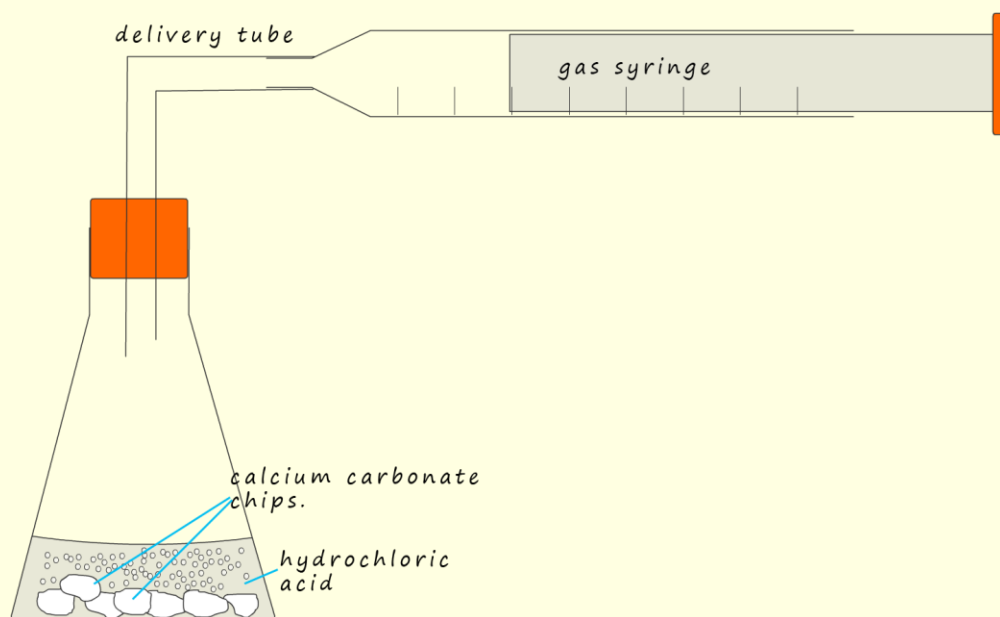


Acids and metal carbonates

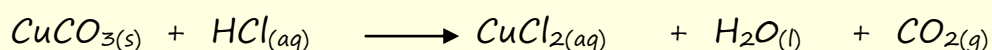
Answer all the questions below then check your answers

1. A student was investigating how the volume of carbon dioxide changed when different masses of calcium carbonate are used. She plans to use the apparatus below to measure the volume of carbon dioxide gas released.



- a. Write a word and balanced symbolic equation for the reaction of calcium carbonate and hydrochloric acid. If you need help with working out the formula for all the compounds involved then visit the page - [finding the formula](#)

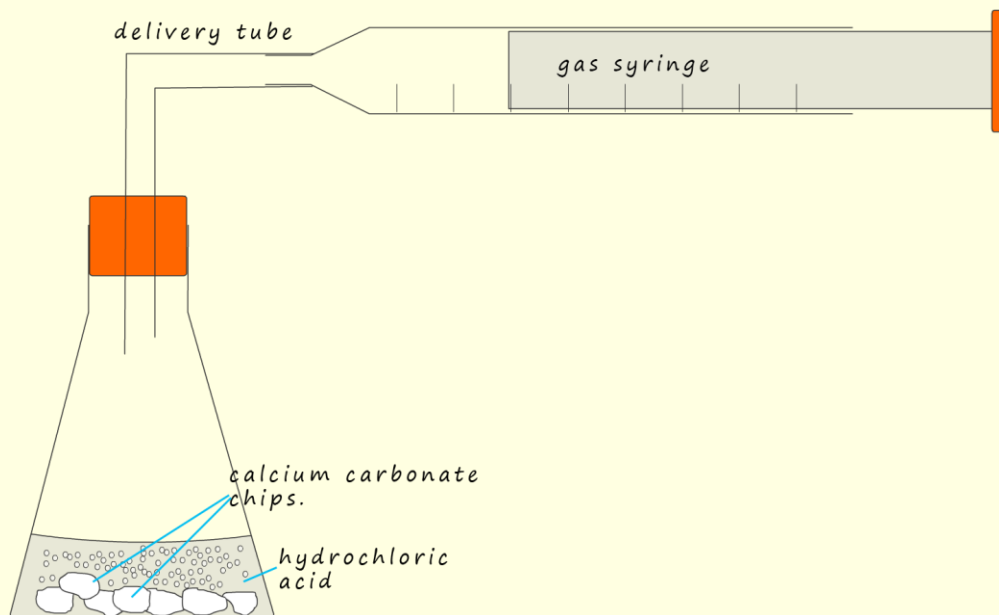
- b. The student plans to use an excess of acid in this investigation. Why would she use an excess of acid?
 - c. How will the student know when the reaction is finished?
 - d. What are the dependent and independent variables in this experiment?
 - e. What variables should the student control to ensure that her investigation is fair?
 - f. Outline a method to enable the student to collect reliable and accurate results.
2. Copper carbonate reacts with hydrochloric acid according to the equation below:



