

THE HOUSEHOLD CLEANING PRODUCTS REACTION MYSTERY

Gamify your students' learning with this interactive and engaging Mystery Activity.

NO PREP

The Cleaning Products Reaction Mystery

Part 1 – Mission Briefing & Case Overview
Name: _____ Date: _____

Case File #517 – The Cleaning Products Reaction Mystery
Science students across several classrooms are reporting a strange observation during a cleaning investigation. When different cleaning products were used on the same types of messes, some worked quickly while others had little effect.

In some tests, a greasy stain lifted off a surface after dish soap was added. In others, vinegar helped remove a chalky buildup, and a disinfectant reduced odor and "germ" signs on shared classroom materials.

Students observed the surfaces before and after cleaning and noticed that results depended on the type of mess, the type of cleaner, and the conditions used during cleaning. Scientists suspect that this may be related to how cleaning products work through particle interactions, chemical reactions, and the removal or killing of microorganisms.

Cleaning investigations include:

- Removing grease and oily stains
- Dissolving mineral buildup
- Bubbling reactions that loosen dirt
- Disinfecting surfaces to reduce microorganisms
- Comparing warm water vs cold water cleaning

No single observation fully explains how cleaning products work.

You are a science detective assigned to investigate this cleaning mystery.

Your Mission

- Explain how cleaning products remove different kinds of messes
- Identify why one cleaner works better for one job than another
- Describe what happens to particles during cleaning
- Propose an explanation for how cleaning products work

The unknowns of the products depends on what you discover.

Questions During Cleaning?
Provided, then answer the following:
Designed to do?

Removing dirt and disinfecting germs?

Which products work better on certain messes than others?

Teach With Fergy



SCROLL
to take a look inside!

DETECTIVE FILE ON CHEMICAL REACTIONS IN OUR LIVES

★ A complete student case file with guided worksheets for every step of the investigation.

★ 10 detailed evidence cards based on real *household cleaning product* research and real-world examples that include images, graphs, and text.

★ A full teacher answer key AND marking rubric with sample responses.

What You Get

NO-PREP. JUST PRINT TO GO!

Full investigation breakdown

Evidence Cards

Evidence Card 1 – Grease Breaks Up with Soap
A greasy stain lifted and rinsed away more easily after dish soap was added and the surface was rubbed with water.

Evidence Card 2 – Water Alone Struggles with Oil
When only water was used, the greasy stain spread around but did not fully wash away.

Interpretation & Recording Data

10 Evidence Cards to Determine Culprit

HOW THIS ACTIVITY HELPS YOU

- Saves prep time with a fully structured, print-and-go investigations.
- Drives high engagement while still meeting academic goals as students are interested in what they're doing.
- Builds deep understanding with **real-world relevance** as the students analyze real evidence, make connections, and using CER to explain everyday chemistry.

10-PART INVESTIGATION

Students:

1. Step into the role of a Science Detective.
2. Examine real scientific evidence from around the world.
3. Track the hidden pathways of **household cleaning products** and how it's an example of everyday chemistry.
4. Interrogate suspects (disinfectants, acids, scrubbing, etc.) and identify the main culprits.
5. Build a scientific case using Claim-Evidence-Reasoning.
6. Propose real solutions that matter.

★★★★★ The added images and graphs enhanced the activity. My students were engaged and motivated during the case study, and it was an effective introduction to the topics. - Mystery Resource Buyer

