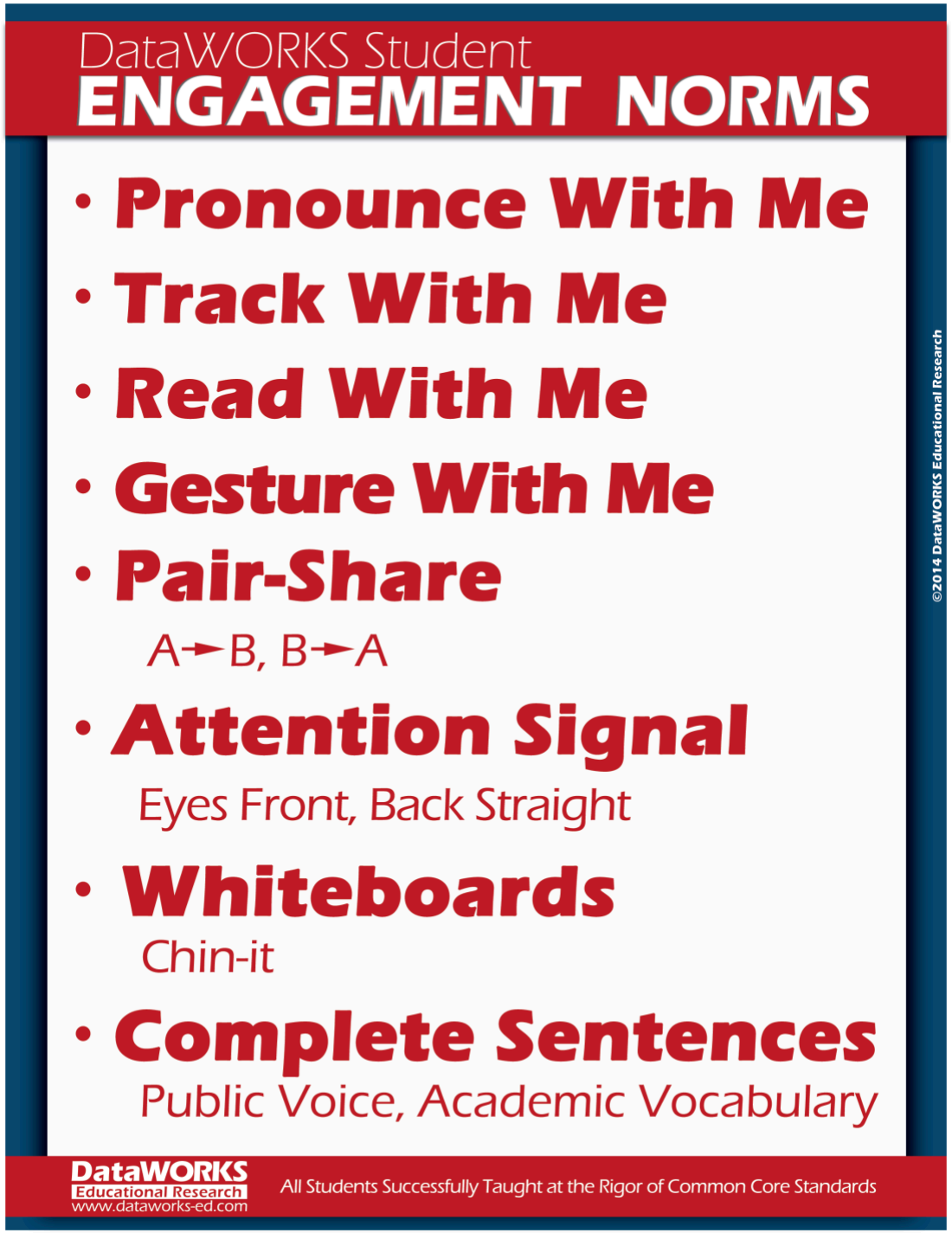
SAFETY BAY SENIOR HIGH SCHOOL

imagine believe achieve

Science relies on measuring with accuracy

Year 7 Science

Mr Groznica



- **Pronounce with me** – Supports English learners and all other students with help pronouncing difficult vocabulary
- **Track with me** – Helps students begin to read new words by connecting the words they hear to the written words
- **Read with me** – Gives student opportunity to read the words
- **Gesture with me** – Stores information in multiple pathways in the brain by incorporating a kinesthetic movement.
- **Pair-share** – Processes information by sharing with a partner. Provides students with an opportunity to vocalize their response in their own words.
- **Attention Signal** – Helps cut down lost instructional time by refocusing the class with a simple command
- **Whiteboard** – Check to determine if students are learning and thinking so that the correct effective feedback can be provided.
- **Complete Sentences** – Require students to respond using the newly introduced academic vocabulary.

Daily Review

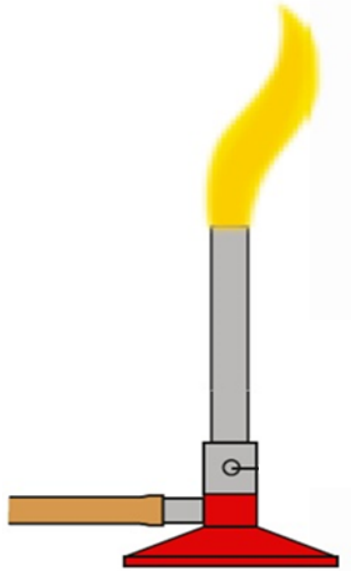
Reviewing what we know

Re(teach)

Characteristics of the Yellow Flame

Read / track with me:

- Air holes closed
- Safety Flame
- Relatively Cool
- Highly Visible
- Dirty Flame

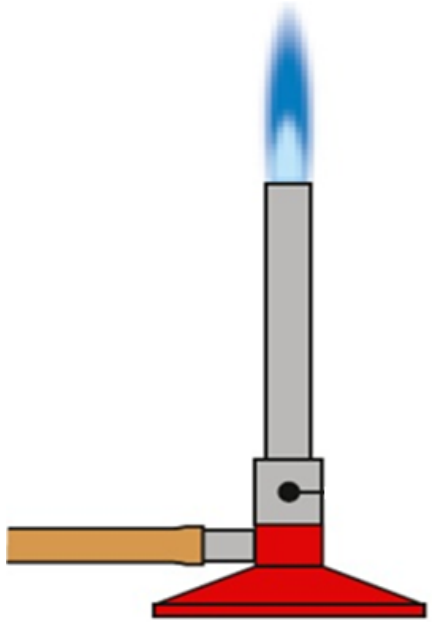


Re(teach)

Characteristics of the Blue Flame

Read / track with me:

- Air holes open
- Heating Flame
- Relatively Hot
- Difficult to see
- Clean Flame



Retrieve

Finish the sentence.

