

MOLARITY (M)

Name _____

$$\text{Molarity} = \frac{\text{moles of solute}}{\text{liter of solution}}$$

Solve the problems below.

1. What is the molarity of a solution in which 58 g of NaCl are dissolved in 1.0 L of solution?

Na	23	
Cl	35.5	
		58.5g/mol

$$\frac{58\text{g NaCl}}{58\text{g}} \times \frac{1\text{mol}}{58\text{g}} = 1\text{mol NaCl}$$

$$\frac{1\text{mol}}{1.0\text{L}} = 1\text{M}$$

1 M NaCl Solution

2. What is the molarity of a solution in which 10.0 g of AgNO₃ is dissolved in 500. mL of solution?

Ag	108	
N	14	
O	3x16=48	
		170g/mol

$$\frac{10\text{g}}{170\text{g}} \times \frac{1\text{mol}}{170\text{g}} = 0.059\text{mol}$$

$$\frac{0.059\text{mol}}{0.5\text{L}} = 0.118\text{M AgNO}_3$$

$$\frac{500\text{mL}}{1000\text{mL}} = 0.5\text{L}$$

0.118 M AgNO₃ sol'n

3. How many grams of KNO₃ should be used to prepare 2.00 L of a 0.500 M solution?

K	39	
N	14	
O	3x16=48	
		100g/mol

$$0.500\text{M} = \frac{X}{2\text{L}}$$

$$X = 1\text{mol KNO}_3 \times \frac{100\text{g}}{1\text{mol}} = 100\text{g KNO}_3$$

100g KNO₃

4. To what volume should 5.0 g of KCl be diluted in order to prepare a 0.25 M solution?

K	39	
Cl	35.5	
		74.5g/mol

$$\frac{5\text{g}}{74.5\text{g}} \times \frac{1\text{mol}}{74.5\text{g}} = 0.067\text{mol}$$

$$0.25\text{M} = \frac{0.067\text{mol}}{X\text{L}}$$

$$\frac{0.25X}{0.25} = \frac{0.067}{0.25}$$

$$X = 0.127\text{L}$$

0.127 L

5. How many grams of CuSO₄•5H₂O are needed to prepare 100. mL of a 0.10 M solution?

Cu	63.5x1=63.5	
S	32x1=32	
O	16x4=64	
H ₂ O	18x5=90	
		249.5g/mol

$$\frac{100\text{mL}}{1000\text{mL}} = 0.1\text{L}$$

$$0.1\text{M} = \frac{X\text{mol}}{0.1\text{L}}$$

$$X = 0.01\text{mol}$$

$$\frac{0.01\text{mol}}{1\text{mol}} \times \frac{249.5\text{g}}{1\text{mol}} = 2.495\text{g}$$

2.495 g CuSO₄•5H₂O

Name: _____ Date: _____ Class _____

Solubility Curve Practice Problems Worksheet 1



You'll notice that for most substances, solubility increases as temperature increases. As discussed earlier in solutions involving liquids and solids typically more solute can be dissolved at higher temperatures. Can you find any exceptions on the graph? $NH_3 + Ce_2(SO_4)_3$

