FLINN SCIENTIFIC

Possible Pairs of Reactants

Directions: Use a scissors to cut apart the possible pairs of assigned reactants. Have each lab group draw a card to determine which pair they will use for their experiment.

#1 **A. zinc sulfate heptahydrate** **+** **B. calcium acetate monohydrate**	**#2** **A. zinc sulfate heptahydrate** **+** **B. sodium carbonate**
#3 **A. zinc sulfate heptahydrate** **+** **B. calcium chloride dihydrate**	**#4** **A. zinc sulfate heptahydrate** **+** **B. potassium carbonate**
#5 **A. magnesium sulfate heptahydrate** **+** **B. calcium acetate monohydrate**	**#6** **A. magnesium sulfate heptahydrate** **+** **B. sodium carbonate**
#7 **A. magnesium sulfate heptahydrate** **+** **B. calcium chloride dihydrate**	**#8** **A. magnesium sulfate heptahydrate** **+** **B. potassium carbonate**
#9 **A. calcium acetate monohydrate** **+** **B. sodium carbonate**	**#10** **A. calcium acetate monohydrate** **+** **B. potassium carbonate**
#11 **A. sodium carbonate** **+** **B. calcium chloride dihydrate**	**#12** **A. calcium chloride dihydrate** **+** **B. potassium carbonate**

Theoretical Results

For each pair of reactants below there is a complete word equation, balanced formula equation, molar mass values and grams of reactants needed and products formed.

Reactant Pair #1

zinc sulfate heptahydrate + calcium acetate monohydrate ⟶ calcium sulfate + zinc acetate + water

$ZnSO_4 \cdot 7H_2O + Ca(C_2H_3O_2)_2 \cdot H_2O \longrightarrow CaSO_4(s) + Zn(C_2H_3O_2)_2 + 8H_2O$

287.56 g/mole	176.19 g/mole	136.15 g/mole	183.48 g/mole	18.02 g/mole
4.22 g	2.59 g	2.00 g	2.70 g	2.12 g

Reactant Pair #2

zinc sulfate heptahydrate + sodium carbonate ⟶ zinc carbonate + sodium sulfate + water

$ZnSO_4 \cdot 7H_2O + Na_2CO_3 \longrightarrow ZnCO_3(s) + Na_2SO_4 + 7H_2O$

287.56 g/mole	105.99 g/mole	125.38 g/mole	142.02 g/mole	18.02 g/mole
4.59 g	1.69 g	2.00 g	2.27 g	2.01 g

Reactant Pair #3

zinc sulfate heptahydrate + calcium chloride dihydrate ⟶ calcium sulfate + zinc chloride + water

$ZnSO_4 \cdot 7H_2O + CaCl_2 \cdot 2H_2O \longrightarrow CaSO_4(s) + ZnCl_2 + 9H_2O$

287.56 g/mole	147.02 g/mole	136.15 g/mole	136.29 g/mole	18.02 g/mole
4.22 g	2.16 g	2.00 g	2.00 g	2.38 g

Reactant Pair #4

zinc sulfate heptahydrate + potassium carbonate ⟶ zinc carbonate + potassium sulfate + water

$ZnSO_4 \cdot 7H_2O + K_2CO_3 \longrightarrow ZnCO_3(s) + K_2SO_4 + 7H_2O$

287.56 g/mole	138.21 g/mole	125.38 g/mole	174.27 g/mole	18.02 g/mole
4.59 g	2.20 g	2.00 g	2.78 g	2.01 g

Reactant Pair #5

magnesium sulfate heptahydrate + calcium acetate monohydrate ⟶ calcium sulfate + magnesium acetate + water

$MgSO_4 \cdot 7H_2O + Ca(C_2H_3O_2)_2 \cdot H_2O \longrightarrow CaSO_4(s) + Mg(C_2H_3O_2)_2 + 8H_2O$

246.50 g/mole	176.19 g/mole	136.15 g/mole	142.38 g/mole	18.02 g/mole
3.62 g	2.59 g	2.00 g	2.09 g	2.12 g

