

4 • Reactions & Solution Stoichiometry

Station 1 – ELECTROLYTES

Classify each statement as talking about a [S]trong electrolyte, [W]eak electrolyte, or [N]on-electrolyte when mixed with water.

<u>W</u>	H ₂ O	<u>N</u>	CH ₃ OH covalent molecule
<u>S</u>	NaCl	<u>W</u>	HC ₂ H ₃ O ₂ acetic acid (vinegar) is <u>weak</u>
<u>S</u>	KOH strong base	<u>W</u>	NH ₃ ammonia is a <u>weak</u> base
<u>N</u>	AgCl insoluble salt	<u>N</u>	C ₆ H ₁₂ O ₆ covalent molecule
<u>S</u>	HNO ₃ strong acid	<u>N</u>	SrSO ₄ insoluble salt
<u>S</u>	NaOH strong base	<u>S</u>	NaHCO ₃
<u>N</u>	Table sugar covalent molecule	<u>N</u>	Ethyl alcohol covalent molecule

4 • Reactions & Solution Stoichiometry

Station 2 – SOLUBILITY RULES

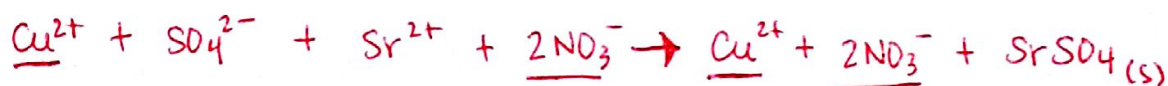
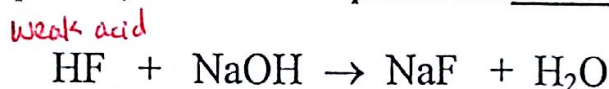
Circle the ionic compounds that are Insoluble (i.e. circle the precipitates):

<u>MgF₂</u>	CuSO ₄	NH ₄ Cl	<u>Fe(OH)₃</u>	CsF
<u>AgCl</u>	<u>CdS</u>	CuF ₂	<u>PbSO₄</u>	Ba(OH) ₂
Na ₂ SO ₄	NH ₄ OH	Sr(NO ₃) ₂	<u>Hg₂I₂</u>	Na ₂ CrO ₄
<u>BaCO₃</u>	<u>PbBr₂</u>	<u>CaC₂O₄</u>	HC ₂ H ₃ O ₂	<u>MgO</u>

4 • Reactions & Solution Stoichiometry

Station 3 – WRITE THE IONIC EQUATION

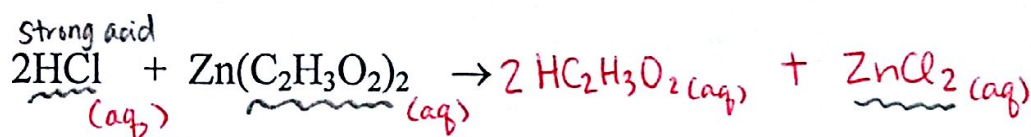
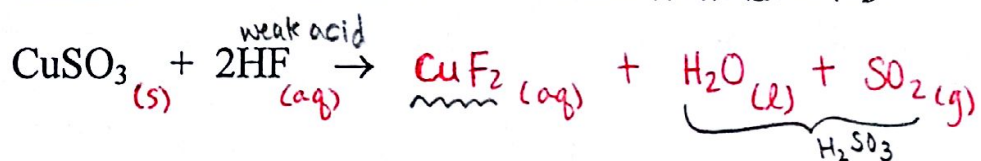
For the following molecular equations, write the ionic equation and underline the spectators:



4 • Reactions & Solution Stoichiometry

Station 4 – PREDICT THE PRODUCTS

Predict the products in these molecular equations. Indicate (s), (l), (g), or (aq):



F.Y.I.: Substances with underlines would be written as separate ions in the complete ionic equation.

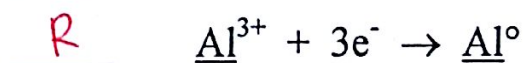
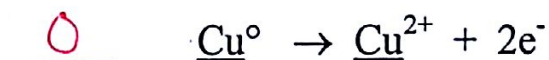
4 • Reactions & Solution Stoichiometry**Station 5 – NAMING ACIDS**

Fill in this chart:

Anion name	Anion formula	Acid formula	Acid name
cyanide	CN ⁻	HCN	hydrocyanic acid
chlorate	ClO ₃ ⁻	HClO ₃	chloric acid
hypochlorite	ClO ⁻	HClO	hypochlorous acid
sulfide	S ²⁻	H ₂ S	hydrosulfuric acid
sulfate	SO ₄ ²⁻	H ₂ SO ₄	sulfuric acid
sulfite	SO ₃ ²⁻	H ₂ SO ₃	sulfurous acid
nitrate	NO ₃ ⁻	HNO ₃	nitric acid
acetate	C ₂ H ₃ O ₂ ⁻	HC ₂ H ₃ O ₂	acetic acid