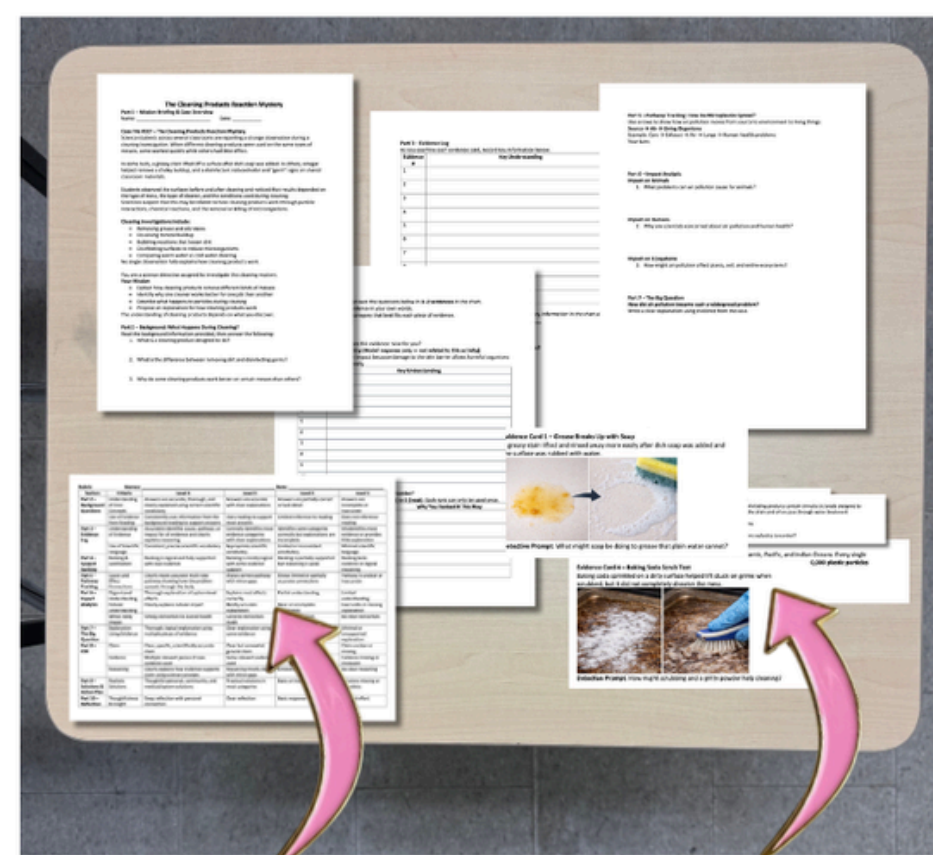
HOW THIS MYSTERY WILL HELP YOU



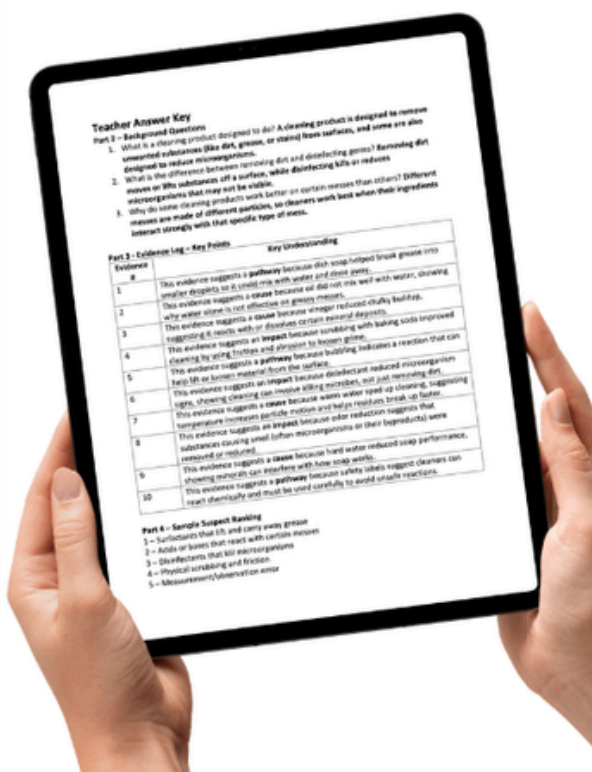
- Prep-FREE and fully editable Mystery Investigation - just print/upload and assign with no materials.
- **Evidence Cards** can be printed with and without images or projected on board.
- Engages every learner through hands-on, high-interest mystery investigations that boost motivation and participation.
- **Builds essential skills** such as graph interpretation, problem-solving, teamwork, creativity, and communication.

What Will Your Students Learn?

FULLY EDITABLE AND READY-TO-GO INVESTIGATION



**FULL
ANSWER KEY**



**RUBRIC EVIDENCE
CARDS**

★★★★★ This is very well crafted and it great to use for a subplan but also when I am in-class with students. They enjoy the detective layer of the work and it kept the students engaged. - Mystery Resource Buyer

- ✓ What cleaning products are designed to do
- ✓ The difference between removing dirt and disinfecting germs
- ✓ How surfactants break up grease
- ✓ How acids and bases react with certain stains
- ✓ Why pH matters in cleaning
- ✓ How disinfectants reduce microorganisms
- ✓ Why different messes require different chemical solutions
- ✓ How to use Claim–Evidence–Reasoning (CER) to support scientific explanations
- ✓ How chemistry connects to everyday life

Part 1 & 2

The Cleaning Products Reaction Mystery

Part 1 – Mission Briefing & Case Overview

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Students observed the surfaces before and after cleaning and noticed that results depended on the type of mess, the type of cleaner, and the conditions used during cleaning. Scientists suspect that this may be related to how cleaning products work through particle interactions, chemical reactions, and the removal or killing of microorganisms.