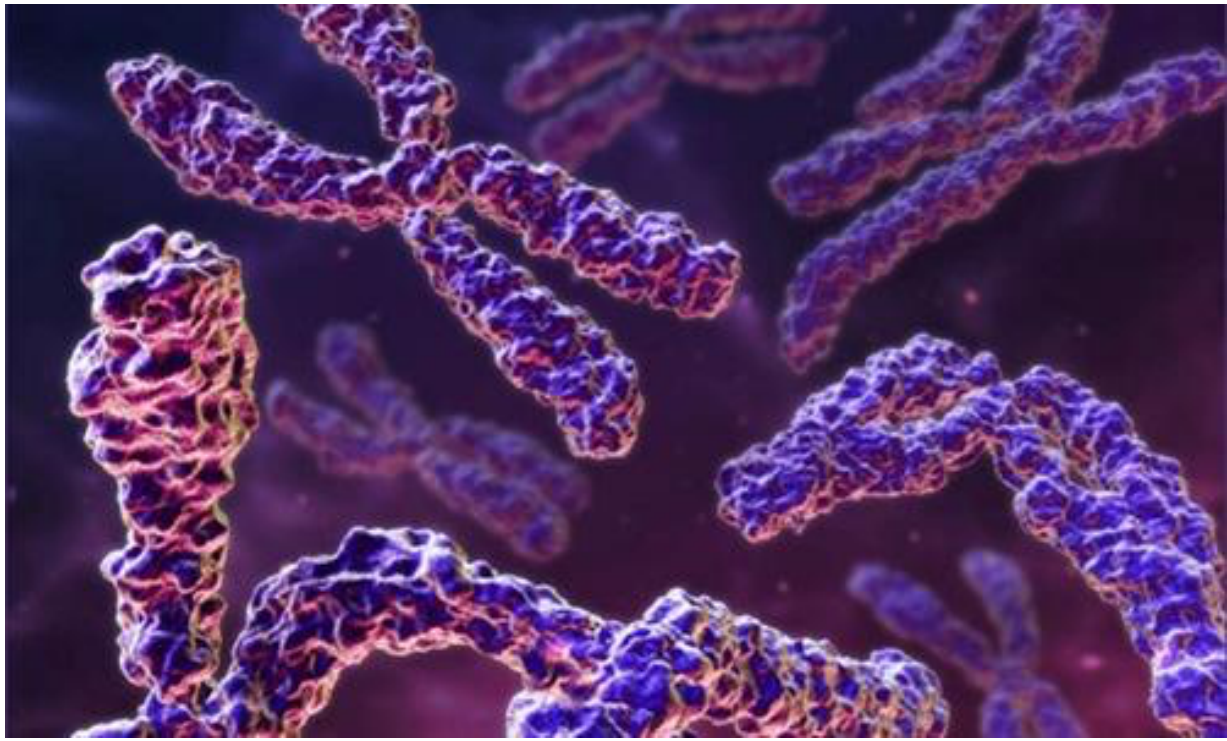
The _____ flame is much hotter than the _____ flame.

Re(teach)

Read / track with me:

Biology

Biologists study living things. There are many different branches of biology. A zoologist studies animals and a botanist studies plants. An entomologist studies insects while a microbiologist studies small living things that can only be viewed under a microscope.



Retrieve

Finish the sentence.

is t__ s____ of l_____ t____.

Re(teach)

Read / track with me:

» Filter funnel

» Thermometer

» Test tube holder

» Measuring cylinder

» Test tube rack

» Tripod stand

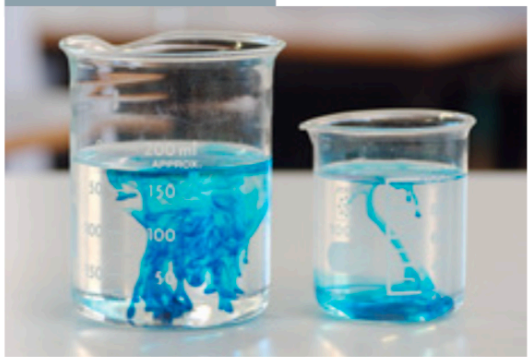
» Retort stand with boss head and clamp

» Bunsen burner

Re(teach)

Read / track with me:

» Beaker



» Watch glass

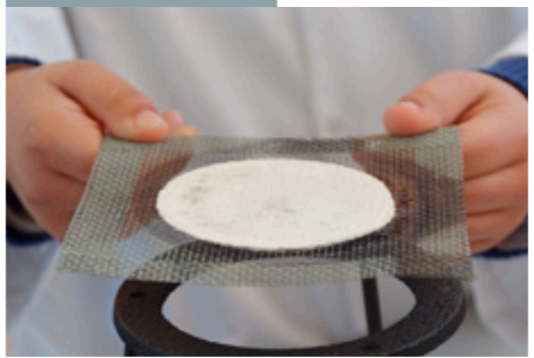
» Conical flask

» Spatula

» Test tube

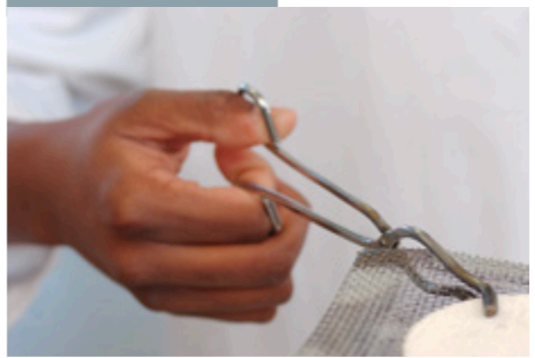
» Stirring rod

» Gauze mat



» Evaporating dish

» Metal tongs

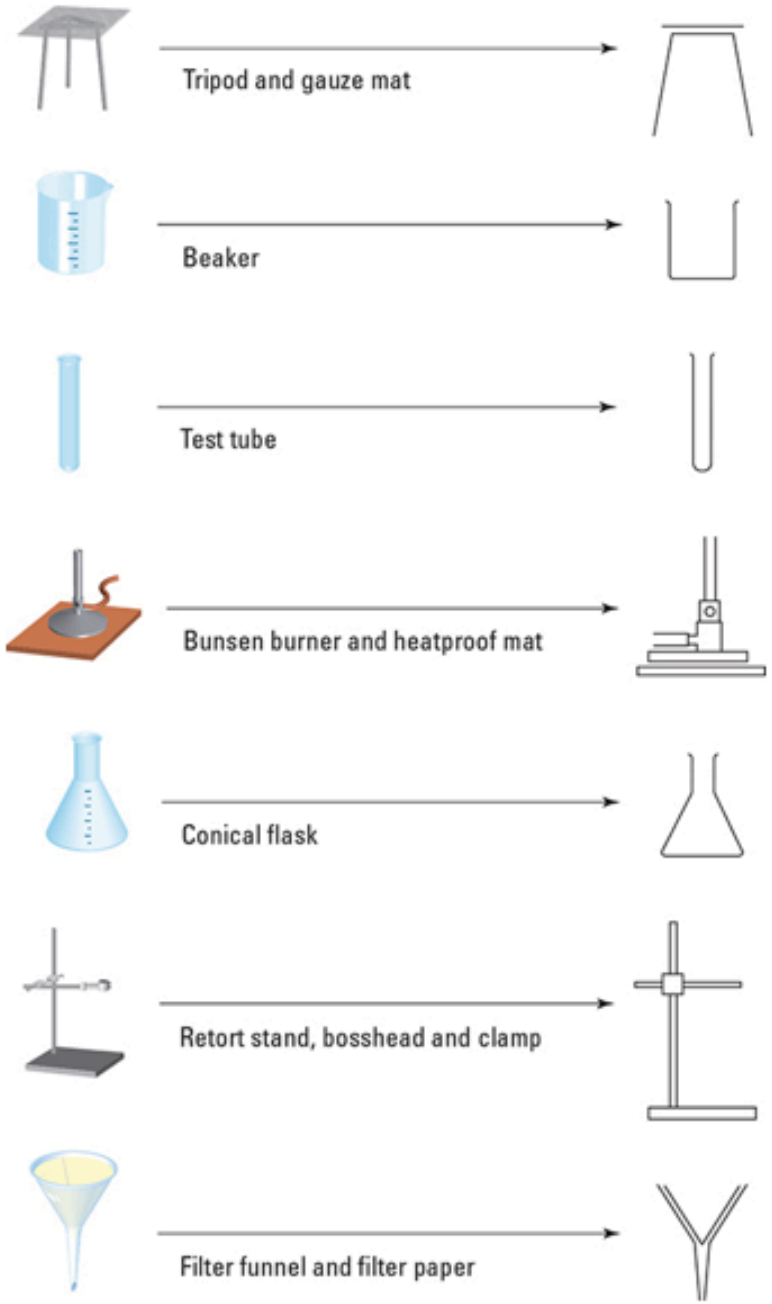


Re(teach)

