

CER - WRITE

Chemical Reactions - The Diamond Robbery - CER

Learning Targets:

- 1) I can use **evidence** to explain what the unknown substance was that was used to steal the diamond.
 - 2) I can explain how the primary suspect is guilty based on the chemicals they purchased and the chemicals that were or were not found at their homes.
 - 3) I can incorporate key concepts from the Chemical Reactions unit into my **reasoning** to explain how the evidence supports the claim that a chemical reaction occurred and acid was made and used to steal a diamond.
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Directions: Make sure you have all of your evidence and work from the past couple of days.

- ☐ First, finish the **claim** to address the investigation question: “Which suspect used hydrofluoric acid to steal the diamond?”
- ☐ Next, identify evidence that explains how you know it is hydrofluoric acid at the crime scene.
- ☐ Then, **identify** at least 2 pieces of **evidence** that support your claim and 1 piece of evidence that refutes the alternative claim/different suspect.
- ☐ Finally, **explain** how each piece of evidence supports your answer with **reasoning**. You may use your modeling tool, slides in Google Classroom, and evidence cards.

Vocabulary you should use: reactants, products, atoms, rearrange, conservation of mass, chemical properties, physical properties, chemical formula, molecules, chemical reaction, corrosive

Question: “Which suspect used hydrofluoric acid to steal the diamond?”

What are the 2 strongest pieces of **evidence** that support your claim and what is 1 piece of **evidence that refutes** an alternative claim/different suspect?

The point of view to write this is as an expert chemist providing your insight to the police investigation.

The graphic organizer is to list out your thoughts and evidence, NOT to write your final CER.

Links to write:

Draft on [PAGE 2](#)

Final CER on [PAGE 3](#)

HELPFUL REMINDERS [HERE!](#)

STEP 1: Gather your evidence and plan out your reasoning in the graphic organizer.

Claim	
→The suspect who stole the diamond is Tracy.	
Evidence from research (minimum of 3 pieces)	Reasoning - Support your evidence and connect back to the claim
1) (how we know it's HF acid)	1) We know it is hydrofluoric acid because we observed its physical properties that helped us narrow it down to hydrofluoric acid. For example, the substance was said to be clear with an irritating odor. The other substances did not have those exact same properties like hydrofluoric acid did.
2) (refutes alternative claim)	2) Some people may think that it was a different substance because other substances may have the same physical properties like being clear or have an irritating odor like what was noticed.
3) (supports your claim)	3) But, the only substance that matches the description perfectly is hydrofluoric acid. When I was doing the Amplify assignment there were four substances, hydrobromic acid, hydrofluoric acid, iodine monochloride, and perchloric acid. All of them had color but hydrofluoric acid and perchloric acid. I finally narrowed it down to hydrofluoric acid when I saw that perchloric acid had no odor.
4) (supports your claim)	4) Finally, I know that the substance was hydrofluoric acid because it is a corrosive substance, meaning that it can cause damage when in contact with glass. This means that the hole in the glass was from the hydrofluoric acid.

Question: “Which suspect used hydrofluoric acid to steal the diamond?”

Helpful Reminders:

Sentence Starters to help you write your CER

Describing Evidence	Explaining how the Evidence Supports the Claim (Reasoning)
The evidence that supports my claim is...	If... then...
My first piece of evidence is...	This is important because...
My second piece of evidence is...	Since...
Scientists found ...	Based on the evidence, I conclude that...

Vocabulary you should use: reactants, products, atoms, rearrange, conservation of mass, chemical properties, physical properties, chemical formula, molecules, chemical reaction, corrosive. **Highlight them in your writing.**

STEP 2: Write your letter to the police department about who stole the diamond.

Claim: The suspect who stole the diamond with hydrofluoric acid is Tracy.

1. **Evidence 1:** My first piece of evidence is that Tracy was able to make 4 hydrofluoric acid compounds while Pat was able to make 2 and Alex was unable to make any with the chemicals that they purchased.

Reasoning 1: This piece of evidence proves that Tracy stole the diamond because there was a half full glass of hydrofluoric acid, and they had the most to use. If they used some of it to steal the diamond, yet still had a half full glass, they would have to have a good amount of hydrofluoric acid.

2. **Evidence 2:** My second piece of evidence is that the chemical supply company confirmed the delivery of purified water and fluorine to Tracy’s house. Pat had ordered sulfuric acid and calcium fluoride and Alex ordered sulfuric acid and magnesium chloride.

Reasoning 2: The piece of evidence stated above supports that Tracy stole the diamond because purified water and fluorine is able to make 4 hydrofluoric acid compounds while Alex would be unable to make any. This means that Tracy was able to make the most amount of hydrofluoric acid with the chemicals that she purchased.

3. **Evidence 3:** To add on, Dr. Yung confirmed that calcium sulfate is commonly used in sculpting. Pat is a sculptor and the chemicals that he bought could also make calcium sulfate.