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- Identify why one cleaner works better for one job than another
- Describe what happens to particles during cleaning
- Propose an explanation for how cleaning products work

The understanding of cleaning products depends on what you discover.

Part 2 – Background: What Happens During Cleaning?

Read the background information provided, then answer the following:

1. What is a cleaning product designed to do?
2. What is the difference between removing dirt and disinfecting germs?
3. Why do some cleaning products work better on certain messes than others?

Part 1 – Mission Briefing & Case Overview

Students take on the role of science detectives and are introduced to *household cleaning products* and examine how they work and what makes certain ones more effective.

Part 2 – Background: Understanding How Cleaning Products Work

Students read a short background passage and answer guiding questions to build foundational understanding before analyzing evidence.

Part 3 & 4

Part 3 – Evidence Log

For each Evidence Card, answer the questions below in 1–2 sentences in the chart.

1. Summarize the evidence in your own words.
2. Choose the one category that best fits each piece of evidence.
☐ Cause
☐ Pathway
☐ Impact
3. What question does this evidence raise for you?

Example Evidence Log Entry (Model response only)

This evidence suggests a **pathway** because soap helped break apart grease so it could mix with water and be rinsed away.

Evidence #	Key Understanding
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Part 4 – Suspect List: What Is Making the Cleaning Work?

Rank the suspects from 1 (most responsible) to 5 (least responsible). Each rank can only be used once.

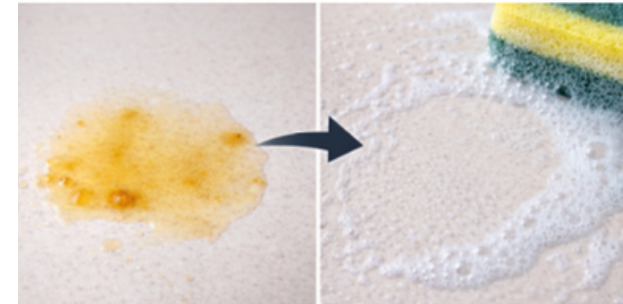
Suspect	Rank	Why You Ranked It This Way
Measurement/observation error		
Disinfectants that kill microorganisms		
Surfactants that lift and carry away grease		
Acids or bases that react with certain messes		
Physical scrubbing and friction		

Part 3 – Evidence Log

Students begin examining the evidence cards and record key information, observations, and insights in their evidence log.

Evidence Card 1 – Grease Breaks Up with Soap

A greasy stain lifted and rinsed away more easily after dish soap was added. The surface was rubbed with water.



Detective Prompt: What might soap be doing to grease that plain water cannot?

Evidence Card 6 – Disinfectant Effect

After a disinfectant wipe was used on a desk surface, a “germ indicator” test showed fewer signs of microorganisms than before cleaning.

Trial	Condition	Microbial Count (CFU per plate)
1	Before Cleaning	185
1	After Disinfectant	22
2	Before Cleaning	203
2	After Disinfectant	18
3	Before Cleaning	176
3	After Disinfectant	25
4	Before Cleaning	194
4	After Disinfectant	21
5	Before Cleaning	188
5	After Disinfectant	19

CFU stands for Colony-Forming Units and is a measurement of microorganisms in a sample.

Detective Prompt: How is disinfecting different

Evidence Card 3 – Vinegar on Mineral Buildup

A chalky white buildup on a faucet area reduced after vinegar was applied and left for a few minutes.



Detective Prompt: What kind of mess might vinegar work best on?

Part 4 – Evidence Analysis

Students summarize each piece of evidence, identify what it reveals about the chemistry of **household cleaning products**, and generate questions, building critical thinking and reasoning skills.

EVIDENCE CARDS

- All Evidence Cards come in two versions - *With images and graphs and Without* and can be printed or projected as needed. Note: Both contain data tables.
- Students analyze each Evidence Card and record the following in their **Evidence Log**
 1. Summarize the evidence in their own words.
 2. Determine what this evidence suggests
 - ❑ What causes it
 - ❑ Pathway
 - ❑ Its impact on its particles and systems
 3. Explain what question(s) this evidence raises for them?

