

Property Detective Bench

Mission: A mystery sample X was found in the lab. Test known materials with a magnet, an electric circuit, and water. Then use the properties to figure out what sample X is made of.

Big question: How can observable properties identify a material?

★ Warm-up: Two truths and a lie

Two statements are true and one is false. Find the lie and fix it.

A. All metals stick to magnets. B. Wood floats. C. Salt dissolves in water. ✓ **A is the lie: only some metals (like iron) are magnetic.**

A. Copper wires carry electricity. B. Plastic covers wires to keep us safe. C. Rubber is a great conductor. ✓ **C is the lie: rubber is an insulator.**

Key vocabulary

Property	A trait you can observe or measure, like hardness or magnetism.
Magnetic	Attracted by a magnet (iron, steel, nickel).
Conductor	Lets electricity flow through it; metals are good conductors.
Insulator	Does not let electricity flow (wood, plastic, rubber).
Dissolve	Mix into a liquid so completely you cannot see it.

1 Box 1

Predict

PREDICTION Will the magnet attract the copper wire and the aluminum foil too? They are metals.

☐ Yes, magnets attract all metals ☐ No, only some metals are attracted ☐ Only the foil

Test the other metals

In the simulator: Test the **copper wire** and the **aluminum foil** with the magnet.

You predicted: _____. What did you find?

☐ Only iron was attracted; copper and aluminum were not ☐ All three metals were attracted
☐ None of the metals were attracted

✓ **Only iron was attracted; copper and aluminum were not**

2 Box 2

Property chart

Record the results. Type yes/no, or floats/sinks/dissolves.

Material	Magnetic?	Conducts?	In water
Wood block	no	no	floats
Copper wire	no	yes	sinks
Salt	no	no	dissolves

3 Box 3

Conductors vs. insulators

In the simulator: Run the circuit test on at least 5 materials.

Sort the materials by what the bulb did.

Sort: Iron nail · Copper wire · Aluminum foil · Wood block · Plastic spoon · Salt (dry)

Conductor (bulb lit)	Insulator (bulb off)
Iron nail Copper wire Aluminum foil	Wood block Plastic spoon Salt (dry)

Why wires are built this way

Electric cords have copper inside and plastic outside. Use your test results to explain why.

- ☐ Copper conducts electricity; plastic insulates so we don't get shocked ☐ Plastic conducts better than copper
☐ Copper is magnetic so it holds the plastic ☐ It is only for color

✓ **Copper conducts electricity; plastic insulates so we don't get shocked**

4 Box 4

Test the mystery sample

In the simulator: Run all three tests on **Mystery sample X**.

Sample X is magnetic, conducts electricity, and sinks. Which material matches ALL of its properties?

- ☐ Iron ☐ Copper ☐ Wood ☐ Salt

✓ **Iron**

5 Box 5

Legend: one test is not enough Legend only

If you had ONLY run the circuit test on sample X, could you know it was iron?

- ☐ No. Copper and aluminum also conduct, so more tests were needed ☐ Yes, only iron conducts
☐ Yes, the bulb is always brighter for iron

✓ **No. Copper and aluminum also conduct, so more tests were needed**

6 Box 6

Identify sample X (CER)

What is Mystery sample X made of?

Claim

Look for: Names the material (iron); at least 4 words

Evidence

Look for: Uses the magnet test; Uses the circuit test; Uses the water test; at least 12 words

Reasoning

Look for: Explains that the properties match iron; at least 10 words



Exit ticket: answer the big question in your own words

How can observable properties identify a material?

Look for: Every material has properties you can observe and test: whether a magnet attracts it, whether it conducts electricity, and whether it floats, sinks, or dissolves in water. Matching properties can identify an unknown material.



Completion codes

Students see a code like **ABC-I3** when they finish. The first part must match below. The letter is the level (E = Explorer, I = Investigator, L = Legend), and the number at the end is how many stars they earned.

Level	Code starts with
 Explorer	1VF-E
 Investigator	168-I
 Legend	17K-L



Watch for these misconceptions

- "Dissolved things disappear and have no mass." The particles are still there and still have mass.
- "Gas has no mass." Gas is matter. When it escapes an open container, the scale drops because matter left.
- "Ice weighs more than water because it is solid." Freezing changes volume a little, but mass stays the same.