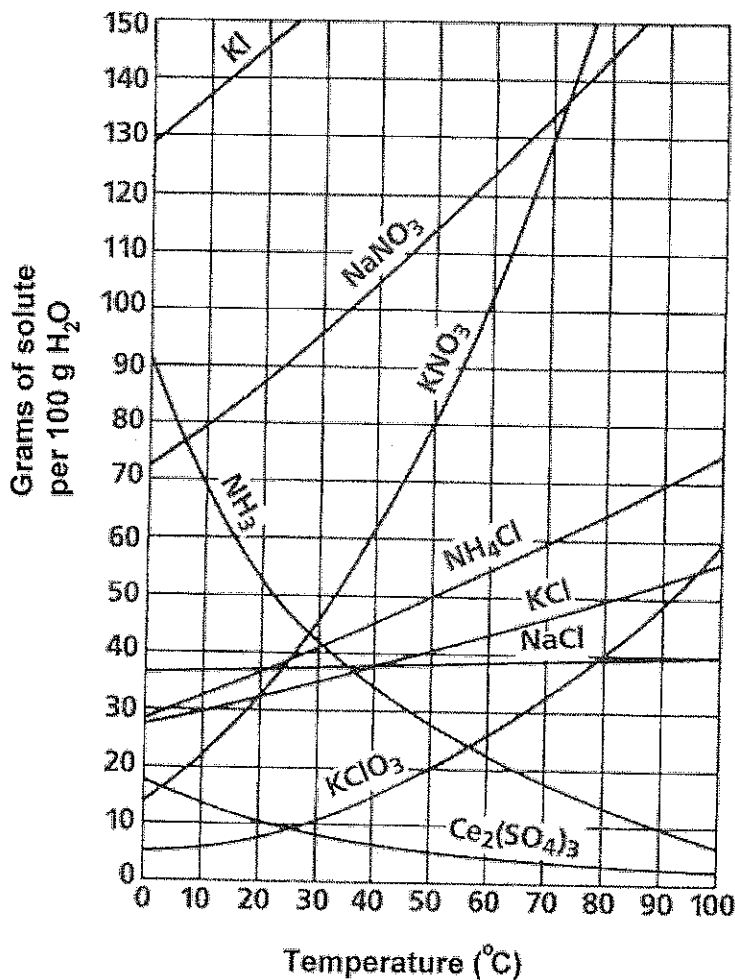
Here's an example of how to read the graph. Find the curve for $KClO_3$.

At $30^\circ C$ approximately 10g of $KClO_3$ will dissolve in 100g of water. If the temperature is increased to $80^\circ C$, approximately 40g of the substance will dissolve in 100g (or 100mL) of water.

Directions: Use the graph to answer the following questions. REMEMBER UNITS!

1) What mass of solute will dissolve in 100mL of water at the following temperatures?

- a. KNO_3 at $70^\circ C$ = 130g
- b. $NaCl$ at $100^\circ C$ = 40g
- c. NH_4Cl at $90^\circ C$ = 70g
- d. Which of the above three substances is most soluble in water at $15^\circ C$. = $NaCl$



2) Types of Solutions

On a solubility curve, the lines indicate the concentration of a saturated solution - the maximum amount of solute that will dissolve at that specific temperature.

Values on the graph below a curve represent unsaturated solutions - more solute could be dissolved at that temperature.

Label the following solutions as saturated or unsaturated. If unsaturated, write how much more solute can be dissolved in the solution.

Solution	Saturated or Unsaturated?	If unsaturated: How much more solute can dissolve in the solution?
a solution that contains 70g of NaNO_3 at 30°C (in 100 mL H_2O)	30° 70g NaNO_3 unsaturated	30° 95g 70g <u>25g</u>
a solution that contains 50g of NH_4Cl at 50°C (in 100 mL H_2O)	saturated 50° 50g	
a solution that contains 20g of KClO_3 at 50°C (in 100 mL H_2O)	50°C 20g saturated	
a solution that contains 70g of KI at 0°C (in 100 mL H_2O)	0° 70g unsaturated	$130 - 70 = 60\text{g}$

Homework - Use the Solubility Graphs on Page 1

- What is the solubility of KCl at 5°C ? 28g
 - What is the solubility of KCl at 25°C ? 34g
 - What is the solubility of $\text{Ce}_2(\text{SO}_4)_3$ at 10°C ? 14g
 - What is the solubility of $\text{Ce}_2(\text{SO}_4)_3$ at 50°C ? 5g
- At 90°C , you dissolved 10 g of KCl in 100. g of water. Is this solution saturated or unsaturated?
 - How do you know? unsaturated
at 90°C KCl solubility is 53g so 43 more will dissolve
- A mass of 100 g of NaNO_3 is dissolved in 100 g of water at 80°C .

 - Is the solution saturated or unsaturated? unsaturated
 - As the solution is cooled, at what temperature should solid first appear in the solution? Explain.
 35°C - The solubility at 35°C is 100g