

Balancing equations and conserving atoms

Grade 8 science (Year 9 · Class 8) · Lab answers

Model answers follow the sample data in the table. Your own values will differ slightly, but the open flask should lose clearly more mass than the sealed flask.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS1-2, MS-PS1-5

Question 1 Mean mass change

Open: $(1.45 + 1.43 + 1.45) \div 3 = 4.33 \div 3 = 1.44$ g lost. Sealed: $(0.02 + 0.01 + 0.02) \div 3 = 0.017$, about **0.02 g lost**. So open = **-1.44 g**, sealed = **-0.02 g**.

Question 2 Explaining the open flask

The reaction made carbon dioxide gas, which escaped into the air. The atoms of carbon and oxygen are still there, but outside the flask. **The gas carried the mass away.**

Question 3 Explaining the sealed flask

The balloon trapped the gas, so all products stayed on the balance. The tiny drop is within the balance and buoyancy error. **Mass is conserved.**

Question 4 Checking the equation

Left: Na 1, C $1 + 2 = 3$, H $1 + 4 = 5$, O $3 + 2 = 5$. Right: Na 1, C $2 + 1 = 3$, H $3 + 2 = 5$, O $2 + 1 + 2 = 5$. **All equal: balanced.**

Question 5 Expected mass of gas

Mass = $3.0 \times 44 \div 84 = 1.57$ g of CO₂.

Question 6 Percentage escaped

$1.44 \div 1.57 \times 100 = 92$ %.

Question 7 Why not 100 %?

Some carbon dioxide dissolves in the liquid, and some gas stays in the flask above the liquid. Also the balance reading may not settle exactly. **Dissolved and trapped gas.**

Question 8 Improving the lab

Plug the neck with cotton wool to stop liquid spray leaving, wait until fizzing completely stops, and repeat to find a mean. **Cotton wool and more repeats.**