

Fire, fuels and burning safely

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

Name: _____ Date: _____ Class: _____

What does a burning candle make? In this lab you hold a cold beaker over the flame to collect water vapour, then test the burnt gases with limewater for carbon dioxide, and compare them with a control and with your breath.

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

Aim

To find out which products are formed when a candle burns, using a cold beaker to collect water vapour and limewater to test for carbon dioxide.

Equipment

- Tea-light candle on a heat-proof mat and matches or a lighter
- Two clean glass beakers (250 mL), one chilled in a fridge or with ice outside
- Tongs or a cloth to hold the beaker
- Limewater (about 20 mL per trial) and a measuring cylinder
- Drinking straw (for a breath control, with a fresh straw for each person), stopwatch, safety goggles

Safety

Safety

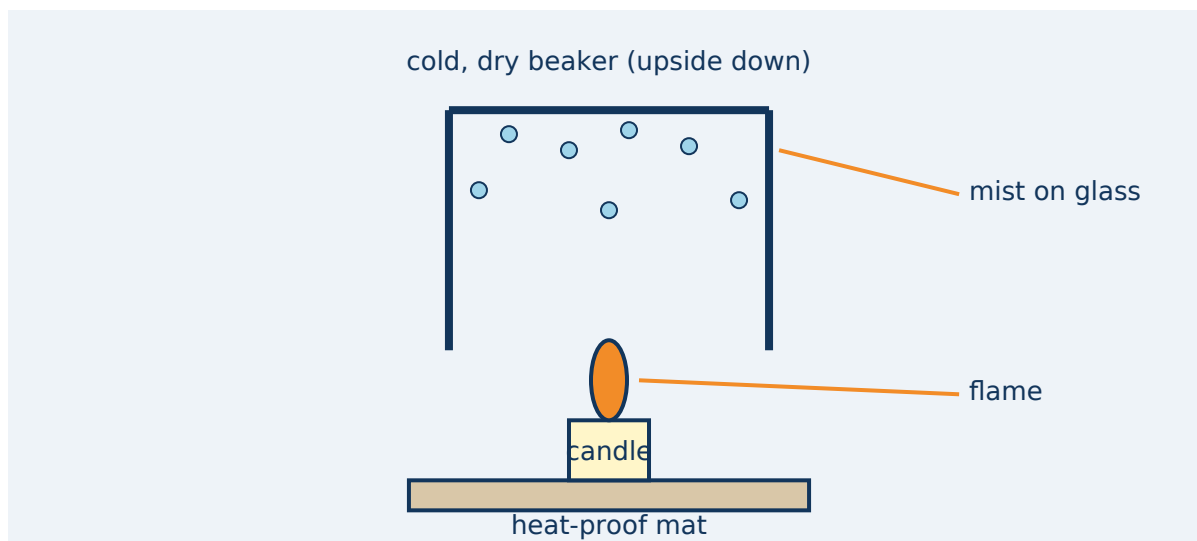
Wear safety goggles. Tie back long hair and keep sleeves away from the flame. The beaker becomes hot, so hold it with tongs. Limewater is an irritant to the eyes; wash splashes with plenty of water. Blow out through the straw only; never suck limewater up through it.

Method

1. Light the candle and let the flame settle.
2. Hold the cold, dry beaker upside down about 5 cm above the flame for 20 seconds. Record what forms on the inside of the glass.
3. Move the beaker away, quickly turn it upright, add 20 mL of limewater, swirl and start the stopwatch.
4. Stop the timer when the limewater turns milky. If nothing happens after 120 seconds,

record "no change".

5. Repeat the burn-and-test three times.
6. Control test: swirl 20 mL of limewater in a clean beaker of ordinary air and record any change after 120 seconds.
7. Breath test: using a fresh clean straw, blow gently into 20 mL of limewater in a clean beaker and time how long it takes to turn milky.



Set-up: a cold dry beaker is held upside down over a burning candle.

Results

A class in Perth, Australia recorded this sample data.

Test	Observation	Time to turn milky (s)
Candle gas, trial 1	mist inside beaker; limewater milky	12
Candle gas, trial 2	mist inside beaker; limewater milky	10
Candle gas, trial 3	mist inside beaker; limewater milky	14
Control: fresh air only	limewater stays clear	no change after 120
Breath blown in	limewater milky	6

Analysis questions

Question 1 Mean time

Calculate the mean time for the limewater to turn milky in the three candle trials.

Question 2 The mist

Explain what the mist on the cold beaker shows and which element in the wax it tells you about.

Question 3 The limewater result

State what the milky limewater shows about the gas in the beaker, and name the white solid.

Question 4 The control test

Explain why the fresh-air control is needed.

Question 5 Equation for limewater

Write the balanced equation for the reaction in the limewater and show that it is balanced.

Question 6 Burning wax

Candle wax can be written as $C_{25}H_{52}$. Balance $C_{25}H_{52} + O_2 \rightarrow CO_2 + H_2O$ for complete combustion.

Question 7 Comparing candle and breath

The breath turned the limewater milky in 6 s while the candle gas took 12 s on average. Suggest two reasons.

Question 8 Improving the lab

Suggest two improvements to make the experiment more reliable.