



11–14 years

# Popping good chemistry



# Effervescent vitamin C tablets

A chemical reaction is effervescent if it produces bubbles of gas.

Effervescent vitamin C tablets are a common way for people to increase the vitamin C they obtain from their diet.

We will find out more about this effervescent chemical reaction and develop our scientific enquiry skills.



Source: Rolling Stones/Shutterstock

# Understanding

1. Describe chemical reactions as the rearrangement of atoms.
2. Represent chemical reactions using formulas and equations.

## Success criteria

1. I can describe chemical reactions as the rearrangement of atoms.
2. I can represent chemical reactions using formulas and equations.

# Skills

1. Make predictions, observations and measurements.
2. Identify variables and how to make an experiment fair.
3. Identify patterns and make conclusions from results.
4. Evaluate the reliability of methods and suggest improvements.

## Success criteria

1. I can make predictions using scientific knowledge and understanding.
2. I can identify dependent and independent variables and can state how to make an experiment fair.
3. I can make and record observations and measurements.
4. I can identify patterns and make a conclusion from my results.
5. I can evaluate the reliability of methods and suggest possible improvements.

# How do effervescent tablets work?

## Ingredients

- Citric acid
- Sodium hydrogencarbonate
- Vitamin C
- Maltodextrin, colours (beta carotene compound [containing dextrin, acacia, vegetable oil, sodium ascorbate, DL-alpha-tocopherol] and beetroot), flavourings (orange and apple [containing maltodextrin and starch]), sweeteners (sodium saccharin, E420).



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**sodium hydrogencarbonate**

+

**citric acid**



**sodium citrate**

+

**water**

+

**carbon dioxide**

These are the **reactants** in the (neutralisation) reaction we are observing.

*What starts the reaction?*

*Why?*

**Hint**



Source: Royal Society of Chemistry

# A reaction occurs when there is...

**Collision** – the particles need to come into contact with each other for the reaction to happen.

AND they need to be the right way around.

**Energy** – the particles need to have enough energy to help break the bonds and form new products.



Source: showcake/Shutterstock

# Equation jigsaw

carbon dioxide
citric acid
water
sodium hydrogencarbonate
sodium citrate
+
+
+
→



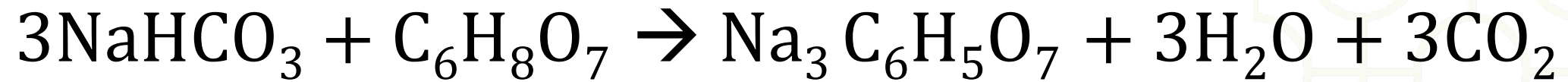
Source: iStock





# Equations

sodium hydrogencarbonate + citric acid  $\rightarrow$  sodium citrate + water + carbon dioxide



# Scientific enquiry skills

What do you think will happen when a vitamin C tablet is put in a sealed tablet tube with some water?

We are going to investigate what factors affect the time taken for the lid to pop off (this indicates the rate of the reaction).



Source: Royal Society of Chemistry

## Hazard

The lid pops off suddenly

The solution can be a mild irritant

Remember: never eat or drink anything in the lab.

Always follow instructions.

## Precaution/control measure

- Wear safety glasses or goggles to protect your eyes.
- Do not look directly down at the tube once the reaction has started.
- Make sure the tube is upright in the test tube rack.
- Do not point the tube at anyone.
- If the lid has not popped off after a few minutes, ask your teacher for help.
- Wear safety glasses or goggles.
- Wash hands after experimenting.



# Planning your investigation

1. What **variables** might affect the time taken for the lid to pop off? You should pick one variable to investigate.
2. Can you predict how changing this variable might change the time taken for the lid to pop off?
3. How will you ensure this is a **fair test**?
4. How can you make your experiment more **reliable**?





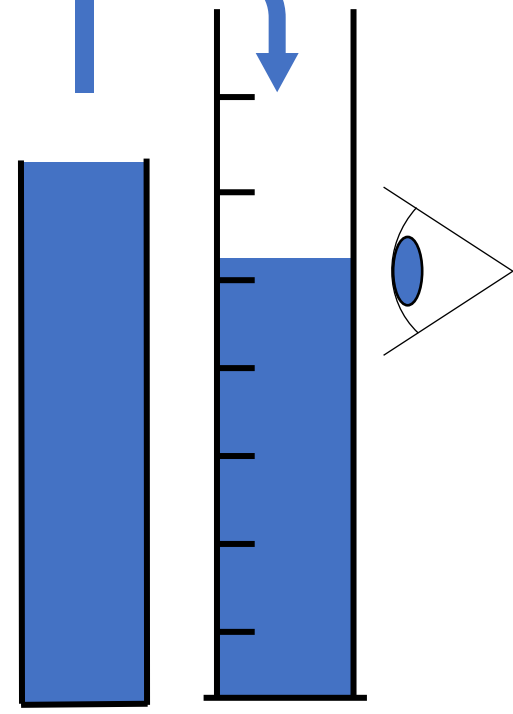
# Method

1. Remember to follow the safety instructions.
2. Fill the empty tube with water, then pour it into a measuring cylinder. Write down the volume and calculate half. This is the volume of water you will use for each repeat.
3. Measure the volume of water from step 2 and pour it into the tablet tube. Place the tablet tube in a test tube rack.
4. Put one tablet in the tube and put the lid on firmly. Work with a partner to make sure you start the timer as soon as the lid is on.
5. Stop the timer when the lid pops off.
6. Record the time taken.
7. Change your independent variable at least twice (making sure you still have a fair test) and repeat steps 3–6.

