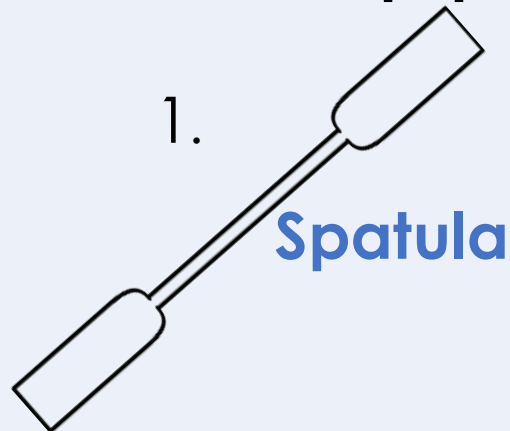
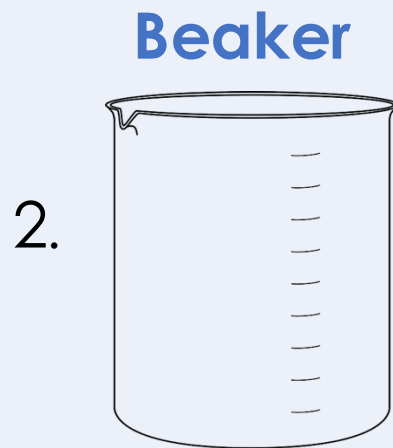


Making Soluble Salts 2

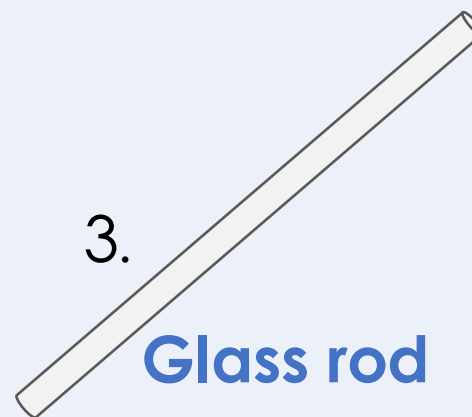
Name the equipment shown below.



