

Why total mass stays the same

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

Name: _____ Date: _____ Class: _____

Is mass really conserved when substances dissolve, change state or react? In this lab you weigh three changes before and after, some in closed jars and one in an open cup, and use the balance readings to decide where mass can seem to disappear. It needs only a kitchen-style balance and common materials.

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

Aim

To find out whether the total mass changes when salt dissolves, when ice melts and when a tablet reacts with water, and to explain any change in terms of closed and open systems.

Equipment

- Digital balance reading to 0.1 g
- Two glass jars with screw lids and one plastic cup
- Table salt, about 10 g
- Ice cubes and tap water
- Plain effervescent tablets (two)
- Spoon, paper towel and a measuring cylinder

Safety

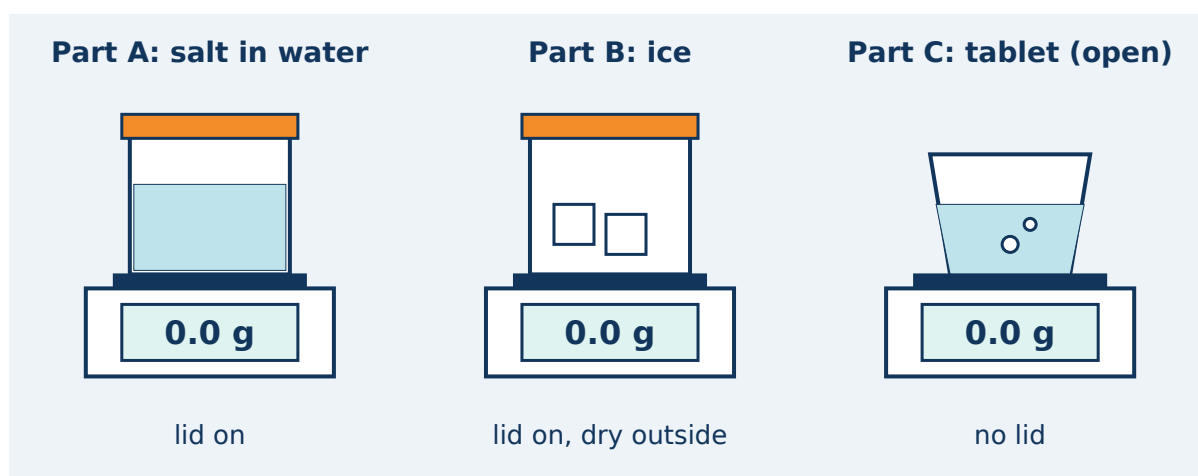
Safety

Wear safety goggles. Never eat or drink anything in the lab. Use only an open cup for the tablet, never a closed container, because the gas can build up pressure. Wipe up spills at once and wash your hands afterwards.

Method

1. Part A: put 100 cm³ of water and a spoon of salt (about 5 g) into a jar. Do not mix yet. Screw the lid on tightly, dry the outside and record the mass.
2. Shake the jar until the salt has dissolved. Dry the outside again and record the mass.
3. Part B: put three ice cubes in a second jar, screw on the lid, dry the outside and record the mass. Leave the jar until the ice has melted, dry the outside and record the mass again.

- Part C: put 100 cm³ of water in the cup and stand it on the balance with one tablet beside it. Record the mass of everything, then drop the tablet in. When the fizzing stops, record the mass again.
- Repeat each part once more with fresh materials.



The three set-ups. Parts A and B use closed jars. In part C the cup is open.

Results

Sample measurements from one group:

Part	Trial	Mass before (g)	Mass after (g)	Change (g)
A Salt dissolving (lid on)	1	286.4	286.4	0.0
A Salt dissolving (lid on)	2	301.2	301.1	-0.1
B Ice melting (lid on)	1	214.8	214.8	0.0
B Ice melting (lid on)	2	220.3	220.3	0.0
C Tablet fizzing (open cup)	1	158.2	157.1	-1.1
C Tablet fizzing (open cup)	2	159.0	157.8	-1.2

Analysis questions

Question 1 Mean changes

Calculate the mean change in mass for parts A, B and C.

Question 2 Dissolving and melting

Use the particle idea to explain why the mass hardly changed in parts A and B.

Question 3 The open cup

Explain why the mass fell in part C.

Question 4 Balance uncertainty

The change in part A trial 2 was -0.1 g. Suggest why this does not mean that mass was lost.

Question 5 Percentage loss

Calculate the mean percentage loss of mass in part C, using the mean starting mass.

Question 6 Drying the jar

Explain why the outside of the jar in part B must be dried before weighing.

Question 7 Showing mass is conserved

Suggest how part C could be changed so that the total mass would not fall, and state one problem with your idea.

Question 8 Conclusion

Write a one-sentence conclusion that links the results of parts A, B and C.