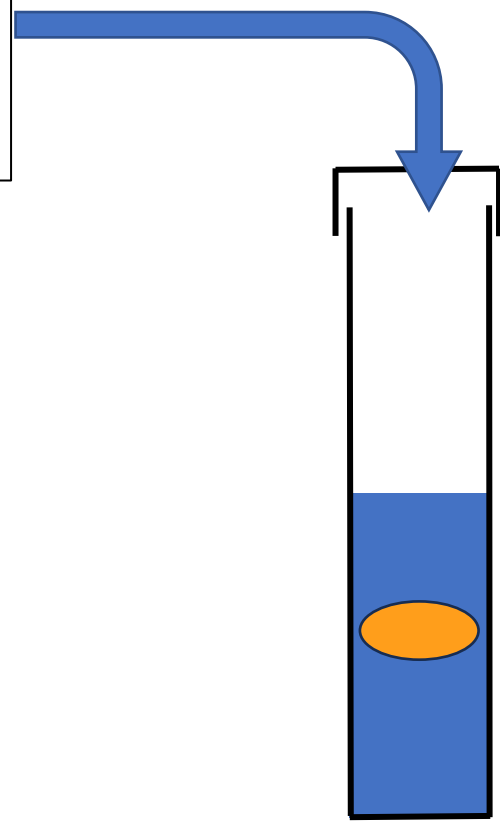
Think: how could you make your experiment more reliable?



**1** Volume of tube  
 $\div 2 = \text{_____ cm}^3$

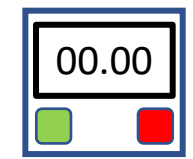


**2** \_\_\_\_\_ cm<sup>3</sup>  
 water

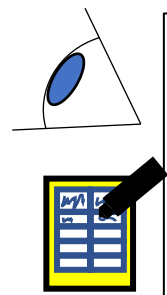


**3** Vitamin C  
 tablet

**4** Lid on.  
 Start timer



**5** Stop timer when  
 lid pops off.  
 Record time.

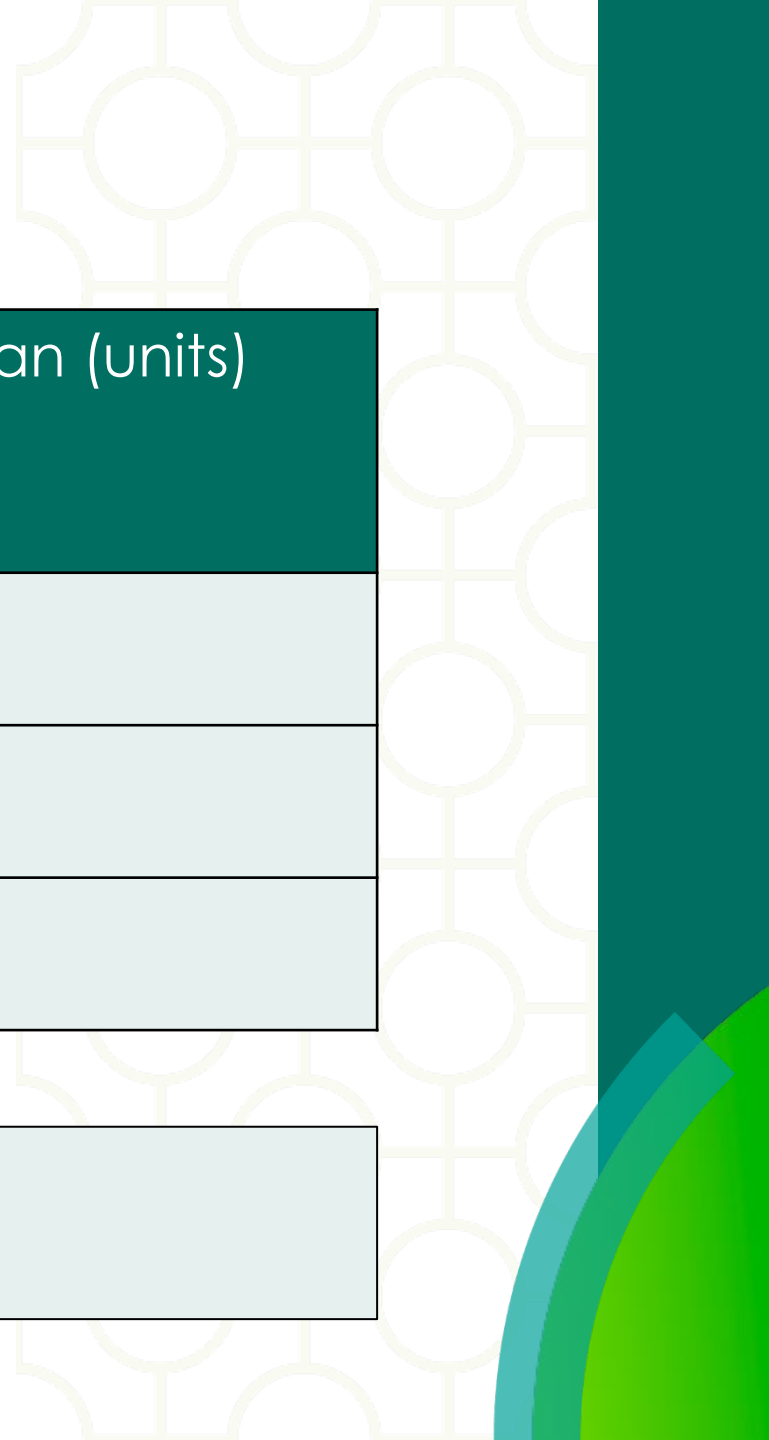




# Model results table

Independent variable (units)	Dependent variable (units) Attempt 1	Dependent variable (units) Attempt 2	Mean (units)

Conclusion





# Evaluation

1. Did your conclusion match your prediction?
2. How did you ensure your results were reliable?
3. How could you have improved your experiment?