Read / track with me:

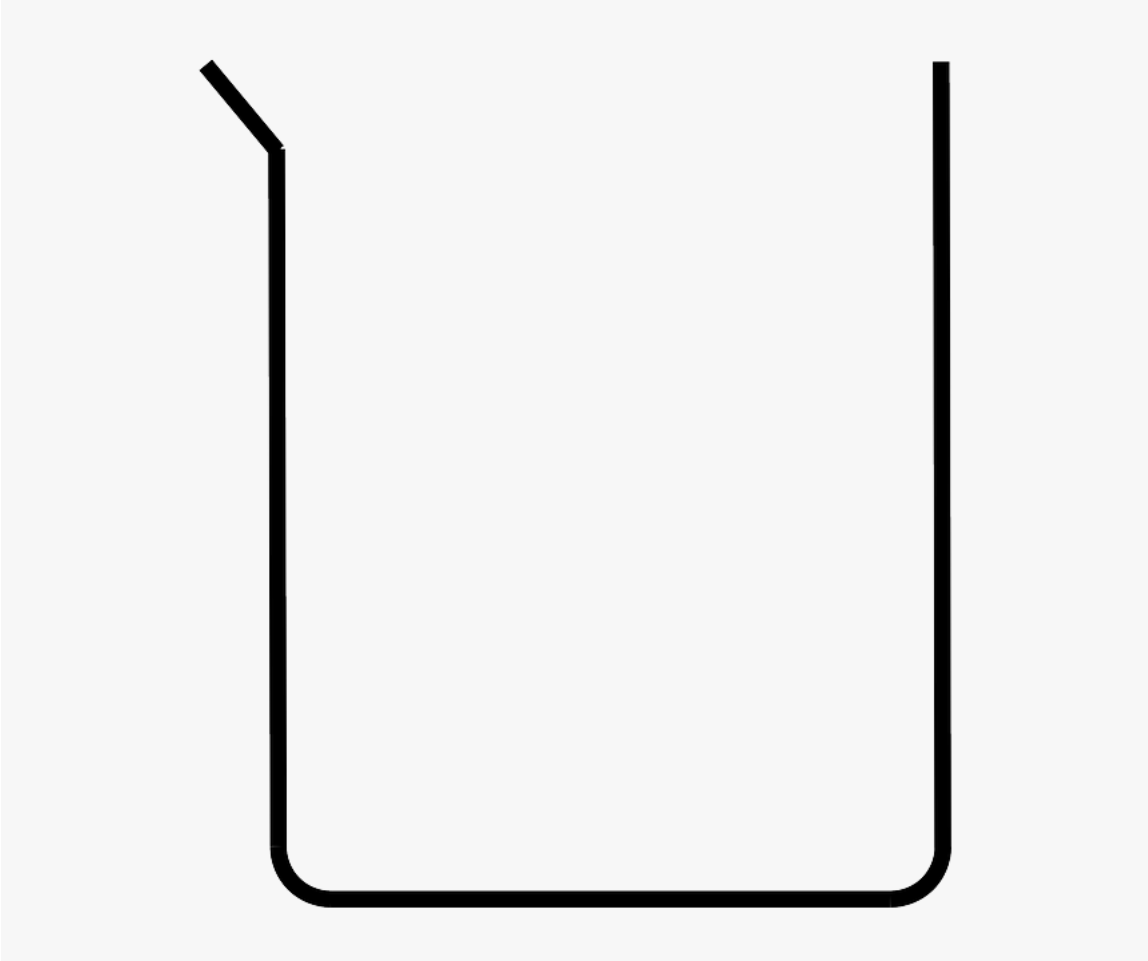
When we draw science equipment we turn a 3D object into 2D lines to make it as simple and neat as possible.

This is called scientific drawing.



Retrieve

Name this piece of equipment:



Retrieve

What piece of equipment would we use to measure:

temperature?

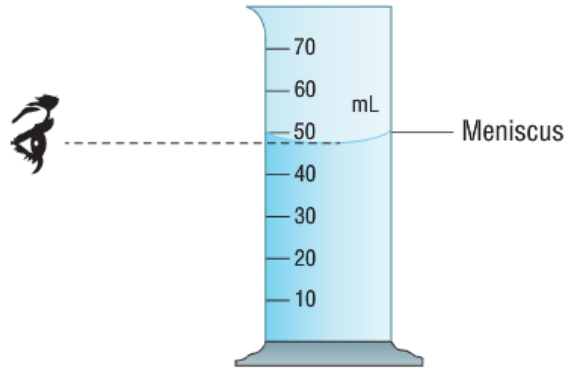
Apply

Draw this equipment as a scientific drawing:

Conical flask

New Topic

What we are learning today



Students will be able to:

Learning Objective

Science relies on measuring with accuracy

Check for Understanding

What are we learning today (own words)?

Think - Pair - Share

Success Criteria

- Describe how units of measurement have changed over time
- List a range of units of measurement from the metric system and the symbols used to communicate them
- Describe some common instruments that are used to measure accurately
- Understand and explain how to accurately measure data using a variety of different pieces of equipment

YEAR 7 Transition 1

	MUST	Check	Teacher Initial	SHOULD	Check	Teacher Initial	COULD	Check	Teacher Initial
I can	**Identify questions that can be investigated, plan and conduct fair experiments showing logical steps in method and identify how variables will be changed and measured.**			**Identify questions that can be investigated, plan and conduct fair experiments showing logical steps in method and identifying variables to be changed and measured.**			**Identify questions that can be investigated, plan and conduct fair experiments, identifying variables to be changed and measured.**		
	State that science is the knowledge attained through study or practice.			Describe the nature of science. Understands why are curiosity and asking questions important.			Explain the nature of science. Explains that science measures what we observe and organises it into testable explanations.		
	State what makes a person a scientist.			Describe what constitutes a scientist.					
	Understand that scientists focus on asking questions and finding answers.			Suggest scientific questions to explore.			Suggest specific scientific questions to explore.		
	Understand what an experiment is.			Explain how an experiment is different to other types of investigations.					
	Name some pieces of specialised science equipment.			Name and describe a variety of pieces of specialised science equipment.			Name and describe a variety of pieces of specialised science equipment and states what they are used for.		
	Draw a scientific diagram of some scientific equipment.			Draw a detailed scientific diagram of scientific equipment.			Draws detailed, labelled scientific diagrams showing all equipment used.		
	Use a Bunsen burner safely.			Use a Bunsen burner safely and accurately.			Explain the difference between the two flames that can be created by the Bunsen burner.		
	List a range of units of measurement form the metric system.			List a range of units of measurement from the metric system and the symbols used to communicate them.			Explain how units of measurement have changed over time.		
	List a range of units of measurement.			Describe some common instruments that are used to measure accurately.			Understand and explain how to accurately measure data using a variety of different pieces of equipment.		

Activate Prior Knowledge

Think-pair-share:

Pair-share:

Brainstorm as many different units of measurements as you can think of and group them into categories based on the type of measurement (e.g. length, mass, temperature).

CFU

List two things that you measured today.

Concept Development

Old ways of measuring

CFU 1

Why do you think it's a problem to use body parts as a measuring tool?

For thousands of years, distances have been measured by comparing them to parts of the human body.

Some countries, such as the USA, measure distance in feet.

Examples

OLD UNIT	CIVILISATION	ESTIMATED EQUIVALENT TODAY
Royal foot	Ancient Egypt	25.4 cm
Royal cubit	Ancient Egypt	52.4 cm
Finger	Ancient Mesopotamia	1.9 cm
Palm	Ancient Mesopotamia	7.5 cm
Fathom	Ancient Mesopotamia	1.8 m
Knuckle	Ancient Greece	3.9 cm
Lick	Ancient Greece	15.4 cm

We now use a standard system.