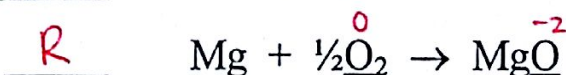
4 • Reactions & Solution Stoichiometry**Station 6 – RECOGNIZING OXIDATION-REDUCTION**

For each statement, classify the change of the underlined element as [O]xidation, [R]eduction, or [N]either:



R gaining electrons

O oxidation number increases



4 • Reactions & Solution Stoichiometry

Station 7 – OXIDATION NUMBERS

Determine the oxidation number of the underlined element:

$+2$ <u>Mg</u> F ₂	$+6$ Cu <u>S</u> O ₄	-3 N <u>H</u> ₄ ⁺	$+4$ <u>C</u> O ₂
$+1$ <u>Ag</u> Cl	$+6$ <u>Cr</u> ₂ O ₇ ²⁻	$+5$ <u>Cl</u> O ₃ ⁻	-4 <u>Si</u> H ₄

4 • Reactions & Solution Stoichiometry

Station 8 – MOLARITY PROBLEMS

Solve the following problems:

A 2.00 mole sample of NaOH is dissolved in enough water to make 500. mL of solution. What is the concentration of the solution? = .500L

$$M = \frac{2.00 \text{ mol}}{.500 \text{ L}} = \boxed{4.00 \text{ M NaOH}}$$

60.0 grams of NaOH (MM = 40.00 g·mol⁻¹) is dissolved in enough water to make 0.750 L of solution. What is the concentration of the solution?

$$M = \frac{(60.0 \text{ g NaOH} \times \frac{1 \text{ mol NaOH}}{40.00 \text{ g}})}{.750 \text{ L}} = \boxed{2.00 \text{ M NaOH}}$$

A 250. mL sample of a 0.125 M solution of NaOH contains _____ grams of NaOH.

$$250. \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{.125 \text{ mol}}{1 \text{ L}} \times \frac{40.00 \text{ g NaOH}}{1 \text{ mol NaOH}} = \boxed{1.25 \text{ g NaOH}}$$

4 • Reactions & Solution Stoichiometry**Station 9 – DILUTIONS AND STOICHIOMETRY***Show your work for these problems:*You need to make 2.00 L of 0.200 M HCl.What volume of concentrated HCl (11.65 M) should you dilute? ____

$$M_1 V_1 = M_2 V_2$$

$$(11.65 \text{ M}) V_1 = (0.200 \text{ M}) (2.00 \text{ L})$$

$$V_1 = \boxed{0.0343 \text{ L}} \text{ or } \boxed{34.3 \text{ mL}}$$

Given the equation: $\text{Al}_2\text{O}_3(\text{s}) + 6 \text{HCl}(\text{aq}) \rightarrow 3 \text{H}_2\text{O}(\text{l}) + 2 \text{AlCl}_3(\text{aq})$ What volume of 0.250 M HCl is needed to completely react with 25.0 grams Al_2O_3 (MM = 101.96 $\text{g} \cdot \text{mol}^{-1}$).

$$25.0 \text{ g } \cancel{\text{Al}_2\text{O}_3} \times \frac{1 \text{ mol } \cancel{\text{Al}_2\text{O}_3}}{101.96 \text{ g } \cancel{\text{Al}_2\text{O}_3}} \times \overset{\text{stoch.}}{\frac{6 \text{ mol } \cancel{\text{HCl}}}{1 \text{ mol } \cancel{\text{Al}_2\text{O}_3}}} \times \frac{1 \text{ L } \cancel{\text{HCl}}}{0.250 \text{ mol } \cancel{\text{HCl}}} = \boxed{5.88 \text{ L HCl}}$$

4 • Reactions & Solution Stoichiometry**Station 9 – DILUTIONS AND STOICHIOMETRY***Show your work for these problems:*You need to make 2.00 L of 0.200 M HCl.What volume of concentrated HCl (11.65 M) should you dilute? ____Given the equation: $\text{Al}_2\text{O}_3(\text{s}) + 6 \text{HCl}(\text{aq}) \rightarrow 3 \text{H}_2\text{O}(\text{l}) + 2 \text{AlCl}_3(\text{aq})$ What volume of 0.250 M HCl is needed to completely react with 25.0 grams Al_2O_3 (MM = 101.96 $\text{g} \cdot \text{mol}^{-1}$).