Images & Graphs

Evidence Card 1 – Grease Breaks Up with Soap
A greasy stain lifted and rinsed away more easily after dish soap was used than when the surface was rubbed with water.

Detective Prompt: What might soap be doing to grease that plain water cannot?

Trial	Condition	Microbial Count (CFU per plate)
1	Before Cleaning	185
1	After Disinfectant	22
2	Before Cleaning	203
2	After Disinfectant	18
3	Before Cleaning	176
3	After Disinfectant	25
4	Before Cleaning	194
4	After Disinfectant	21
5	Before Cleaning	188
5	After Disinfectant	19

Text Only

Evidence Card 2 – Water Alone Struggles with Oil
When only water was used, the greasy stain spread around but did not fully wash away.

Detective Prompt: What might soap be doing to grease that plain water cannot?

Trial	Condition	Microbial Count (CFU per plate)
1	Before Cleaning	185
1	After Disinfectant	22
2	Before Cleaning	203
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3	After Disinfectant	25
4	Before Cleaning	194
4	After Disinfectant	21
5	Before Cleaning	188
5	After Disinfectant	19

Part 5-7

Part 5 – Pathway Tracking: How Does a Cleaner Remove a Mess?

Use arrows to show how matter moves during cleaning.

Mess + Cleaner + Water → Interaction/Reaction → Mess breaks apart or dissolves → Mess is carried away or neutralized

Example:

Grease + Dish soap + Water → Soap surrounds grease → Grease breaks into tiny droplets → Rinses away

Your Turn: Choose one cleaning test from the case and trace what happened to the mess.

Part 6 – Impact Analysis

Impact on Particles

What happens to dirt, grease, or germs at the particle level during cleaning?

Impact on the System

What happens when cleaning is done with warm water or with extra scrubbing?

Impact on Measurements

Why might students observe less odor, fewer stains, or cleaner surfaces after using certain products?

Part 7 – The Big Question

How do cleaning products work? Use evidence from the case to explain.

Part 5 – Suspect List

Students rank possible issues, defend their choices, and determine which suspect is most responsible for the problem.

Part 6 – Pathway Tracking

Students trace how ***household cleaning products*** work and why some work better than others based on chemistry.

Part 7 – Impact Analysis

Students analyze the chemistry and effectiveness of ***household cleaning products*** using evidence from the case to support their answers.

Part 8-10

Part 8 – Claim–Evidence–Reasoning (CER)

Claim

What is the main reason the cleaning products worked differently in this case?

Evidence

List two pieces of evidence from the case.

1.

2.

Reasoning

Explain how your evidence supports your claim.

Part 9 – Solutions & Action Plan

Personal Actions

Classroom Actions

Scientific / Experimental Actions

Part 10 – Reflection

One thing that surprised me in this case was:

One change I would make after learning this information is:

Part 8 – The Big Question

Students synthesize all their learning to explain the main cause of the problem in this case.

Part 9 – Claim-Evidence-Reasoning (CER)

Students write a structured scientific argument, making a claim, supporting it with evidence, and explaining their reasoning.

Part 10 – Reflection and Solutions

Students propose realistic actions at the personal, school/community, and scientific/environmental system levels, moving from awareness to problem-solving.

Full Teacher Answer Key

Teacher Answer Key

Part 2 – Background Questions

1. What is a cleaning product designed to do? **A cleaning product is designed to remove unwanted substances (like dirt, grease, or stains) from surfaces and is designed to reduce microorganisms.**
2. What is the difference between removing dirt and disinfecting? **Removing dirt moves or lifts substances off a surface, while disinfecting kills or reduces microorganisms that may not be visible.**
3. Why do some cleaning products work better on certain messes? **Cleaners are made of different particles, so cleaners will interact strongly with that specific type of mess.**