Concept Development

Measurement and units

CFU 1

What laboratory equipment do we use to measure time?

To get the best results from your experiments, it is important that you use the correct equipment.

Different equipment is used to measure different quantities in different units.

Quantities such as temperature, length, mass and time have units.

Example

Quantity	Units and symbols	Laboratory equipment examples
Time	Second (s) Minute (min) Hour (h)	Stopwatch

Concept Development

Measurement and units

Units – standard measurement.

The metric system is used by scientists world wide.

Examples

Figure 1.21 Length Measurements of length can be shown using a unit called metres, with the symbol 'm'. For long distances, **kilometres (km)** are used. For short distances, **centimetres (cm)** or **millimetres (mm)** can be used. In school science, the devices we use to measure length and distance are the trundle wheel (pictured), metre rule and tape measure.

Figure 1.22 Mass This measures the amount of **matter** or substance in an object. Mass is measured in units called **grams (g)**, **kilograms (kg)** and **tonnes (t)**. Smaller masses are measured in **milligrams (mg)**. Mass-measuring devices are called scales or balances. You will use an electronic balance to measure mass.

CFU 1

Explain the definition in your own words.

Units . . .

CFU 2

Measurements of mass have the units called . . .

CFU 3

Measurements of length have the units called . . .

Concept Development

Measurement and units

Units – standard measurement.

The metric system is used by scientists world wide.

Examples

Figure 1.23 **Time** A watch or clock set to the correct time tells you the time of day. A stopwatch measures how much time has passed. In your experiments, measurements of time will often have the unit called **seconds (s)**.

Figure 1.24 **Temperature** This is usually measured using a thermometer. Some thermometers have a digital scale. Measurements of temperature have the unit called degrees **Celsius**. Its symbol is '°C'.

CFU 1

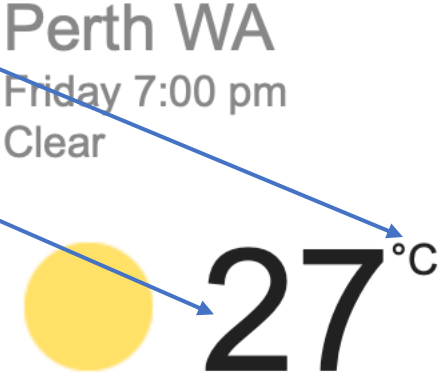
Measurements of temperature have the unit called . . .

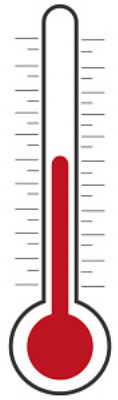
Concept Development

Recording measurement

Measurements have two parts: a number and a unit.

Quantity	Units and symbols	Laboratory equipment examples
Time	Second (s) Minute (min) Hour (h)	Stopwatch
Temperature	Degrees Celsius (°C)	Thermometer Temperature probe
Length	Millimetre (mm) Centimetre (cm) Metre (m) Kilometre (km)	Ruler
Mass	Gram (g) Kilogram (kg)	Electronic balance
Volume (liquids)	Millilitre (mL) Litre (L)	Measuring cylinder
Volume (regular solids)	Centimetres cubed (cm^3) Metres cubed (m^3)	Ruler (length × breadth × height)



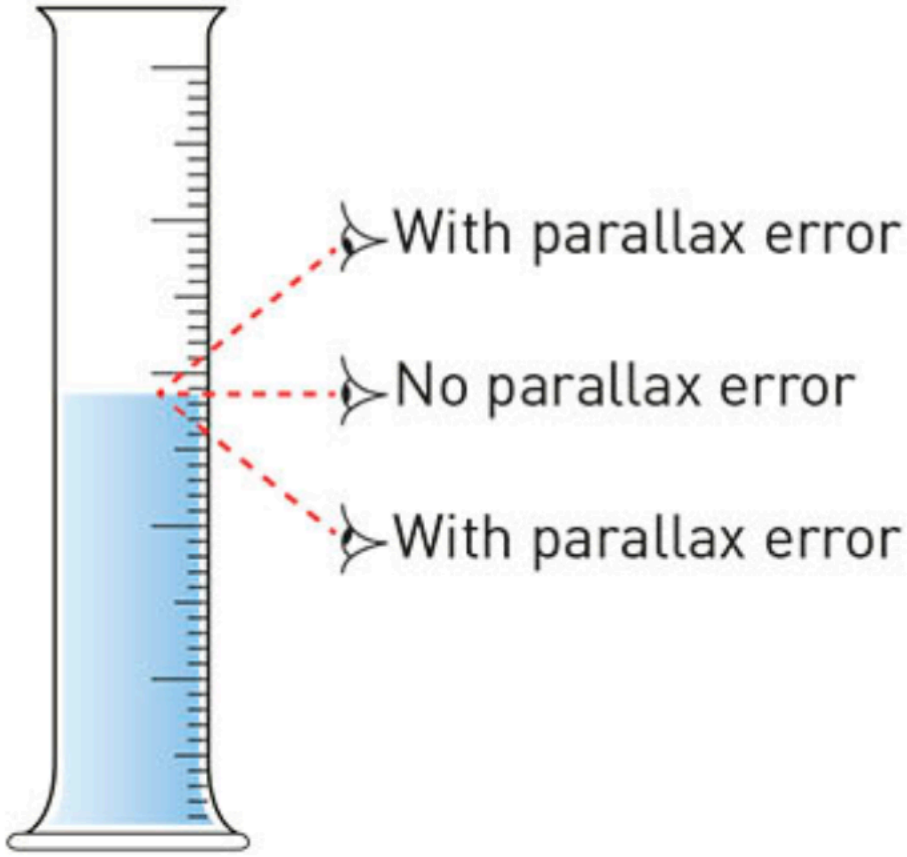


Concept Development

Measuring accurately

Accuracy – careful and correct measurement.

Error – the unavoidable and random inconsistency in measurement.



Parallax error occurs when you read a scale from an angle.

Skill Development

Guided Practice

Vocabulary

Meniscus – the curved part or the surface of the liquid.

