

CASES 01-05

RESPONSE FORMAT • CER

GRADES 5-8 CORE • K-16 ADAPTABLE

CER & ACE Case Files

OBSERVE. TEST. EXPLAIN. EXTEND.



Five reusable investigations in matter, energy, magnetism, and conductivity. Every case uses the same reasoning routine, so you can put your attention on the evidence instead of on learning a new worksheet. Your response pages use **Claim • Evidence • Reasoning**.

01	Mystery Mixture	Which method separates each mixture
02	Density Deception	Which cube matches an unknown material
03	State Detectives	What changed and where energy moved
04	Magnet or Mimic?	Which objects respond to a magnet and why
05	Conductor Clues	Which materials complete a low-voltage circuit

NAME _____

CLASS / PERIOD _____

The Case File Routine

Use the same four moves in every case

01**Observe**

Record what you notice before naming the object or explaining the result.

02**Test**

Choose a property, tool, or measurement that can produce useful evidence.

03**Explain**

Connect the result to a science idea. Tell why the evidence matters.

04**Check**

Retest, consider another explanation, and state what still feels uncertain.

TEAM ROLES

EVIDENCE MANAGER Handles tools and samples safely

RECORDER Writes observations and measurements

SKEPTIC Checks whether the evidence supports the claim

REPORTER Shares the group's explanation and uncertainty

YOUR PAGE 2 RESPONSE**Claim · Evidence · Reasoning**

Claim answers the mystery. Evidence names specific observations or data. Reasoning explains why the evidence supports the claim using a science concept.

EVIDENCE RULE

A result is not automatically evidence. Explain what the result tells you and why it matters.

Worked Example: Density Deception

How evidence becomes an explanation

NAME _____

DATE _____

GROUP _____

THE MYSTERY

Four equal-volume cubes were tested. Which cube is aluminum, and how does the density evidence support the identification?



MATERIALS Four 2 cm cubes, balance, ruler, water tub, paper towels, calculator

SAFETY Wipe spills. Lower cubes gently and keep the balance dry.

STEP 1 OBSERVE BEFORE YOU EXPLAIN

SAMPLE / OBJECT	WHAT I OBSERVE	TOOL OR TEST USED
Cube A	Light tan; floats high	Hands; water
Cube B	White; floats low	Hands; water
Cube C	Silver-gray; sinks	Hands; water
Cube D	Dark gray; sinks fast	Hands; water

STEP 2 COLLECT EVIDENCE

TEST PERFORMED	RESULT / DATA	WHAT IT TELLS ME
Mass	A=4.0 g; B=7.6 g; C=21.6 g; D=56.8 g	Mass differs at equal volume
Volume	All cubes = 8 cm ³	Volume is controlled
Density	A=0.50; B=0.95; C=2.70; D=7.10	C matches aluminum

Worked Example: Density Deception

Build an argument from the evidence

HOW TO USE THIS PAGE

Answer the mystery. Use specific data from Page 1, then explain the science idea that connects the evidence to your claim.

1 Claim

One clear sentence that answers the mystery.

Cube C is aluminum.

2 Evidence

Name the measurements and observations that best support the claim.

All four cubes had the same 8 cm^3 volume. Cube C had a mass of 21.6 g, so its density was 2.70 g/cm^3 . That value matches the aluminum reference value, and Cube C sank in water as predicted.

3 Reasoning

Explain why the evidence supports the claim. Name the science concept that makes the evidence matter.

Density is mass per unit volume and is a characteristic physical property under stated conditions. Dividing 21.6 g by 8 cm^3 gives 2.70 g/cm^3 . Because this matches the reference value for aluminum, the measurements support the identification.

4 Alternative explanation

What else might explain the result, and what evidence makes it less likely?

Cube D is also metallic and sank, but its density of 7.10 g/cm^3 matches zinc, not aluminum.

5 Confidence check

What increases or limits your confidence?

High, because the calculated density matches the reference value; the water test is supporting evidence, not enough by itself.

STEMS Based on my investigation, I claim... | The strongest evidence is... | This supports my claim because...

Mystery Mixture

Separate the evidence without changing it

NAME _____

DATE _____

GROUP _____

THE MYSTERY

Four mixtures are made from familiar solids. Choose a separation method for each sample, then use physical properties to explain why your method worked.



MATERIALS Samples A–D, trays, magnet wand, sieve, water cups, filter funnel, filter paper, scoop, magnifier

SAFETY Wear goggles. Do not taste samples. Keep iron filings contained; do not rinse them into a sink.

STEP 1 OBSERVE BEFORE YOU EXPLAIN

SAMPLE / OBJECT	WHAT I OBSERVE	TOOL OR TEST USED
Sample A		
Sample B		
Sample C		
Sample D		

STEP 2 COLLECT EVIDENCE

TEST PERFORMED	RESULT / DATA	WHAT IT TELLS ME
Magnetism		
Particle size / sieve		
Solubility + filtration		

Mystery Mixture

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2 Evidence

Name the measurements and observations that best support the claim.