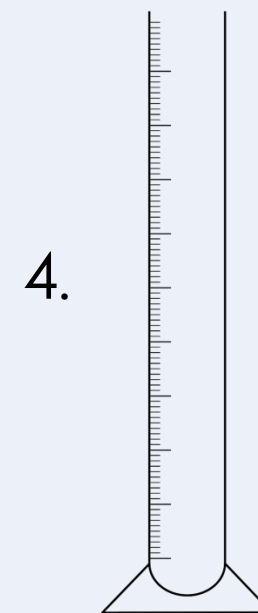
Spatula



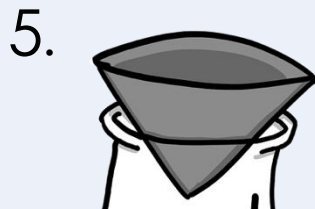
Beaker



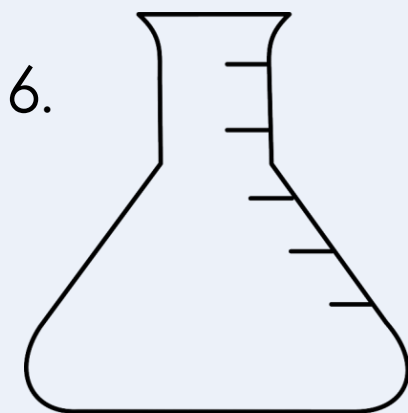
Glass rod



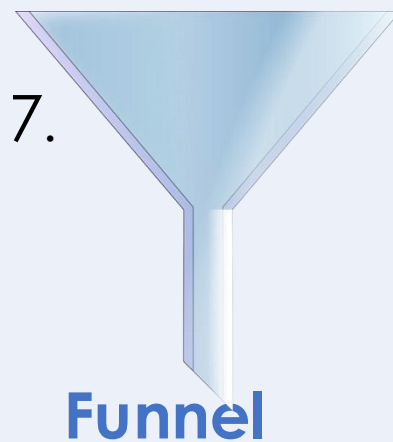
Graduated cylinder



Filter paper



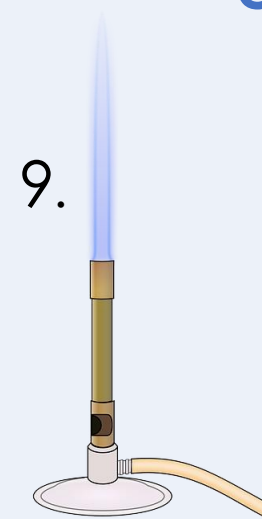
Conical flask



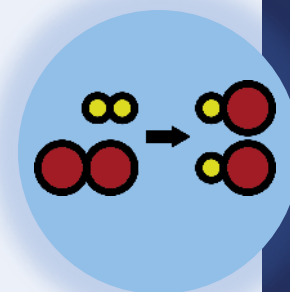
Funnel



Evaporating dish



Bunsen burner



Making Soluble Salts 2

C3.2.11

Science
Mastery



C3.2.1 Prior Knowledge Review

C3.2.2 Relative Formula Mass

C3.2.3 Percentage by Mass

C3.2.4 Conservation of Mass

C3.2.5 Balancing Equations

C3.2.6 Uncertainty

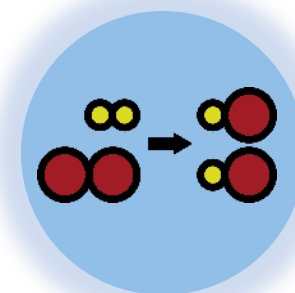
C3.2.7 Introducing Concentration

C3.2.8 Concentration Calculations

C3.2.9 Soluble Salts

C3.2.10 Making Soluble Salts

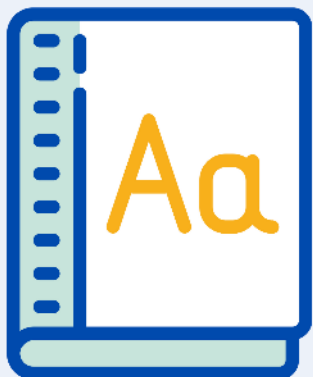
➤ **C3.2.11 Making Soluble Salts 2**



Following this lesson, students will be able to:

- Justify the techniques used for the practical activity to prepare a pure, dry sample of a soluble salt
- Explain how to measure volumes of liquid accurately
- Evaluate the quality of crystals produced

Key Words:



meniscus

accurate

justify

concentration

volume

crystals

This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
 - **reteach, explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
 - **practise** answering specific questions or of key skills.
 - **redrafting** or **improving** previous work.

Answer the questions below.

1. Which of the following is a precaution when preparing a soluble salt?
 - ☐ A. Concentrated acid is corrosive.
 - ☒ B. Allow hot glassware to cool before touching it.
 - ☐ C. Concentrated acid can cause chemical burns.
2. After which process/technique are you left with a copper oxide residue?
 - ☐ A. crystallisation
 - ☐ B. evaporation
 - ☒ C. filtration
3. Once the copper sulfate solution is prepared, why do we evaporate off some water using the Bunsen burner?
 - ☐ A. to make the solution stronger
 - ☐ B. to make the reaction happen faster
 - ☒ C. to make the solution more concentrated

Exit ticket

Let's examine our copper sulfate crystals carefully



Large crystals form slowly.

Perhaps the water evaporated over a few days.

Small crystals form quickly.

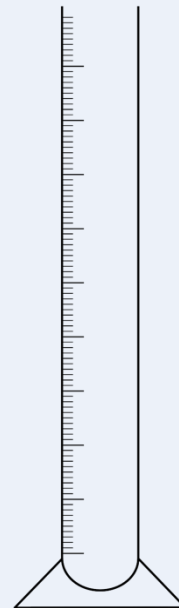
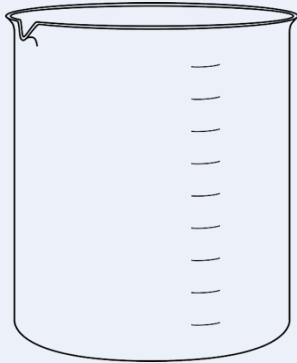
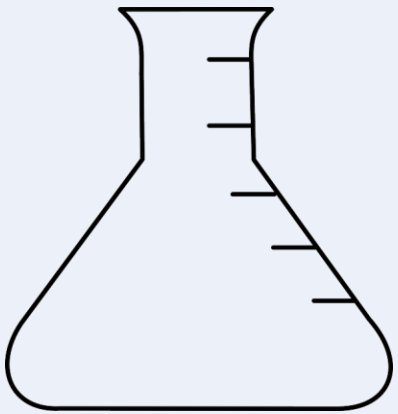
Perhaps the water was evaporated quickly using a Bunsen burner.