H

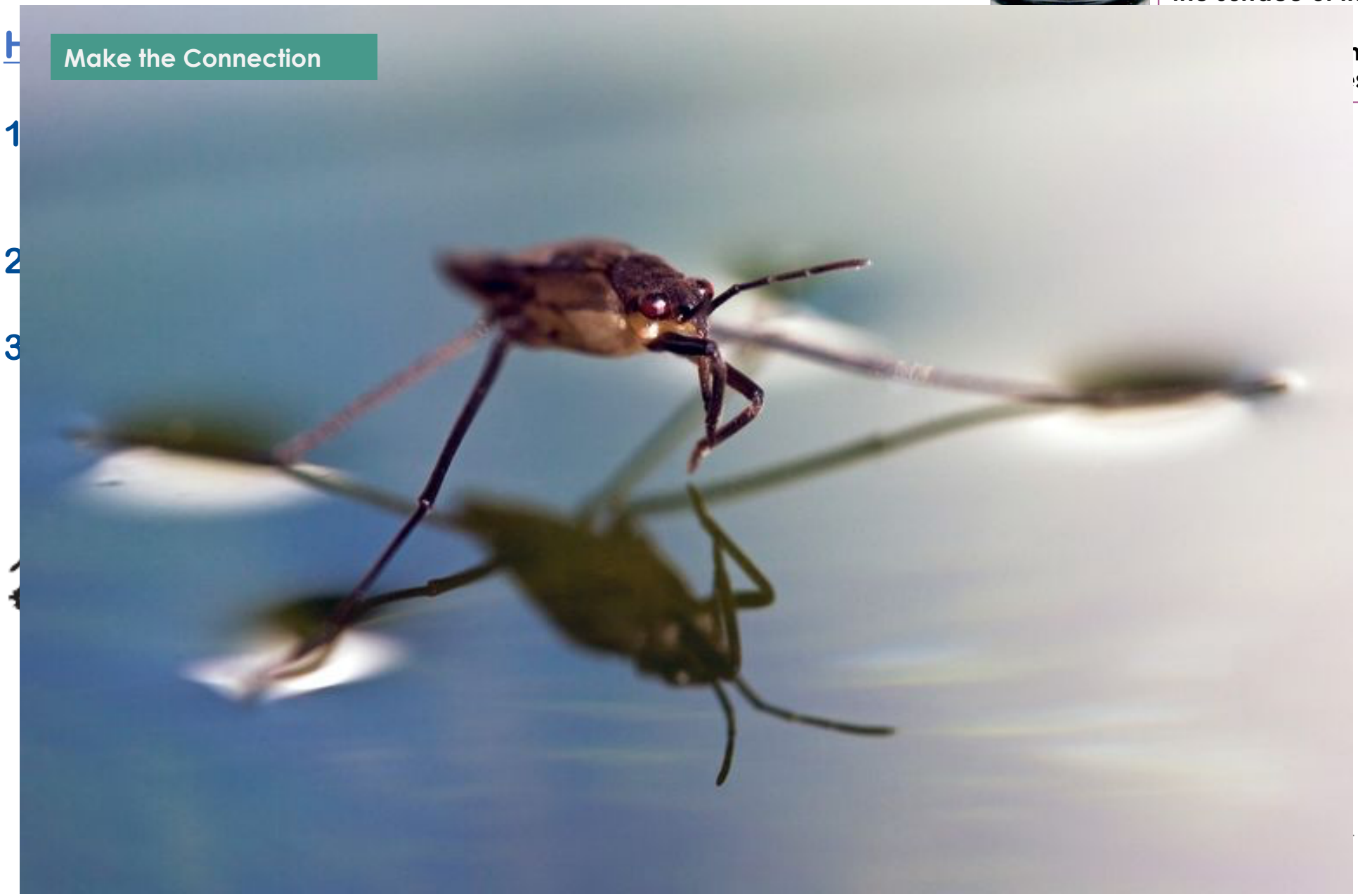
1

2

3

much space
s up

Make the Connection

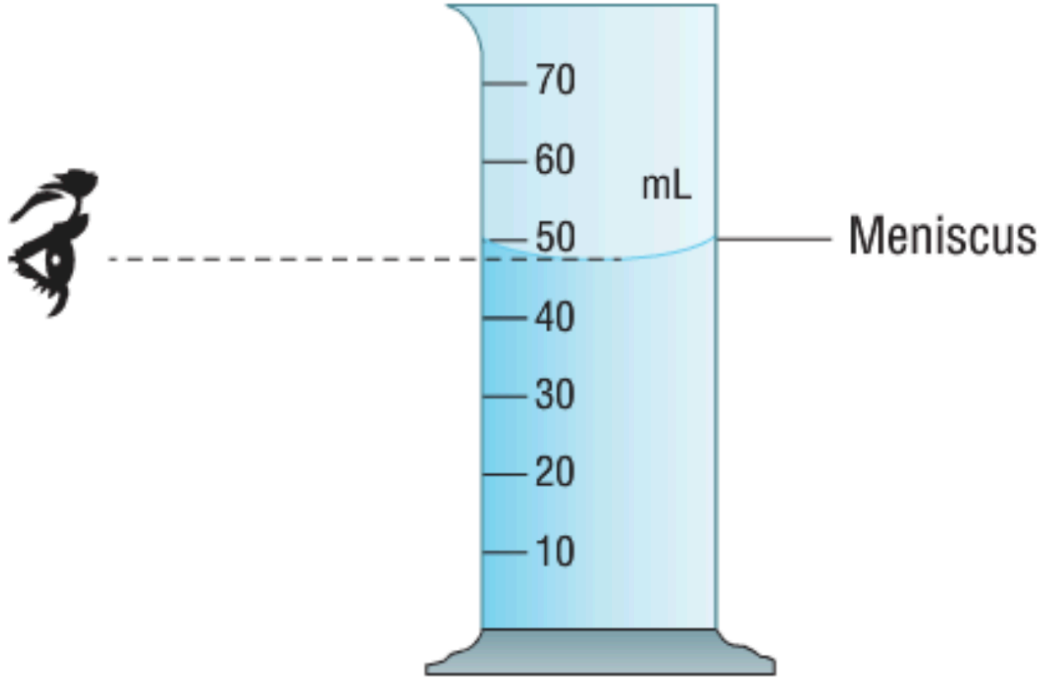


this

Skill Development | Guided Practice

How to use a measuring cylinder correctly?

1. Place the measuring cylinder on a flat surface.
2. Look in line with the top of the liquid.
3. Read the liquid level at the bottom of the meniscus.

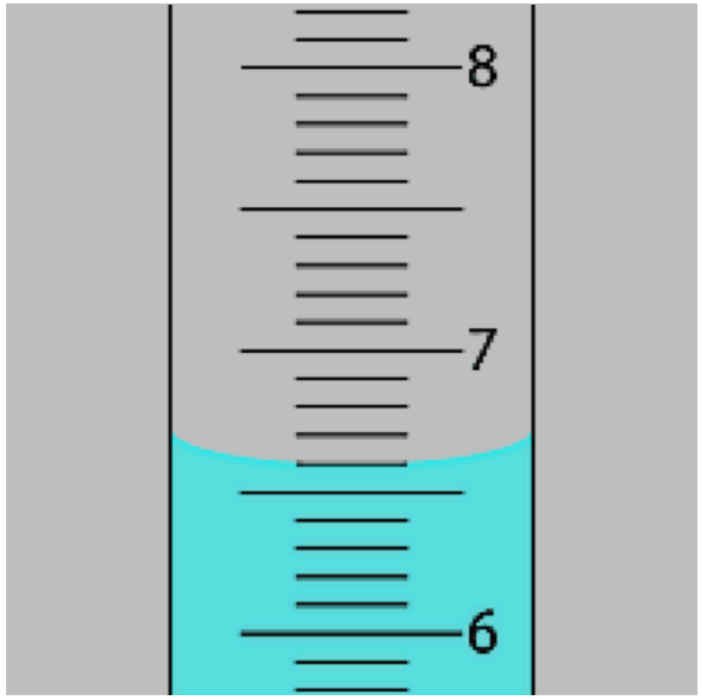


Vocabulary

Meniscus – the curved part on the surface of the liquid .

Volume – how much space something takes up

Question 2

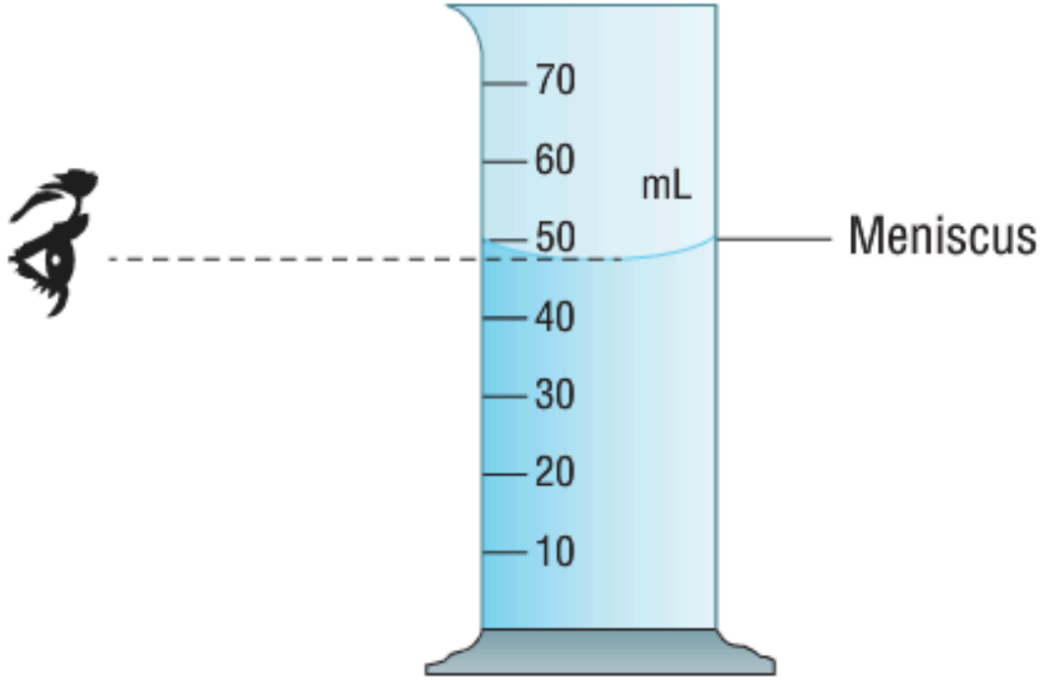


What is the volume of the liquid in this graduated cylinder?

