

Why total mass stays the same

Grade 7 science (Year 8 · Class 7) · Worksheet

Name: _____ Date: _____ Class: _____

These problems train you to apply the law of conservation of mass to dissolving, melting, evaporating and reacting. You will add and subtract masses, convert units, read graphs and balance readings, and explain why a balance sometimes seems to lose mass. They suit Grade 7, Year 8 and Class 7 science (NGSS MS-PS1-5).

Start with the level 1 problems, then move on. Show every step and write units with each answer.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS1-5

Problem 1 State the law (easy)

Chiamaka in Lagos is revising conservation of mass.

1. State the law of conservation of mass in your own words.
2. Describe what a closed system is.
3. State the unit used for mass in the lab.

Problem 2 Sugar in water (easy)

Aarav in Pune stirs 25 g of sugar into 200 g of water until it has all dissolved.

1. Calculate the mass of the sugar solution.
2. State what has happened to the sugar particles.
3. State whether the total mass is bigger, smaller or the same as before stirring.

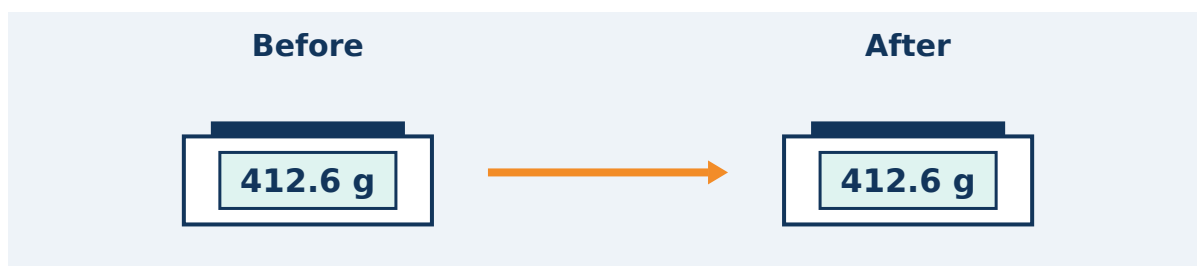
Problem 3 A melting block (easy)

Emma in Leeds weighs a 340 g block of ice and lets it melt completely in a sealed bag.

1. State the mass of the water formed.
2. State whether melting is a physical or a chemical change.
3. Explain in one sentence why the mass does not change.

Problem 4 Reading two balances (easy)

The figure shows the reading before and after a reaction inside a sealed flask.



Balance readings before and after a reaction in a sealed flask.

1. State whether the mass changed.
2. Name the type of system.
3. State what the readings show about atoms in the reaction.

Problem 5 Salt in a solution (easy)

Bilal in Lahore has a 320 g salt solution that contains 20 g of salt.

1. Calculate the mass of water in the solution.
2. A second solution of mass 250 g contains 30 g of salt. Calculate its mass of water.

Problem 6 Open or closed? (easy)

Decide what happens to the balance reading in each situation. Write "stays the same" or "falls".

1. An effervescent tablet fizzing in a sealed bottle.
2. An effervescent tablet fizzing in an open cup.
3. Sugar dissolving in a mug with no lid, over one minute.
4. Dry wood burning on an open fire.

Problem 7 Mixing sand and water (easy)

Wanjiru in Nairobi mixes 2.5 kg of sand with 0.75 kg of water to make mortar.

1. Calculate the mass of the mortar in kilograms.
2. Convert your answer to grams.

Problem 8 Fizzy drink going flat (medium)

A sealed bottle of fizzy drink has a mass of 612.4 g. Kwame in Accra opens it and leaves it on a table until it has gone flat. It now has a mass of 610.9 g.

1. Calculate the mass lost.
2. Name the gas that escaped.
3. Explain why the mass of the bottle fell.

Problem 9 Steel wool that gets heavier (medium)

Ravi in Chennai heats 8.2 g of steel wool in the air. The wool changes to a black solid with a mass of 10.5 g.