Part 3 - Evidence Log – Key Points

Evidence #	Key Understanding
1	This evidence suggests a pathway because dish soap breaks grease into smaller droplets so it could mix with water and be rinsed away.
2	This evidence suggests a cause because oil did not mix with water, and why water alone is not effective on greasy messes.
3	This evidence suggests a cause because vinegar reacts with or dissolves certain mineral deposits, suggesting it reacts with or dissolves certain mineral deposits.
4	This evidence suggests an impact because scrubbing cleaning by using friction and abrasion to loosen dirt.
5	This evidence suggests a pathway because bubbles help lift or loosen material from the surface.
6	This evidence suggests an impact because disinfectant kills microorganisms, showing cleaning can involve killing microorganisms.
7	This evidence suggests a cause because warm water temperature increases particle motion and helps loosen dirt.
8	This evidence suggests an impact because odor-reducing substances causing smell (often microorganisms) are removed or reduced.
9	This evidence suggests a cause because hard water showing minerals can interfere with how soap works.
10	This evidence suggests a pathway because safety warnings react chemically and must be used carefully to avoid harm.

Part 4 – Sample Suspect Ranking

- 1 – Surfactants that lift and carry away grease
- 2 – Acids or bases that react with certain messes
- 3 – Disinfectants that kill microorganisms
- 4 – Physical scrubbing and friction
- 5 – Measurement/observation error

Part 5 – Pathway Tracking

Example response:

Grease + Dish soap + Water → Soap surrounds grease → Grease breaks into droplets → Droplets rinse away → Surface looks cleaner

Part 6 – Impact Analysis

Impact on Particles: During cleaning, surfactants can surround grease and help it be rinsed away. Acids or bases can react with certain buildup, and disinfectants kill microorganisms so they cannot survive.

Impact on the System: Warm water can speed up cleaning by loosening sticky residues, and scrubbing adds friction to help loosen dirt from surfaces.

Impact on Measurements: Students may notice that messes are reduced because mess particles are removed or reduced.

Part 7 – The Big Question

Cleaning products work because different ingredients interact with specific types of messes. Soap works well on grease because it breaks it into smaller droplets that can be rinsed away, vinegar can help dissolve or react with mineral buildup, and disinfectants reduce microorganisms that can cause odors or spread illness. Temperature and scrubbing can also speed up cleaning by helping particles move and loosen from surfaces.

Part 8 – Claim–Evidence–Reasoning (CER)

Claim: The cleaning products worked differently because different ingredients interact with different types of messes in different ways.

Evidence:

1. Dish soap
2. Vinegar

Reasoning:

Dish soap helps it rinse away with or without scrubbing, and vinegar reacts with certain messes so the cleaner's ingredients can work.

Understanding How Cleaning Products Work

Cleaning is a part of everyday life. People use cleaning products to wash dishes, wipe down tables, clean bathrooms, and remove stains from clothes. A cleaning product is designed to remove unwanted substances such as dirt, grease, stains, or sticky residue from surfaces. Some cleaning products are also designed to reduce microorganisms, such as bacteria, that may be present even when a surface looks clean.

Not all messes are the same. Grease and oil are particles that do not mix well with water. When water alone is used to clean, the grease may spread around instead of washing away. Dish soap contains ingredients called surfactants. Surfactants help solubilize grease by surrounding the particles and breaking them into tiny droplets that can be rinsed away. If grease is trapped in these droplets, it can be rinsed away.

Hard water can leave behind chalky buildup on sinks and showers from minerals that collect and stick to surfaces over time. Mild acids like vinegar can react with certain mineral deposits and help dissolve them. This is why vinegar may reduce chalky residue better than water alone.

Some cleaners work through chemical reactions. For example, hydrogen peroxide can produce bubbles as it reacts with certain substances. The bubbling action can help loosen stains so they are easier to wipe away. Cleaning can also involve physical processes. Scrubbing adds friction, which helps break dirt loose from a surface. Powders like baking soda can act as a gentle abrasive, helping lift stuck-on grime without fully dissolving it.

Cleaning is different from disinfecting. Removing dirt means lifting or rinsing unwanted particles off a surface. Disinfecting means killing or reducing microorganisms that may not be visible.