Skill Development | Guided Practice

How to use a measuring cylinder correctly?

1. Place the measuring cylinder on a flat surface.
2. Look in line with the top of the liquid.
3. Read the liquid level at the bottom of the meniscus.

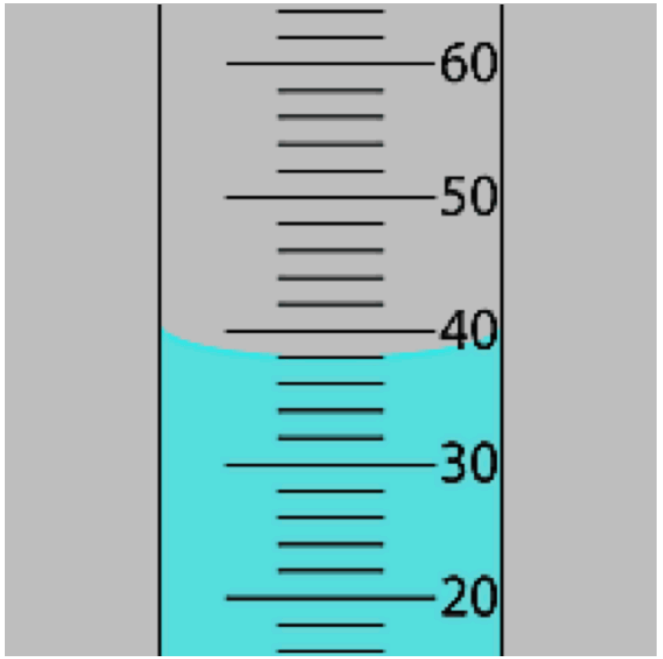


Vocabulary

Meniscus – the curved part on the surface of the liquid.

Volume – how much space something takes up

Question 3



What is the volume of the liquid in this graduated cylinder?

Relevance

Why learn about how science relies on measuring with accuracy?

Whether you are always aware of it or not, you use measurements every day. You may buy milk in a 1 litre carton and ask for 200 grams of ham at the supermarket. You might walk 800 metres to school each day. If you are ill, a doctor will measure your body temperature to see if it varies from the normal 37° Celsius. Each time you look at your watch you are measuring time. Measurements are, and have always been, an important part of life and science.

A temperature of 37 ^{0}C is the same in Kolkata, India, and in Marble Bar in WA.

First Independent Practice & Lesson Closure

Success Criteria: *whiteboards*

Rearrange the letters of each of the words below to work out what is being measured.

A sams _____

B tereprmueat _____

C emit _____

D uvelmo _____

First Independent Practice & Lesson Closure

Success Criteria: *whiteboards*

Use the clues below to determine the unit of measurement.

A equal to 100 cm _____

B 60 minutes worth _____

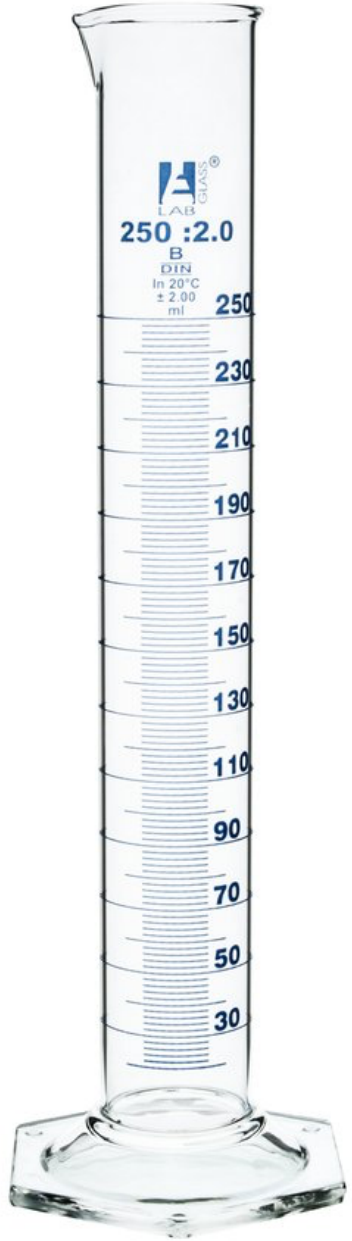
C this unit sounds like ‘degrease’ and tends to heat up _____

1 kilometre = 1000 metres
1 metre = 100 centimetres
1 centimetre = 10 millimetres

First Independent Practice & Lesson Closure

Success Criteria: *whiteboards*

What is a meniscus?



First Independent Practice & Lesson Closure

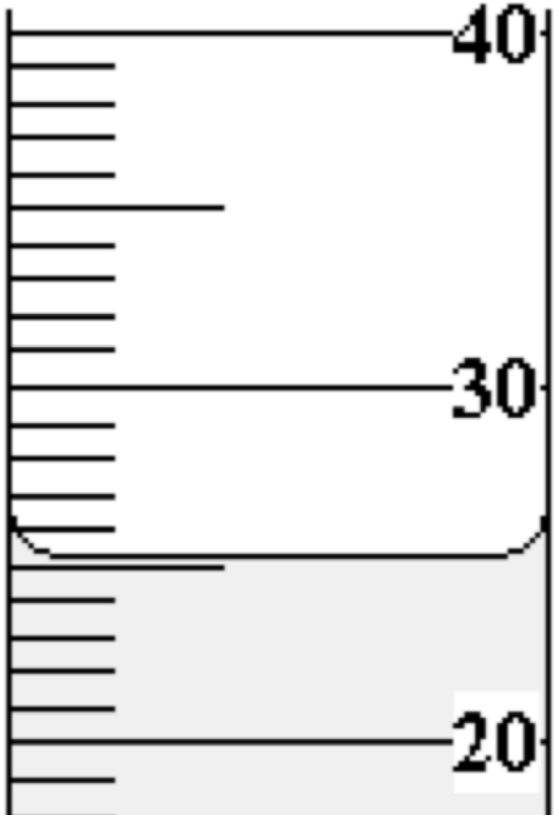
Success Criteria: *whiteboards*

When you measure volume, what part of the meniscus is read?

