

Lab Activity: Double Replacement Forensics



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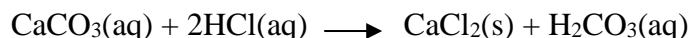
replacement



orensics

Background:

Antacid tablets contain the compound calcium carbonate, CaCO_3 . This compound reacts with the hydrochloric acid, HCl , in your stomach in the following way:



This reaction is an everyday example of a double replacement reaction. A double replacement reaction usually takes place between two ionic compounds in solution (aqueous). The cation of one compound replaces the cation in the other compound to produce two new ionic compounds. The new combination of cations and anions yields products that may form a precipitate, a gas, or water. Precipitates are insoluble solids that form as a reaction product.

Scenario:

Walter White a chemistry teacher in New Mexico, was arrested for suspicion of making narcotics. In his possession at the time of arrest was a vial filled with a clear liquid. One of the compounds used in making the narcotic is *potassium iodide*. Mr. White is claiming that the vial in his possession actually contains *potassium nitrate*. It is your job as the forensic scientist to analyze the evidence and using your knowledge of double replacement reactions, determine if the vial contains *potassium iodide* or *potassium nitrate* by mixing it with one of the aqueous solutions listed in the materials list.

Pre-Lab:

What is the formula for potassium iodide _____

What is the formula for potassium nitrate _____

Materials:

LiNO_3 (aq)

NaOH (aq)

$\text{Pb}(\text{NO}_3)_2$ (aq)

Research Question: How will you use the materials to determine if Walter White is guilty?

Procedure: Write a procedure to solve the problem using the materials provided

Data: Record all data as evidence in your lab notebook

Model: Create a model of each reaction that you performed. In the model include the reactants, resulting products and states of matter.



Analysis/Interpretation:

- Conduct your experiment and collect data (evidence) that you will use to support your claim.
- Using your evidence, make a claim and justify it with scientific reasoning.

Ms. Randall

Regents Chemistry

Lab Conclusion: Double Replacement Forensics

1. Summary of your experimental claim, evidence and reasoning (6)

Lab Grading Rubric

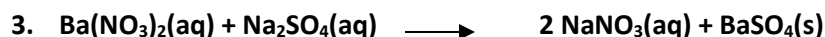
Component	Level		
	0	1	2
Claim - A conclusion that answers the original question.	Does not make a claim, or makes an inaccurate claim.	Makes an accurate but incomplete claim.	Makes an accurate and complete claim.
Evidence – Scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.	Does not provide evidence, or only provides inappropriate evidence (evidence that does not support the claim).	Provides appropriate but insufficient evidence to support claim. May include some inappropriate evidence.	Provides appropriate and sufficient evidence to support claim.
Reasoning – A justification that links the claim and evidence. It shows why the data count as evidence by using appropriate and sufficient scientific principles.	Does not provide reasoning, or only provides reasoning that does not link evidence to claim	Provides reasoning that links the claim and evidence. Repeats the evidence and/or includes some – but not sufficient – scientific principles.	Provides reasoning that links evidence to claim. Includes appropriate and sufficient scientific principles.

2. Given the balanced equation:



This reaction is classified a

- A) synthesis
B) decomposition
C) single replacement
D) double replacement



What type of reaction is shown above?

- A) synthesis
B) decomposition
C) single replacement
D) double replacement

4. Which equation represents a double replacement reaction?

- A) $2 \text{Na} + 2 \text{H}_2\text{O} \longrightarrow 2 \text{NaOH} + \text{H}_2$
B) $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$
C) $\text{LiOH} + \text{HCl} \longrightarrow \text{LiCl} + \text{H}_2\text{O}$
D) $\text{CH}_4 + 2 \text{O}_2 \longrightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$

5. Which two solutions, when mixed together, will undergo a double replacement reaction and form a white, solid substance?

A) NaCl(aq) and $\text{LiNO}_3\text{(aq)}$

B) KCl(aq) and $\text{AgNO}_3\text{(aq)}$

C) KCl(aq) and LiCl(aq)

D) $\text{NaNO}_3\text{(aq)}$ and $\text{AgNO}_3\text{(aq)}$