] D. 4.0 M LiCl [8 moles of ions]
More Ions means conducts electricity better. *Strontium sulfate is INSOLUBLE = no ions in solution*

11 How to you prepare a 225 mL 1.33 M $LiNO_{2(AQ)}$ from a stock solution of 4.68 M?
$M_1V_1 = M_2V_2 \rightarrow (4.68\text{ M})(V_1) = (1.33\text{ M})(225\text{ mL})$

V_1 = 63.9 mL STOCK needed
Then fill with sufficient water to reach the 225 mL MARK



12 Compare the colligative properties of water with a solution of 1.0 M $ZnBr_{2(AQ)}$.
No math, say higher or lower than water's numbers.

12	Water	1.0 M $ZnBr_{2(AQ)}$
Freezing point	273 K	LOWER
Boiling Point	373 K	HIGHER
Vapor Pressure	Low	LOWER