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Station 1 – ELECTROLYTES

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

W H_2O

S NaCl

S KOH strong base

N AgCl insoluble salt

S HNO_3 strong acid

S NaOH strong base

N Table sugar covalent molecule

N CH_3OH covalent molecule

W $HC_2H_3O_2$ acetic acid (vinegar) is weak

W NH_3 ammonia is a weak base

N $C_6H_{12}O_6$ covalent molecule

N $SrSO_4$ insoluble salt

S $NaHCO_3$

N Ethyl alcohol covalent molecule

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Station 2 – SOLUBILITY RULES

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

MgF_2	$CuSO_4$	NH_4Cl	$Fe(OH)_3$	CsF
AgCl	CdS	CuF_2	$PbSO_4$	$Ba(OH)_2$
Na_2SO_4	NH_4OH	$Sr(NO_3)_2$	Hg_2I_2	Na_2CrO_4
$BaCO_3$	$PbBr_2$	CaC_2O_4	$HC_2H_3O_2$	MgO

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Station 3 – WRITE THE IONIC EQUATION

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

weak acid

$$HF + NaOH \rightarrow NaF + H_2O$$

$$HF + Na^+ + OH^- \rightarrow Na^+ + F^- + H_2O$$

$$CuSO_4 + Sr(NO_3)_2 \rightarrow Cu(NO_3)_2 + SrSO_4$$

$$Cu^{2+} + SO_4^{2-} + Sr^{2+} + 2NO_3^- \rightarrow Cu^{2+} + 2NO_3^- + SrSO_{4(s)}$$

$$2HCl + BaSO_3 \rightarrow BaCl_2 + H_2O + SO_2$$

$$2H^+ + 2Cl^- + BaSO_{3(s)} \rightarrow Ba^{2+} + 2Cl^- + H_2O_{(l)} + SO_{2(g)}$$

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Station 4 – PREDICT THE PRODUCTS

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

weak acid

$$CuSO_{3(s)} + 2HF_{(aq)} \rightarrow CuF_{2(aq)} + \underbrace{H_2O_{(l)} + SO_{2(g)}}_{H_2SO_3}$$

$$Ca(NO_3)_{2(aq)} + (NH_4)_2SO_{4(aq)} \rightarrow CaSO_{4(s)} + 2NH_4NO_{3(aq)}$$

Strong acid

$$2HCl_{(aq)} + Zn(C_2H_3O_2)_{2(aq)} \rightarrow 2HC_2H_3O_{2(aq)} + ZnCl_{2(aq)}$$

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

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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_2S	hydrosulfuric acid
sulfate	SO_4^{2-}	H_2SO_4	sulfuric acid
sulfite	SO_3^{2-}	H_2SO_3	sulfurous acid
nitrate	NO_3^-	HNO_3	nitric acid
acetate	$C_2H_3O_2^-$	$HC_2H_3O_2$	acetic acid

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Station 6 – RECOGNIZING OXIDATION-REDUCTION

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

O $\quad \underline{Cu}^{\circ} \rightarrow \underline{Cu}^{2+} + 2e^-$

R $\quad \underline{Al}^{3+} + 3e^- \rightarrow \underline{Al}^{\circ}$

O $\quad \overset{-4}{\underline{C}}H_4 \rightarrow \overset{+4}{\underline{C}}O_2$

N $\quad Na\overset{-2}{\underline{O}}H + HCl \rightarrow NaCl + H_2\overset{-2}{\underline{O}}$

R $\quad$ gaining electrons

O $\quad$ oxidation number increases

R $\quad Zn^{\circ} + 2\overset{+1}{\underline{H}}Cl \rightarrow ZnCl_2 + \overset{0}{\underline{H_2}}$

R $\quad Mg + \tfrac{1}{2}\overset{0}{\underline{O_2}} \rightarrow Mg\overset{-2}{\underline{O}}$

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Station 7 – OXIDATION NUMBERS

Determine the oxidation number of the underlined element:

+2 $\underline{Mg}F_2$	+6 $Cu\underline{S}O_4$	-3 $\underline{N}H_4^+$	+4 $\underline{C}O_2$
+1 $\underline{Ag}Cl$	+6 $\underline{Cr}_2O_7^{2-}$	+5 $\underline{Cl}O_3^-$	-4 $\underline{Si}H_4$

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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

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

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?

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

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

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

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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? ___

$M_1V_1 = M_2V_2$

$(11.65\ M)\ V_1 = (.200 M)\ (2.00\ L)$

$V_1 =$ 0.0343 L or 34.3 mL

Given the equation: $Al_2O_3(s) + 6\ HCl(aq) \rightarrow 3\ H_2O(l) + 2\ AlCl_3(aq)$
What volume of 0.250 M HCl is needed to completely react with 25.0 grams Al_2O_3 (MM =101.96 g·mol^{-1}).

♡ stoich. M^{-1}

$$25.0\ g\ Al_2O_3 \times \frac{1\ mol\ Al_2O_3}{101.96\ g\ Al_2O_3} \times \frac{6\ mol\ HCl}{1\ mol\ Al_2O_3} \times \frac{1\ L\ HCl}{0.250\ mol\ HCl} = 5.88\ L\ HCl$$

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What volume of 0.250 M HCl is needed to completely react with 25.0 grams Al_2O_3 (MM =101.96 g·mol^{-1}).