3 Reasoning

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4 Alternative explanation

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5 Confidence check

What increases or limits your confidence?

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Density Deception

Use mass and volume to identify the unknown

NAME

DATE

GROUP

THE MYSTERY

Four equal-size cubes look similar. Which cube is aluminum? Measure mass and volume, calculate density, and compare your results with the reference table.



MATERIALS

Cubes A–D, digital balance, metric ruler or graduated cylinder, water tub, paper towels, calculator

SAFETY

Wipe spills at once. Lower cubes into water gently. Keep the balance dry.

STEP 1 OBSERVE BEFORE YOU EXPLAIN

SAMPLE / OBJECT	WHAT I OBSERVE	TOOL OR TEST USED
Cube A		
Cube B		
Cube C		
Cube D		

STEP 2 COLLECT EVIDENCE

TEST PERFORMED	RESULT / DATA	WHAT IT TELLS ME
Mass (g)		
Volume (cm ³)		
Density (g/cm ³)		

Density Deception

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State Detectives

Follow the water and the energy

NAME _____

DATE _____

GROUP _____

THE MYSTERY

Water is changing at three stations. Identify melting, condensation, and evaporation, then explain whether the water undergoing each state change absorbs or releases energy.



MATERIALS Ice and beaker, cold metal cup, shallow warm-water dish, thermometers, timer, balance, trays, paper towels

SAFETY Teacher provides warm water below 45 °C. No hot plates or open flames. Wipe condensation and spills.

STEP 1 OBSERVE BEFORE YOU EXPLAIN

SAMPLE / OBJECT	WHAT I OBSERVE	TOOL OR TEST USED
Station A: ice		
Station B: cold cup		
Station C: warm water		
Room air		

STEP 2 COLLECT EVIDENCE

TEST PERFORMED	RESULT / DATA	WHAT IT TELLS ME
Start / end temperature		
Visible change / mass		
Energy absorbed or released		

State Detectives

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Magnet or Mimic?

Metallic shine is not enough evidence

NAME _____

DATE _____

GROUP _____

THE MYSTERY

Several objects look metallic, but only some respond strongly to a magnet. Which objects are magnetic, and what second property could help you classify the mimics?



MATERIALS Magnet wand, steel washer, iron nail, paper clip, aluminum tab, copper disk, brass fastener, wood, plastic

SAFETY Keep magnets away from electronics. Test objects on a tray and return every small item after use.

STEP 1 OBSERVE BEFORE YOU EXPLAIN

SAMPLE / OBJECT	WHAT I OBSERVE	TOOL OR TEST USED
Object 1		
Object 2		
Object 3		
Object 4		

STEP 2 COLLECT EVIDENCE

TEST PERFORMED	RESULT / DATA	WHAT IT TELLS ME
Magnetic attraction		
Appearance / texture		
Second property test		

Magnet or Mimic?

Build an argument from the evidence

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Conductor Clues

A dark lamp needs a second look

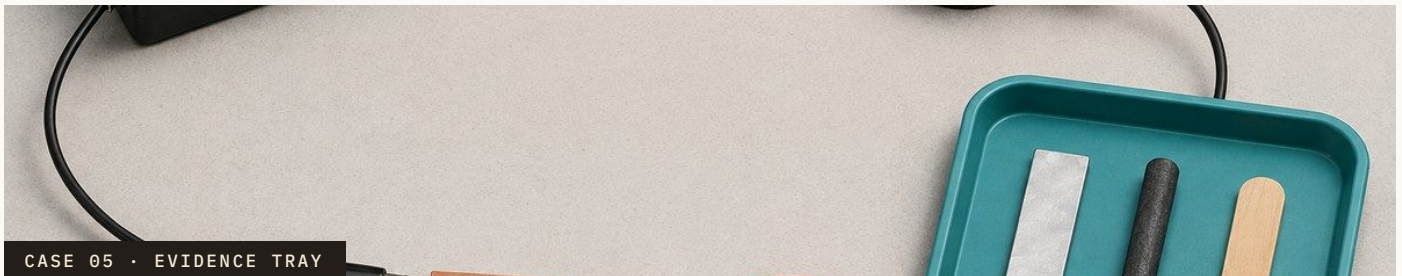
NAME _____

DATE _____

GROUP _____

THE MYSTERY

Which samples conduct electricity well enough to complete a low-voltage circuit? Test one sample at a time, then rule out loose clips or weak batteries before classifying an insulator.



MATERIALS Two-AA battery holder, LED lamp module, insulated leads, alligator clips, copper, aluminum, graphite, plastic

SAFETY Use batteries only, never a wall outlet. Never clip the battery terminals directly together. Disconnect anything that becomes warm.

STEP 1 OBSERVE BEFORE YOU EXPLAIN

SAMPLE / OBJECT	WHAT I OBSERVE	TOOL OR TEST USED
Copper		
Aluminum		
Graphite		
Plastic		

STEP 2 COLLECT EVIDENCE

TEST PERFORMED	RESULT / DATA	WHAT IT TELLS ME
Lamp on / off		
Brightness		
Retest result		

Conductor Clues

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