

Mix & Separate Lab

Mission: The recycling station received a messy mixture of sand, salt, iron filings, and water. Make the mixture on a scale, then separate every part and weigh it. Can you get back ALL the mass?

Big question: When we mix substances and then separate them, is any mass lost?

★ Warm-up: Real-world riddle

Answer each riddle with a separating tool and a reason.

You dropped paper clips in the sandbox. How can you get them out fast? ✓ **A magnet: steel clips are magnetic, sand is not.**

How does a pasta strainer separate pasta from water? ✓ **It is a filter: water passes through holes, pasta is too big.**

Key vocabulary

Mixture	Two or more substances mixed together that keep their own properties.
Solution	A mixture where one substance dissolves in another (salt water).
Filter	A tool that lets liquid through but catches solid pieces.
Evaporate	Change from liquid to gas when heated.
Condenser	A cool tube that turns steam back into liquid water.

1 Box 1

Make the mixture

In the simulator: Add all four ingredients to the bowl.

What is the total mass of your mixture? Write it in box 1.

Answer: _____ g ✓ **varies: check the student's simulator readout**

2 Box 2

Plan the order

PREDICTION Which tool should you use FIRST?

☐ Magnet: pull out the iron ☐ Evaporate: boil off the water ☐ Filter: catch the sand

Pull out the iron

In the simulator: Use the  **Magnet**.

Why does the magnet separate ONLY the iron?

☐ Iron is magnetic; sand, salt, and water are not ☐ The magnet is too weak for sand ☐ Iron is the heaviest

✓ **Iron is magnetic; sand, salt, and water are not**

3 Box 3

Evaporate the water

In the simulator: Evaporate all the water.

Add up the four dishes. What is the total mass of the separated parts?

Answer: _____ g ✓ **varies: check the student's simulator readout**

Show your thinking:

Compare the totals

Compare the mixture total (box 1) with the separated total. What do you notice?

☐ They are equal: no mass was lost ☐ The separated total is less ☐ The separated total is more

✓ **They are equal: no mass was lost**

4 Box 4

What if steam escapes?

In the simulator: Evaporate with the condenser OFF.

The separated total is less than the mixture this time. Was matter destroyed?

☐ No. The water became vapor and escaped into the air ☐ Yes. Heat destroys water

☐ Yes. Salt disappears when heated

✓ **No. The water became vapor and escaped into the air**

5 Box 5

Legend: plan it in order 🏆 Legend only

Put the separation steps in the best order to get every part back.

Put in order: Heat the salt water with a condenser · Pour through the filter to catch the sand · Use the magnet to remove the iron · Weigh each dish and add the masses

1. **Use the magnet to remove the iron**
2. **Pour through the filter to catch the sand**
3. **Heat the salt water with a condenser**
4. **Weigh each dish and add the masses**

6 Box 6

Final claim (CER)

When we mix substances and then separate them, is any mass lost?

Claim

Look for: Answers the question; at least 6 words

Evidence

Look for: Compares the mixture total and the separated total; a number from the simulator; at least 12 words

Reasoning

Look for: Uses the properties that let us separate them; Explains that matter is not created or destroyed; at least 12 words

Exit ticket: answer the big question in your own words

When we mix substances and then separate them, is any mass lost?

Look for: In a mixture, each substance keeps its own properties, so we can separate them: a magnet pulls iron, a filter catches sand, and evaporation leaves salt behind. If we catch the water vapor too, the separated parts add up to the same total mass as the mixture.

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	149-E
 Investigator	CQV-I
 Legend	1MI-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.