- a. Balance this equation.
- b. Describe a basic method to explain how to collect dry crystals of copper chloride from this reaction.

Answers

1. A student was investigating how the volume of carbon dioxide changed when different masses of calcium carbonate are used. She plans to use the apparatus below to measure the volume of carbon dioxide gas released.



- a. Write a word and balanced symbolic equation for the reaction of calcium carbonate and hydrochloric acid. If you need help with working out the formula for all the compounds involved then visit the page - [finding the formula](#)

calcium carbonate + hydrochloric acid \longrightarrow calcium chloride + water + carbon dioxide



- b. The student plans to use an excess of acid in this investigation. Why would she use an excess of acid? *By using an excess of acid this will ensure all the calcium carbonate reacts.*
- c. How will the student know when the reaction is finished? *Bubbling will stop/no more CO₂ released.*

d. What are the dependent and independent variables in this experiment?

independent variable: The one you change, in this case the mass of calcium carbonate used.

Dependent variable: The variable you measure- in this case the volume of CO₂ released.

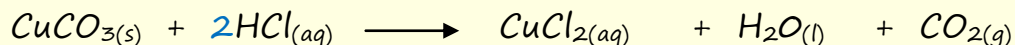
e. What variables should the student control to ensure that her investigation is fair?

- Volume of acid*
- Concentration of acid*
- Temperature, as this will affect the volume of the gas.*

f. Outline a method to enable the student to collect reliable and accurate results.

- Measure the volume of carbon dioxide gas released by using 1g,2g,3g,4g,5g,6g of calcium carbonate. This will give a good range of values for the independent variable.*
- Repeat the experiment to improve its reliability. Repeating the experiment will also enable a mean volume to be calculated and to identify any anomalous results. This will lead to more accurate results.*
- Use an excess of acid to ensure all the calcium carbonate reacts. Use acid which gives a reasonable reaction rate, probably 1M will do!.*
- Wear goggles and gloves since acid is corrosive. Have paper towels available to deal with any spills.*

2. Copper carbonate reacts with hydrochloric acid according to the equation below:



a. Balance this equation.

b. Describe a basic method to explain how to collect dry crystals of copper chloride from this reaction.

- Measure out 25ml of 1M hydrochloric acid into a conical flask
- Slowly with stirring add the copper carbonate, keep on adding the copper carbonate until the reaction stops. Swirl to ensure the reaction has finished. Then add a few more spatulas of copper carbonate. The copper carbonate needs to be in excess to ensure all the acid has reacted. Swirl the flask.
- Next filter to remove the excess copper carbonate.
- Pour the filtrate (the copper chloride solution) into an evaporating basin on a water bath and heat until approximately 80% of the solution has evaporated. Leave the apparatus to cool then place the evaporating basin somewhere warm to allow the remaining water to evaporate and leave crystals of copper chloride.
- Place the crystals in a desiccator to dry them.