Reasoning 3: This evidence is relevant to Tracy stealing the diamond because Pat is the only other person who could've created hydrofluoric acid and he may have just been making sulfuric acid for sculpting.

4. **Evidence 4:** Finally, a key concept states the atoms rearrange to form different groups of atoms are new substances.

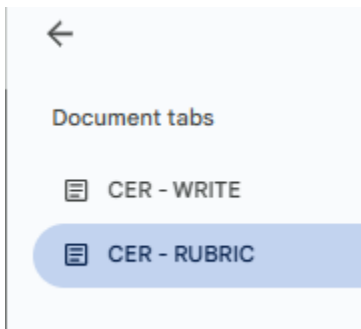
Reasoning 4: This supports my claim by informing that the different suspects may not have been working to create hydrofluoric acid even though they could with those specific chemicals. Even though that still stands with Tracy, she had the least amount of elements left over. Pat had one calcium, 4 oxygen, and 1 sulfur which could be used for many other compounds to be made. Tracy only had 2 oxygen left and Dr. Yung said that oxygen is a clear substance in the air that is not noticeable.

CER put together

The suspect who stole the diamond using hydrofluoric acid is Tracy. My first piece of evidence is that Tracy was able to make 4 hydrofluoric acid compounds while Pat was able to make 2 and Alex was unable to make any with the chemicals that they purchased. This piece of evidence proves that Tracy stole the diamond because there was a half full glass of hydrofluoric acid, and they had the most to use. If they used some of it to steal the diamond, yet still had a half full glass, they would have to have a good amount of hydrofluoric acid. My second piece of evidence is that the chemical supply company confirmed the delivery of purified water and fluorine to Tracy's house. Pat had ordered sulfuric acid and calcium fluoride and Alex ordered sulfuric acid and magnesium chloride. The piece of evidence stated above supports that Tracy stole the diamond because purified water and fluorine is able to make 4 hydrofluoric acid compounds while Alex would be unable to make any. This means that Tracy was able to make the most amount of hydrofluoric acid with the chemicals that she purchased. To add on, Dr. Yung confirmed that calcium sulfate is commonly used in sculpting. Pat is a sculptor and the chemicals that he bought could also make calcium sulfate. This evidence is relevant to Tracy stealing the diamond because Pat is the only other person who could've created hydrofluoric

acid and he may have just been making sulfuric acid for sculpting. Finally, a key concept states the atoms rearrange to form different groups of atoms are new substances. This supports my claim by informing that the different suspects may not have been working to create hydrofluoric acid even though they could with those specific chemicals. Even though that still stands with Tracy, she had the least amount of elements left over. Pat had one calcium, 4 oxygen, and 1 sulfur which could be used for many other compounds to be made. Tracy only had 2 oxygen left and Dr. Yung said that oxygen is a clear substance in the air that is not noticeable.

Final Step - Check the rubric to self-assess your CER (see the tab to the left to review)



Tab 2

Investigation Question: "Which suspect used the hydrofluoric acid to steal the Diamond?"

Success Criteria	4	3	2	1
Claim (C)		Makes an accurate and complete claim that answers the investigation question. Written in a single sentence. Includes scientific vocabulary, used accurately.	Makes an accurate but incomplete claim. The claim is written in multiple sentences. The claim includes any type of reasoning	Makes an inaccurate claim. Not in the right format. Limited or no scientific vocabulary used.
Evidence (E)	Meets all requirements of the 3 and: Includes at least 4 specific pieces of relevant data/evidence that support the claim. 1 piece of evidence is used to refute a different claim/suspect.	Includes 3 specific pieces of relevant data/evidence that support the claim. 1 piece of evidence is used to identify the unknown substance. Use specific details and vocabulary within the evidence.	Includes only 2 pieces of data to support the claim. May include irrelevant data as evidence.	Highlights 1 piece of data in the lab to support the claim written. May include irrelevant data as evidence.
Reasoning (R)	Meets all requirements of the 3 and: Provides accurate, DETAILED, and complete reasoning for each of the 4 pieces of relevant evidence selected. - Applies background knowledge of science concepts to support the claim. - Accurately integrates key concepts from the chemical reactions unit into reasoning.	Provides accurate, DETAILED, and complete reasoning for each of the 3 pieces of relevant evidence selected. Written with proper grammar, sentence structuring, and punctuation. Includes accurate and relevant scientific vocabulary and application.	Provides accurate, DETAILED, and complete reasoning for the 1 or 2 pieces of data selected. Can explain WHY the unknown substance was hydrofluoric acid. It may include some scientific terminology and application, but not sufficiently and/or accurately.	Provides an inaccurate explanation, or only provides a partial explanation to explain the evidence. OR Simply restates the claim and data with no explanation. Scientific terminology and application are used inaccurately.