What does it mean if the crystals aren't clear blue, or if there's some grey or black colouring? **The black copper oxide powder wasn't all removed by filtration. Filtration needs to be improved.**

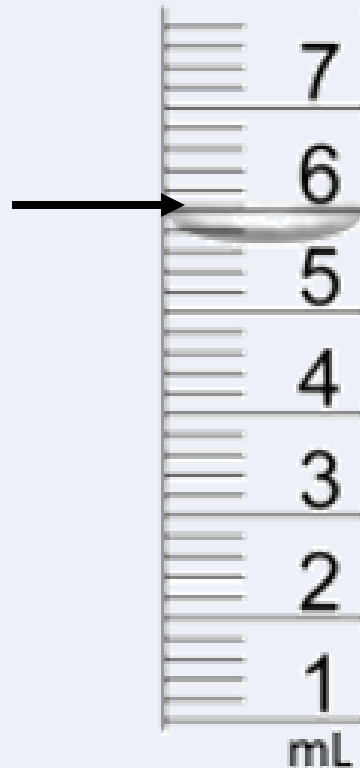
Measuring volume of liquids

1. Measure 40 cm³ sulfuric acid into the 100 cm³ beaker. The volume does not need to be very accurate, so you can use the graduations on the beaker.

What should we use to measure the volume of liquids if we **do** want to be very accurate?



5.6 mL



Evaluating our method

What could we have changed to improve this method?

6. Set up the filter funnel and paper over the conical flask. Use the clamp stand to hold the funnel.
7. Filter the contents of the beaker from step 3.

How could we improve this method to ensure that **all** of the copper oxide was filtered out of the solution?

- Sprinkle a small amount of water onto the filter paper before filtering so it sticks to the funnel.
- Only pour a small amount of solution into the filter paper at a time.
- Give it time to drip through the filter paper. Don't swirl the funnel or poke with a glass rod!

**Use thumbs up or down to show if each statement is true or false.
Rewrite the false statements to make them true.**

1. The volume of a liquid in a cylinder is measured from the highest point of the meniscus.



It is read from the BOTTOM of the meniscus

2. Which graduated cylinder is more accurate than a beaker when measuring the volume of a liquid.



3. Pure crystals should only be one colour.



4. Large crystals form fast whereas small crystals form slowly.



Large crystals form SLOW whereas small crystals form FAST.

5. When making soluble salts, the acid is gently heated to evaporate the water before crystallisation



Acid is heated so that the neutralisation reaction happens faster

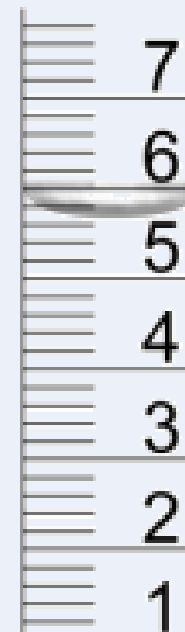
Read this basic method to prepare a soluble salt.

1. The solid is added to the acid until no more reacts.
2. Excess solid is filtered off to produce a solution of the salt.
3. The solution is heated a bit.
4. This concentrated salt solution is crystallised to produce solid salts.
5. The salt is patted dry between two pieces of filter paper.

Suggest 3 improvements that could be made to this method.
Explain why they would improve the method

Drill

1. What is a meniscus?
2. How do you measure the volume of a liquid accurately?
3. What is the volume of this liquid?
4. Why is the acid heated gently?
5. Why is copper oxide added in excess?
6. What pieces of equipment is used for filtration?
7. What pieces of equipment are used for crystallisation?
8. During the crystallisation process, large crystals formed.
What does this tell you?
9. Some parts of the crystal appear black. Why might this be?