1. Calculate the increase in mass.

2. Explain where the extra mass came from.
3. Predict what a balance would show if the experiment was done in a sealed jar that included the air.

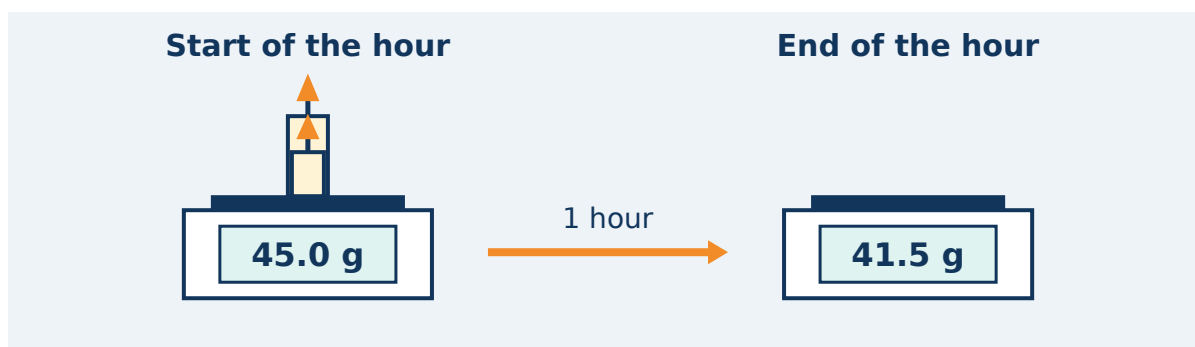
Problem 10 Water in a sealed jar (medium)

A sealed jar holds 80.0 g of water. The empty jar and lid have a mass of 310.0 g. Hana in Nairobi leaves the jar in the sun and some of the water evaporates.

1. Calculate the total mass of the jar and water before.
2. State the total mass after some water has evaporated.
3. Explain why the answer would be different if the lid was left off for a week.

Problem 11 A candle burning (medium)

The figure shows a candle on a balance before and after burning in open air.



A candle on a balance at the start and end of an hour.

1. Calculate the mass lost by the candle.
2. Explain whether this breaks the law of conservation of mass.
3. Suggest how you could set up the test to show that mass is conserved.

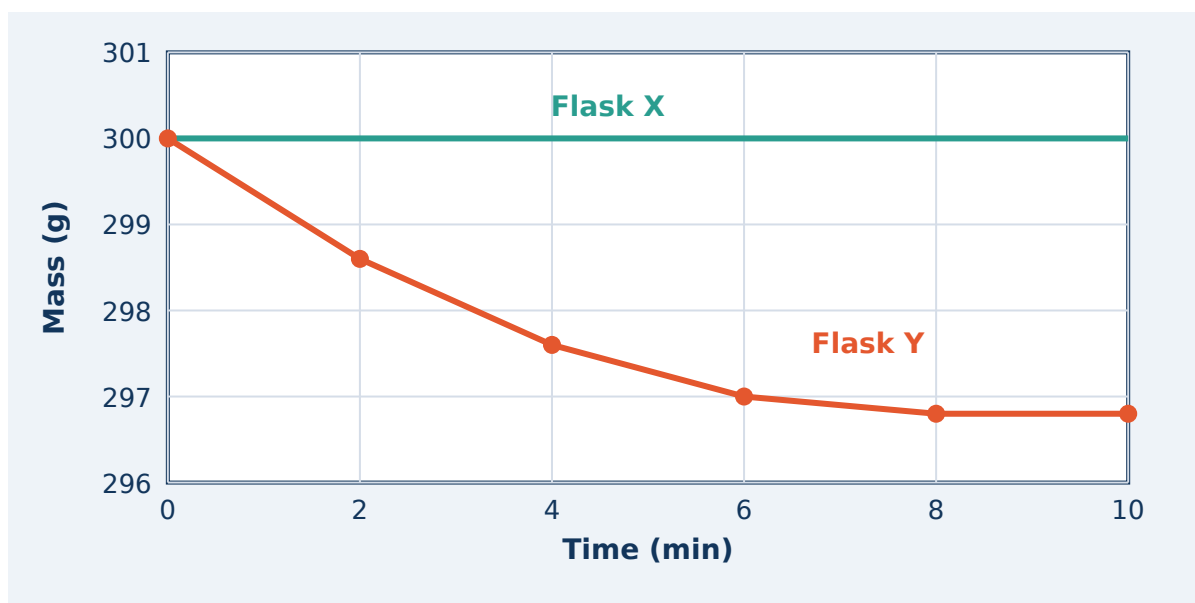
Problem 12 Mixing two solutions (medium)