Reactant Pair #6

magnesium sulfate heptahydrate + sodium carbonate ⟶ magnesium carbonate + sodium sulfate + water

$MgSO_4 \cdot 7H_2O + Na_2CO_3 \longrightarrow MgCO_3(s) + Na_2SO_4 + 7H_2O$

246.50 g/mole	105.99 g/mole	84.31 g/mole	142.02 g/mole	18.02 g/mole
5.85 g	2.51 g	2.00 g	3.37 g	2.99 g

Reactant Pair #7

magnesium sulfate heptahydrate	+	calcium chloride dihydrate	⟶	calcium sulfate	+	magnesium chloride	+	water
$MgSO_4 \cdot 7H_2O$	+	$CaCl_2 \cdot 2H_2O$	⟶	$CaSO_4(s)$	+	$MgCl_2$	+	$9H_2O$
246.50 g/mole		147.02 g/mole		136.15 g/mole		95.76 g/mole		18.02 g/mole
3.62 g		2.16 g		2.00 g		1.41 g		2.38 g

Reactant Pair #8

magnesium sulfate heptahydrate + water		potassium carbonate	⟶	magnesium carbonate		+ potassium sulfate	+
$MgSO_4 \cdot 7H_2O$	+	K_2CO_3	⟶	$MgCO_3(s)$	+	K_2SO_4	+ $7H_2O$
246.50 g/mole		138.21 g/mole		84.31g/mole		174.27 g/mole	18.02 g/mole
5.85 g		3.28 g		2.00 g		4.13 g	2.99 g

Reactant Pair #9

calcium acetate monohydrate	+	sodium carbonate	⟶	calcium carbonate	+	sodium acetate	+	water
$Ca(C_2H_3O_2)_2 \cdot H_2O$	+	Na_2CO_3	⟶	$CaCO_3(s)$	+	$2NaC_2H_3O_2$	+	H_2O
176.19 g/mole		105.99 g/mole		100.09 g/mole		82.03 g/mole		18.02 g/mole
3.52 g		2.12 g		2.00 g		3.28 g		0.36 g

Reactant Pair #10

calcium acetate monohydrate	+	potassium carbonate	⟶	calcium carbonate	+	potassium acetate	+	water
$Ca(C_2H_3O_2)_2 \cdot H_2O$	+	K_2CO_3	⟶	$CaCO_3(s)$	+	$2KC_2H_3O_2$	+	H_2O
176.19 g/mole		138.21 g/mole		100.09 g/mole		98.15 g/mole		18.02 g/mole
3.52 g		2.76 g		2.00 g		3.92 g		0.36 g

Reactant Pair #11

sodium carbonate	+	calcium chloride dihydrate	⟶	calcium carbonate	+	sodium chloride	+	
Na_2CO_3	+	$CaCl_2 \cdot 2H_2O$	⟶	$CaCO_3(s)$	+	2NaCl	+	$2H_2O$
105.99 g/mole		147.02 g/mole		100.09 g/mole		58.45 g/mole		18.02 g/mole
2.12 g		2.94 g		2.00 g		2.34 g		0.72

Reactant Pair #12

calcium chloride	+	potassium carbonate	⟶	calcium carbonate	+ potassium chloride		
$CaCl_2 \cdot 2H_2O$	+	K_2CO_3	⟶	$CaCO_3(s)$	+	2KCl	+ $2H_2O$
147.02 g/mole		138.21 g/mole		100.09 g/mole		74.56 g/mole	18.02 g/mole
2.94 g		2.76 g		2.00 g		2.98 g	0.72

The steps used to determine the above values are the same as those described in the background section of the experiment. The total masses of reactants needed for a class with 12 lab groups to complete the experiment are 17.62 g $ZnSO_4 \cdot 7H_2O$; 18.94 g $MgSO_4 \cdot 7H_2O$; 12.22 g $Ca(C_2H_3O_2)_2 \cdot H_2O$; 8.44 g Na_2CO_3; 10.2; and 11.00 g K_2CO_3. There are enough chemicals included in this kit for five sets of experiments. They are also common laboratory chemicals that have applications in many other experiments.