

EduTrend Contents

W4C · CHEMISTRY · MIDDLE SCHOOL

Race the Tablet

How does temperature change the speed of a reaction?

Ages 12–14 | Level: Intermediate | 60 minutes | Pairs · up to 30 | Activity 04

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 04 · AT A GLANCE

Race the Tablet

Students investigate rate of reaction using effervescent vitamin tablets. They time how long a tablet takes to react completely in water at four temperatures, repeat readings, calculate means and plot a graph. They then use a particle model to explain why reactions speed up when it is warmer.

Learning outcomes

By the end of the session students can:

- plan an investigation with independent, dependent and control variables;
- take repeat readings and calculate a mean;
- plot and describe a line graph;
- explain rate of reaction using collision theory.

KEY WORDS

rate of reaction · temperature · particles · collision · variable · mean · anomaly

CURRICULUM LINKS

Science: chemical reactions and rates, particle model. Maths: means, line graphs. Links to cooking, food storage and industry.

1	2	3	4	5	6
QUESTION	**PREDICT**	**PLAN**	**TEST**	**OBSERVE**	**EXPLAIN**
What do we want to know?	What will happen?	Keep it fair	Try it safely	Record results	Why did it happen?

Materials (per pair)

- 4 effervescent tablets (same brand, halved if large)
- 4 beakers or cups with 100 ml water
- Water at about 10 °C, 20 °C, 35 °C and 50 °C (teacher-prepared)
- Thermometer and stopwatch
- Measuring cylinder
- Worksheets 1, 2 and 3

Before the session

- Prepare jugs of water at the four temperatures; keep warm water in a flask.
- Break tablets in half if needed so that all pieces are the same size.
- Check thermometers.
- Draw the results table on the board.
- Try one test at room temperature.

SAFETY

Goggles on. Warm water no hotter than 50 °C, poured by the teacher. Tablets are not eaten. Wipe spills.

ACTIVITY 04 · SESSION PLAN

Step by step

If time allows, pairs share data so that every temperature has three readings. Pool class data to show how repeats improve reliability.

Time	What happens	Say or ask
0–5 min **Hook**	Drop two tablets, one into cold and one into warm water, side by side.	*"Why is one fizzing faster?"*
5–15 min **Plan**	Pairs identify variables and write a method on Worksheet 1.	*"What must stay the same? How will you know the reaction has finished?"*
15–40 min **Test**	Pairs measure the water temperature, add the tablet and time until fizzing stops. They repeat for each temperature.	*"Is your end point the same every time?"*
40–50 min **Analyse**	Pairs calculate means and plot a line graph on Worksheet 2.	*"Which result looks odd? Should you repeat it?"*
50–58 min **Explain**	Introduce collision theory with a particle diagram or a role-play of moving particles.	*"What are the particles doing differently when it is warmer?"*
58–60 min **Exit**	Worksheet 3 question.	

CHALLENGE CARD (print or copy onto the board)

Predict how long a tablet would take at 40 °C using your graph, then test your prediction.

ACTIVITY 04 · FACILITATOR NOTES

The chemistry in brief

Effervescent tablets contain an acid (usually citric acid) and a carbonate or hydrogencarbonate. When water dissolves them, they react and release carbon dioxide gas. The time taken for the fizzing to stop is a measure of the rate of reaction: a shorter time means a faster rate.

Particles in warm water move faster and have more energy. They collide more often and a greater proportion of collisions have enough energy to react, so the reaction is faster. Refrigerators slow food spoiling for the same reason, and industry uses heat, concentration, surface area and catalysts to control reaction rates.

Common ideas to listen for

- “Hot water makes more gas.” It makes the same amount of gas, just faster.
- “The tablet melts.” It dissolves and reacts.
- “One reading is enough.” Timing errors make repeats essential.

Adapting the activity

Support

Give a writing frame for the method and pre-drawn graph axes.

Stretch

Investigate surface area by comparing a whole tablet with a crushed one at the same temperature.

WORKSHEET 1

Plan the investigation

Name: _____ Class: _____ Date: _____

Complete the plan before you start.

Variables

Variable	What it is in this investigation
Independent (I change)	
Dependent (I measure)	
Control 1	
Control 2	
Control 3	

Prediction

I think that as the temperature increases, the time will

WORKSHEET 2

Results and graph

Record each time in seconds.

Results

Temperature (°C)	Time 1 (s)	Time 2 (s)	Time 3 (s)	Mean (s)
10				
20				
35				
50				

Line graph



y-axis: mean time (s)

x-axis: temperature (°C)

WORKSHEET 3

Explain it

Use the words particles, energy and collisions.

Why does temperature change the rate?

Self-check

I can...	Not yet	Partly	Confidently
name my variables			
calculate a mean			
describe my graph			
explain using collision theory			

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Plans with clear variables	Processes data accurately	Explains with particles

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Race the Tablet is a sample activity from the EduTrend Contents W4C Chemistry programme (middle school, level: intermediate). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.

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