Mateo in Texas pours 150 g of one solution into 100 g of another in a closed flask. A solid forms with a mass of 6.2 g.

1. Calculate the total mass before mixing.
2. State the total mass after mixing.
3. Calculate the mass of liquid left above the solid.

Problem 13 Reading a mass graph (medium)

Two flasks, X and Y, each held a fizzing mixture. The graph shows their masses over ten minutes.



Mass against time for flasks X and Y.

1. State which flask was sealed and give a reason.
2. Read the mass of flask Y at 6 minutes.
3. Calculate the mass lost by flask Y by 10 minutes.

Problem 14 Sports drink (medium)

Zainab in Kano makes a drink with 18 g of sugar, 2 g of salt and 380 g of water.

1. Calculate the mass of the drink.
2. Calculate the mass of water needed to make 600 g of drink with the same 18 g of sugar and 2 g of salt.

Problem 15 Where did the log go? (medium)

Chidi in Enugu says, "A 500 g log burned and left only 6 g of ash, so 494 g of mass was destroyed."

1. Identify the mistake in his statement.
2. Explain where the matter went.
3. Describe how you could test your explanation.

Problem 16 Heating green powder (hard)

Sofia in Leeds heats 12.4 g of green copper carbonate in an open tube. It leaves 8.0 g of black solid and a gas.

1. Calculate the mass of gas that escaped.
2. Calculate this mass as a percentage of the mass of green powder, to 1 decimal place.
3. Predict the total mass if the gas was caught in a syringe fixed to the tube.

Problem 17 Burning magnesium in proportion (hard)

A student burns 1.2 g of magnesium and gets 2.0 g of magnesium oxide.

1. Calculate the mass of oxygen that combined.
2. The masses always combine in the same ratio. Calculate the mass of magnesium oxide made from 4.8 g of magnesium.
3. Calculate the mass of magnesium needed to make 7.5 g of magnesium oxide.

Problem 18 Four set-ups compared (hard)

Masses were measured before and after four tests.

Test	Set-up	Before (g)	After (g)
A	Sugar dissolving in an open beaker (one minute)	245.0	245.0
B	Tablet fizzing in an open cup	301.6	300.1
C	Tablet fizzing in a sealed bag	301.6	301.6
D	Ice melting in a sealed bag	154.2	154.2

1. Calculate the change in mass in test B.
2. Explain why test B differs from A, C and D.
3. Calculate the loss in test B as a percentage of its starting mass, to 2 significant figures.

Problem 19 Boiling water in a pan (hard)

Lerato in Johannesburg heats 800 g of water in an open pan. After some time the water has a mass of 760 g. She says, "Mass is not conserved."

1. Calculate the mass of water that left the pan.
2. Explain where it went.
3. Describe how she could collect the missing water to show that total mass is conserved.

Problem 20 A cake in the oven (hard)

Fatima in Kano mixes 250 g of flour, 150 g of sugar, 100 g of butter, 200 g of eggs and 50 g of milk to make batter. After baking, the cake has a mass of 690 g.

1. Calculate the mass of the batter.
2. Calculate the mass lost during baking.
3. Express the loss as a percentage of the batter, to 1 decimal place.
4. Explain what the lost mass is.