Disinfectant is

Cleaning because it is a process that high contains surfactants to lift and remove dirt.

that can react. These warnings

best when their on grease, acids adds friction to work—and why

Background Reading

Optional Marking Rubric

Rubric		Names:		Date:	
Section	Criteria	Level 4	Level 3	Level 2	Level 1
Part 2 – Background Questions	Understanding of Core Concepts	Answers are accurate, thorough, and clearly explained using correct scientific vocabulary	Answers are accurate with clear explanations	Answers are partially correct or lack detail	Answers are incomplete or inaccurate
	Use of Evidence from Reading	Consistently uses information from the background reading to support answers	Uses reading to support most answers	Limited reference to reading	Does not reference reading
Part 3 – Evidence	Understanding of Evidence	Accurately identifies cause, pathway, or impact for all evidence and clearly explains reasoning	Correctly identifies most evidence categories with clear explanations	Identifies some categories correctly but explanations are incomplete	Misidentifies most evidence or provides little explanation
	Use of Scientific Language	Consistent, precise scientific vocabulary	Appropriate scientific vocabulary	Limited or inconsistent vocabulary	Minimal scientific language
	Ranking & Explanation	Ranking is logical and fully supported with case evidence	Ranking is mostly logical with some evidence support	Ranking is partially supported but reasoning is weak	Ranking lacks evidence or logical reasoning
		Clearly traces accurate multi-step pathway showing how the problem leads through the body	Shows correct pathway with minor gaps	Shows limited or partially accurate connections	Pathway is unclear or inaccurate
		Provides a clear explanation of system-level impact	Explains most effects correctly	Partial understanding	Limited understanding
		Explains cellular impact	Mostly accurate explanation	Basic or incomplete explanation	Inaccurate or missing explanation
		Explains overall health impact	General connection made	Limited connection	No clear connection
		Explains reasoning	Clear explanation using some evidence	Basic explanation with limited evidence	Minimal or unsupported explanation
		Provides scientifically accurate evidence	Clear but somewhat general claim	Claim present but vague	Claim unclear or missing
		Uses relevant pieces of case evidence	Some relevant evidence used	Limited or weak evidence	Evidence missing or irrelevant
		Clearly explains how evidence supports claim using science concepts	Reasoning mostly clear with minor gaps	Limited reasoning connection	No clear reasoning
		Thoughtful personal, community, and medical/system solutions	Practical solutions in most categories	Basic or incomplete solutions	Solutions missing or unrealistic
	Thoughtfulness & Insight	Deep reflection with personal connection	Clear reflection	Basic response	Minimal effort

Upgrade to the Chemistry in Everyday Life Detective Mystery Bundle

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THE OZONE LAYER MYSTERY

NO PREP



DETECTIVE FILE ON CHEMICAL REACTIONS IN OUR LIVES

THE PHASE CHANGE PUZZLE MYSTERY

NO PREP



DETECTIVE FILE ON CHEMICAL REACTIONS IN OUR LIVES

THE MISSING MASS MYSTERY

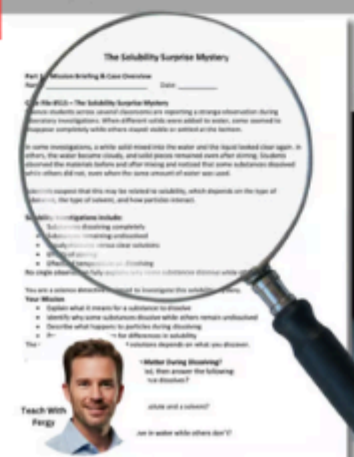
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DETECTIVE FILE ON CHEMICAL REACTIONS IN OUR LIVES

THE SOLUBILITY SURPRISE MYSTERY

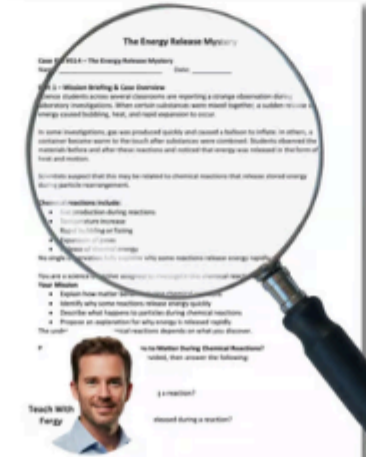
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DETECTIVE FILE ON CHEMICAL REACTIONS IN OUR LIVES

THE ENERGY RELEASE MYSTERY

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DETECTIVE FILE ON CHEMICAL REACTIONS IN OUR LIVES

CHEMISTRY IN EVERYDAY LIFE DETECTIVE MYSTERY BUNDLE

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20 DETECTIVE FILES ON
COMMON CHEMISTRY OUR LIVES



Plus Many More!
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Thanks
**for your interest
in this resource!**

I am a real person and if
you have any questions,
suggestions, or concerns,
please reach out.



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*Let's
Connect!*