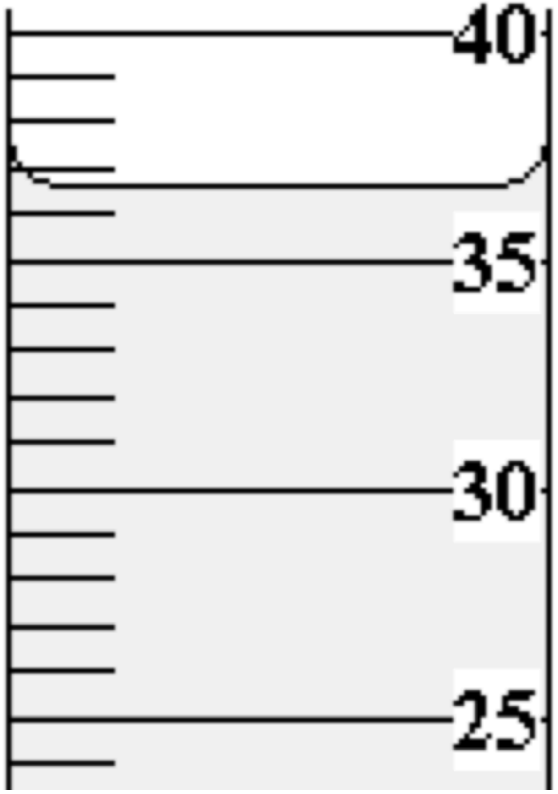
Success Criteria: *whiteboards*

Determine the volume of the liquids in the following cylinders:

A



B



Success Criteria: *whiteboards*

A In the USA, people use imperial units of measurement (foot, pound, mile) but scientists in the USA use metric units. Why do the scientists do this?

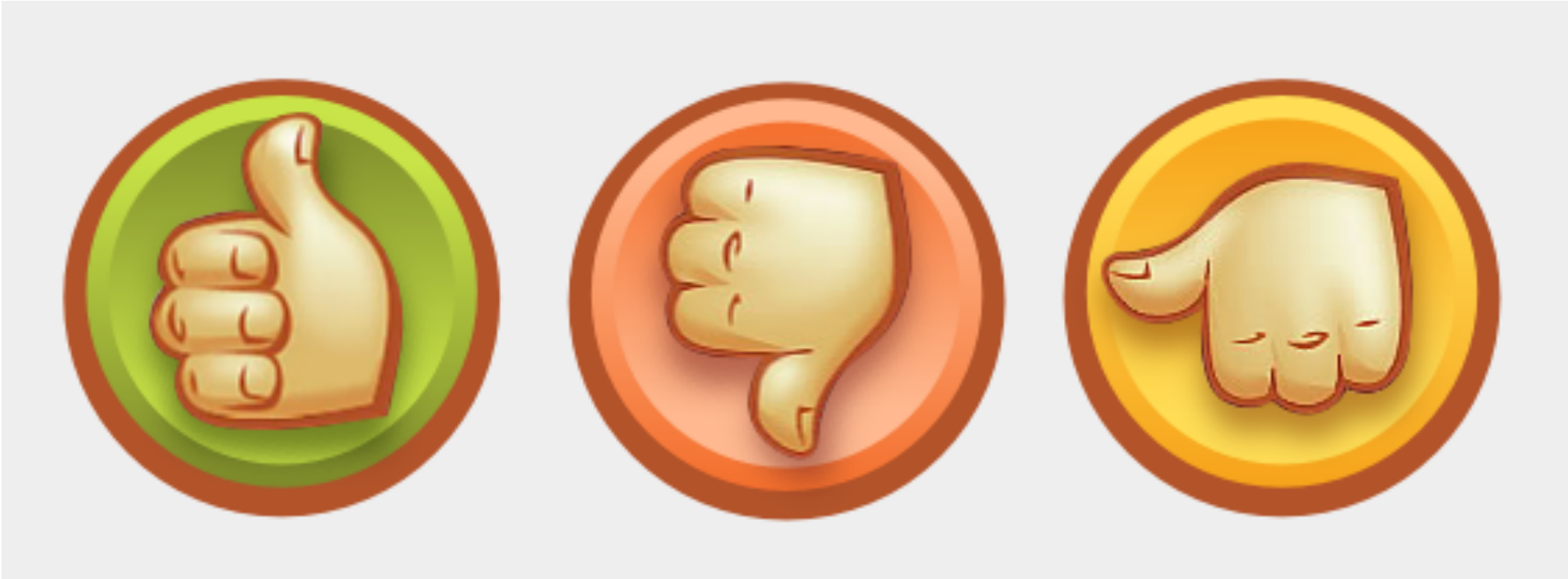
B Would you prefer to walk 14900 centimetres or 3 kilometre? Explain why.

C What tools would you use to measure the following things?
- mass of a carrot
- your mass

Learning Objective | Check-Point

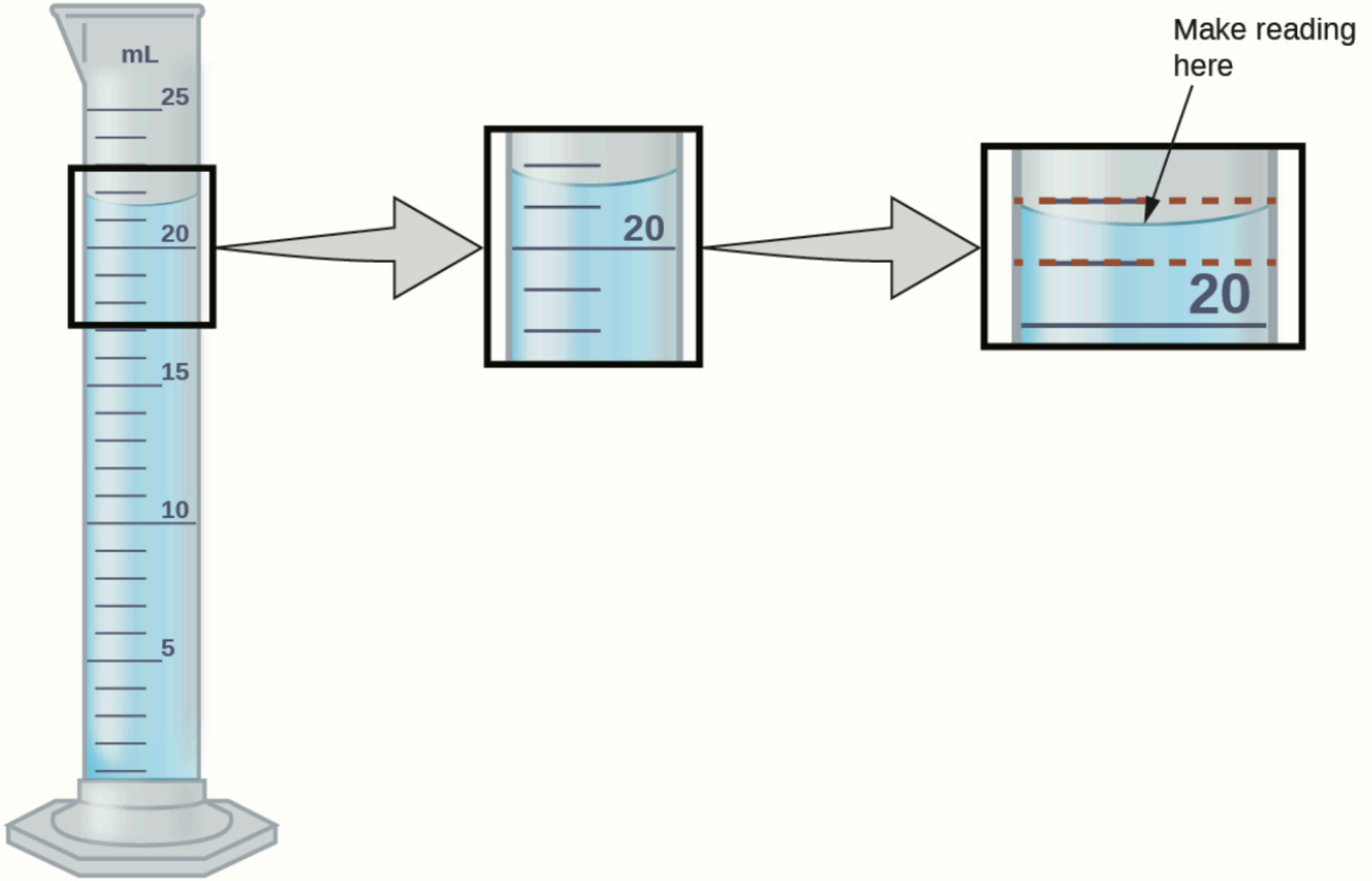
Students will be able to:

