



Measure Lab: Mass & Volume

Mission: The lab needs a measurement report for 5 mystery objects. Weigh them on the balance and use water displacement in a graduated cylinder to find the volume of objects with weird shapes.

Big question: How can we measure the mass and volume of any object, even a lumpy one?

★ Warm-up: Estimation station

Estimate first, then give a reason. Close is good!

About how many grams is a paper clip? (1 g, 100 g, or 1,000 g) ✓ **About 1 g.**

A water bottle holds 500 mL. About how many mL is a spoonful? ✓ **About 5 mL (a teaspoon).**

Key vocabulary

Mass	The amount of matter, measured in grams (g) with a balance.
Volume	The amount of space something takes up, in mL or cm ³ .
Graduated cylinder	A tall tube with marks for measuring liquid volume.
Displacement	Water pushed out of the way by an object. The rise equals the object's volume.
Meniscus	The curved top of water. Read the bottom of the curve.

1 Box 1

Predict

PREDICTION What will happen to the water level when you drop the rock in?

☐ It will go up ☐ It will stay the same ☐ It will go down

Water displacement

In the simulator: Put only the rock in the cylinder.

The water rose from 50 mL to ____ mL. What is the rock's volume?

Answer: _____ mL ✓ **20**

2 Box 2

Measurement report

Fill in the report. (Put each object on the balance and in the cylinder, then type what you read.)

Object	Mass (g)	Volume (mL)
Glass marble	12.5	5
Metal key	16	2
Toy dinosaur	22	14

3 Box 3

Compare

The key has MORE mass than the marble but LESS volume. What does that show?

☐ Mass and volume are different properties ☐ The balance is wrong ☐ Bigger objects always have more mass
☐ Volume and mass are the same thing

✓ **Mass and volume are different properties**

4 Box 4

Predict: squish the clay

PREDICTION If you squish the clay ball into a flat pancake, its mass will...

☐ go up ☐ stay the same ☐ go down

Squish test

In the simulator: Put the clay on the balance and squish it into a pancake.

You predicted the mass would _____. What did the balance show?

☐ Still 36 g: the same ☐ More than 36 g ☐ Less than 36 g

✓ **Still 36 g: the same**

5 Box 5

Two objects at once

In the simulator: Put the marble and the key in the cylinder at the same time.

What is the new water level?

Answer: _____ mL ✓ **57**

Legend: box volume Legend only

A box is 4 cm long, 3 cm wide, and 2 cm tall. It sinks in the cylinder. How many mL will the water rise? ($1 \text{ cm}^3 = 1 \text{ mL}$)

Answer: _____ mL ✓ **24**

Show your thinking:

6 Box 6

Explain the method

Explain to a new lab assistant how to find the volume of a lumpy rock.

Look for: Mentions the water in the cylinder; Explains how to use the rise (subtract)

Model: Read the water level first (50 mL). Drop the rock in and read the new level. Subtract: the rise is the rock's volume.



Exit ticket: answer the big question in your own words

How can we measure the mass and volume of any object, even a lumpy one?

Look for: Mass is measured with a balance in grams. Volume is the space an object takes up. For odd shapes, measure how much the water level rises in a graduated cylinder ($1 \text{ mL} = 1 \text{ cm}^3$). Changing an object's shape does not change its mass.



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	10A-E
 Investigator	11O-I
 Legend	1DH-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.