Drill answers

1. The bottom part of a curve over liquid in a container
2. To measure the volume of a liquid accurately use a graduated measuring cylinder
3. 5.6 cm^3
4. To speed up the reaction
5. Copper oxide is added in excess to ensure that all the acid has reacted
6. A conical flask, funnel and filter paper are used for filtration
7. Evaporating dish, pipe clay triangle, Bunsen burner, tripod and heat proof mat are used for crystallisation
8. Large crystals are formed if the water evaporated slowly from the salt solution
9. Some copper oxide got into the filtrate. So, the crystals appear black

I: Improving a method

1. The copper sulfate is added to hydrochloric acid until no more reacts.
2. Excess copper oxide is sieved out to produce a solution of the copper sulfate.
3. The solution is heated for until it becomes a white powder.
4. The salt is patted dry between two pieces of filter paper.

Spot the mistakes in this method and **suggest** how you will change to improve it.

1. The reaction is between copper oxide and sulfuric acid. Copper sulfate is being made. Make sure to use the correct names of reactants

2. Using the word 'sieved'. This is not the scientifically correct key word. You must use filtered.

3. Heat the solution until it becomes a white powder. The solution has been heated for too long. We must heat gently until a small amount of water is left.

We: Improving a method

1. The copper oxide is added to excess hydrochloric acid.
2. Unreacted copper oxide is filtered out.
3. The copper chloride solution is left on a windowsill to produce big crystals.
4. The salt is patted dry between two pieces of filter paper.

Spot the mistakes in this method and suggest how you will change to improve it.

1. Using excess hydrochloric acid means you can't easily tell if an acid has reacted. Copper oxide is used in excess to ensure that the acid has reacted completely not the acid.
2. There is no excess copper oxide as any that is added would have reacted. Always ensure that copper oxide reacts completely and then add another spatula full until no more copper oxide reacts.
3. Using a windowsill to evaporate the water does work but its not part of good scientific method. Use a water bath or heat gently with a Bunsen burner.
4. Why would you pat dry crystals that are already dry? Do not include this step in this method.

You: Improving a method

1. Add exactly 20 cm³ of sulfuric acid to four spatulas of copper oxide
2. Unreacted copper oxide is filtered out using a beaker and funnel.
3. The copper sulfate solution is heated on a yellow flame for 5 minutes
4. The salt is patted dry between two pieces of filter paper.

Spot the mistakes in this method and suggest how you will change to improve it.

1. **Adding exactly 20cm³. You don't need a precise volume of acid. As long as it is close to 20 cm³ it is fine.**
2. **Adding 4 spatulas of copper oxide when 2 may have been enough. Chemists do not waste chemicals; you will add incremental amounts until no more is needed.**
3. **A beaker and funnel cannot be used for filtration. Use a funnel, conical flask and filter paper.**
4. **Heating with a yellow flame. You heat with a blue flame and can control the intensity of the flame from the chimney of the Bunsen burner or the gas tap.**

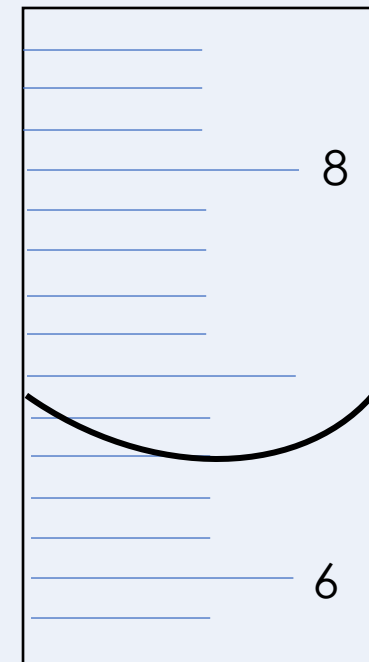
Answer the following questions.

1. Which piece of equipment would give the most precise measurement of volume?

- ☒ A. Graduated cylinder
- ☐ B. Beaker
- ☐ C. Both A and B

2. What volume of water is in the graduated cylinder pictured?

- ☒ A. 6.6 mL
- ☐ B. 7.2 mL
- ☐ C. 7 mL



3. Why do we need to heat the acid when preparing a solution of copper sulfate?

- ☐ A. So the water starts to evaporate for crystallisation
- ☒ B. So the reaction happens faster
- ☐ C. So that bigger crystals will form

Lesson C3.2.11

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)
or by emailing sciencemastery@arkonline.org
Thank you!