Family edition

Reaction Lab: Does Burning Destroy Matter?

Ages 11-14 · about 45 minutes, in one sitting

Your child burns steel wool and a candle on a scale in Reaction Lab, safely on the screen, and finds out why one gets heavier and the other lighter while no matter is destroyed.

What you need

- A computer or Chromebook with a current browser.
- The lesson link: mytekdev.com/try/reactionlab?lesson=does-burning-destroy-matter&ref=fam-reactionlab-4. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/reactionlab?lesson=does-burning-destroy-matter&ref=fam-reactionlab-4. A short guide opens over the app on the steel wool lab bench: a pad of steel wool on a dish on a kitchen scale reading 85.0 g, with a magnifier beside it.

1. **Steel wool.** `Light it`. The strands glow and turn from gray to black, and the reading rises to 85.6 g. In the magnifier, oxygen molecules come apart and their atoms join the iron.
2. **The candle.** Burning methane on the shelf, then `Lab bench`. The candle burns and the reading falls from 120.0 g to 119.4 g. The magnifier shows methane, the small cousin of wax, burning in the open: carbon dioxide and water vapor leave.
3. **Fix the claim.** `Puzzles`, then `Fix the claim`. A friend wrote that the scale must be broken. The answer box saves with the project.

> The steel wool goes against what nearly every child expects. Ask for predictions first, and keep them on the board.

The ideas, in plain words

Burning is a reaction with oxygen from the air. When iron burns, the oxygen joins it to make iron oxide, a solid, so the solid on the scale weighs more: mostly black Fe_3O_4, with some red Fe_2O_3. In a classroom only the outside of a pad burns, so the real gain is small, a few tenths of a gram for a pad of a few grams.

When a candle burns, the wax joins oxygen and leaves as carbon dioxide and water vapor, both gases that go into the room, so the candle gets lighter. In a real class that takes several minutes; the app speeds it up. In both cases no atom is made or destroyed: what changes is what stays on the scale. Light and heat are given off, and they have no mass any scale could weigh.

Research on middle school children finds that about half think burning iron loses mass, and some say a candle's light itself has mass. Both are what this lesson is aimed at.

Do it together

1. Open mytekdev.com/try/reactionlab?lesson=does-burning-destroy-matter&ref=fam-reactionlab-4 together. A short guide opens over the app with steel wool on a scale. Ask: will it get heavier or lighter? Then press `Light it`.

   > **You'll know it worked when:** The scale goes from 85.0 g to 85.6 g.

2. Drag the magnifier over the steel wool.

   > **You'll know it worked when:** Your child can say oxygen from the air joined the iron.

3. Open `Burning methane` from the list, press `Lab bench`, and light the candle.

   > **You'll know it worked when:** The candle gets lighter, and your child can say what left.

4. Press `Puzzles`, then `Fix the claim`, and write a reply to the person who thinks the scale is broken.

   > **If you get stuck:** Start with: the scale is not broken, because ...
   >
   > **You'll know it worked when:** Two sentences with the readings in them.

Talk about it

Ask these while you work together. A child who has understood it can answer them without help:

- Where did the extra 0.6 g on the steel wool come from?
- Where did the candle's lost mass go?
- Does the light from the flame weigh anything?
- Is the scale broken? How do you know?
- Would the candle lose mass if it burned in a sealed jar on the scale?

> The last question is the real test: in a sealed jar the gases stay, so the mass would hold.

For younger and older kids

Younger: For a younger child, do the steel wool and talk about the magnifier.

Older: For a teenager, compare the candle with burning methane in the particle view, lid on and lid off.

Keep going

- Run Burning magnesium in the particle view and say whether it gains or loses mass in the open, and why.
- In the particle view, burn methane with the lid on and with it off, and explain the difference with the candle.
- Find out why real rust weighs more than the iron it came from.

Bring it into other subjects

- Math: the steel wool gained 0.6 g. If a pad of 3 g gains 20 percent, what would it weigh after?
- Earth science: rust is slow burning. Find out why a rusty nail weighs more than a new one.
- English: turn the reply to the friend into a short lab report: claim, evidence, reasoning.
- History: read about phlogiston, the old idea that burning things lose a substance, and why weighing metals as they burned overturned it.

For your records

Ready to copy into an hour log, a portfolio or a transcript.

LESSON	Reaction Lab: Does Burning Destroy Matter?
SUBJECTS	Physical science
TIME	45 minutes
WHAT WE DID	Compared burning steel wool, which gains mass, with a burning candle, which loses it, used a particle model to explain both, and wrote a claim with evidence and reasoning.
SKILLS PRACTICED	Combustion; Conservation of mass; Claim, evidence and reasoning

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/reactionlab?lesson=does-burning-destroy-matter

Essential question: When something burns, is matter destroyed?

Warm-up: A candle burns for an hour and gets shorter. Was some of the candle destroyed?

_____

1. **Vocabulary.** Combustion, oxygen, iron oxide, water vapor, evidence: write each in your own words.

2. **The before-and-after table.** Steel wool: before _____ g, after _____ g, heavier or lighter _____, why _____. Candle: before _____ g, after _____ g, heavier or lighter _____, why _____.

3. **Fix the claim.** My reply to the friend, with a claim, the readings as evidence, and my reasoning:

1. Steel wool got heavier and the candle got lighter. Explain both with atoms.

2. Would a candle burning in a sealed jar on a scale get lighter? Why?

Quick check

Name: _____

1. Steel wool burns on a scale, open to the air. The reading after is: (A) lower (B) the same (C) higher

2. A candle burns and gets lighter because: (A) its atoms were destroyed (B) its products left as gases (C) the light took the mass

3. A friend says burning destroys matter. Write one sentence back, with evidence from today.

Answers

QUESTION	ANSWER	WHY
1	C	Oxygen from the air joins the iron to make iron oxide, which stays on the scale.
2	B	Carbon dioxide and water vapor leave into the room. Light has no mass any scale could weigh.
3	Open answer	A full answer names one reading and the atoms: for example, the steel wool got heavier because oxygen joined it, so nothing was destroyed.

If your state or umbrella school asks, this lesson covers NGSS MS-PS1-5, NGSS MS-PS1-2.

Terms of use

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The app this lesson uses is free and runs in the browser, with nothing to install and no account needed. It is at mytekdev.com.

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