Science relies on measuring with accuracy



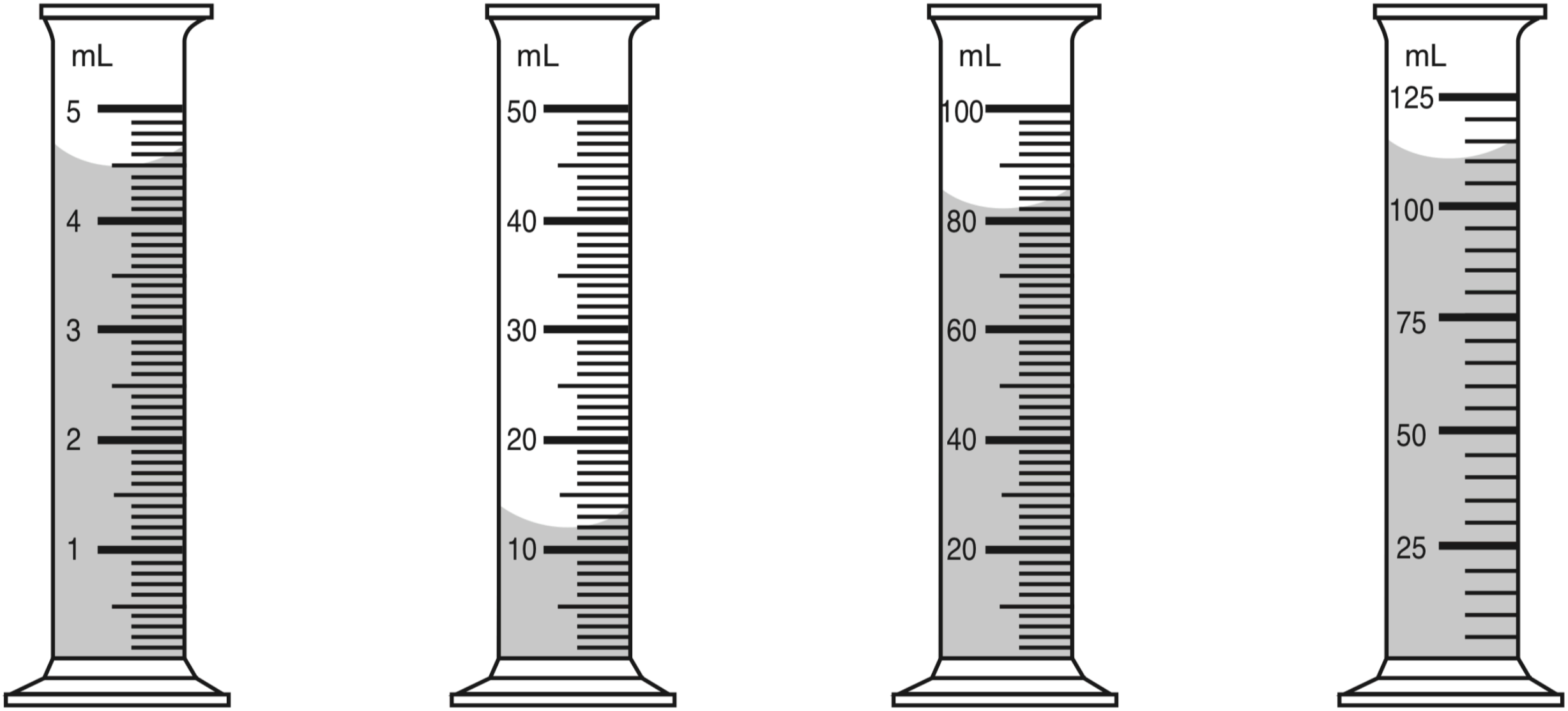
Independent Practice

Your turn: How many millilitres?



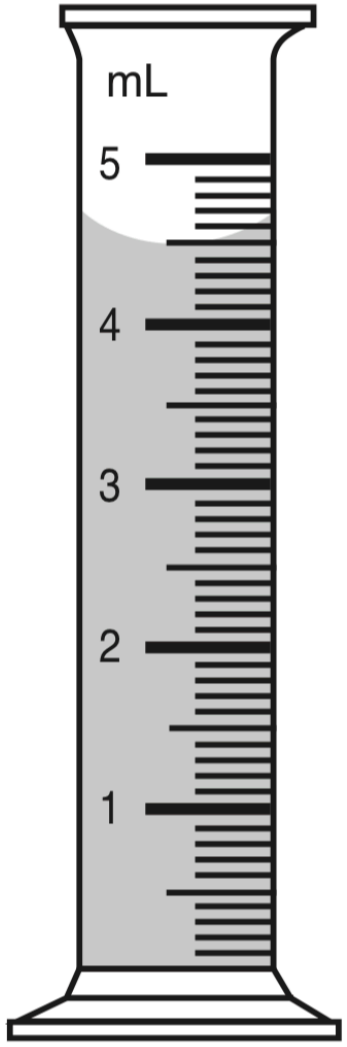
Independent Practice

Your turn: How many millilitres?

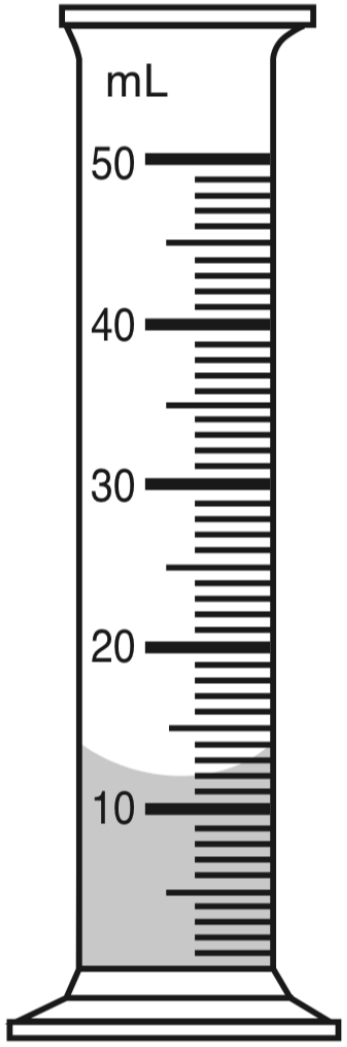


Independent Practice

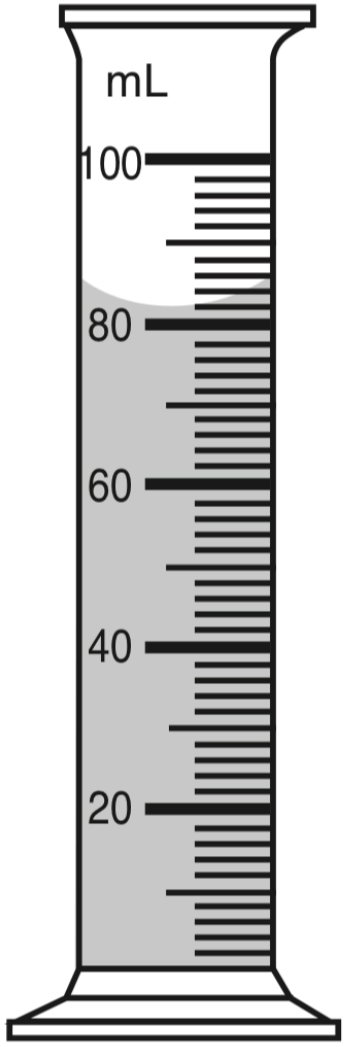
Your turn: How many millilitres?



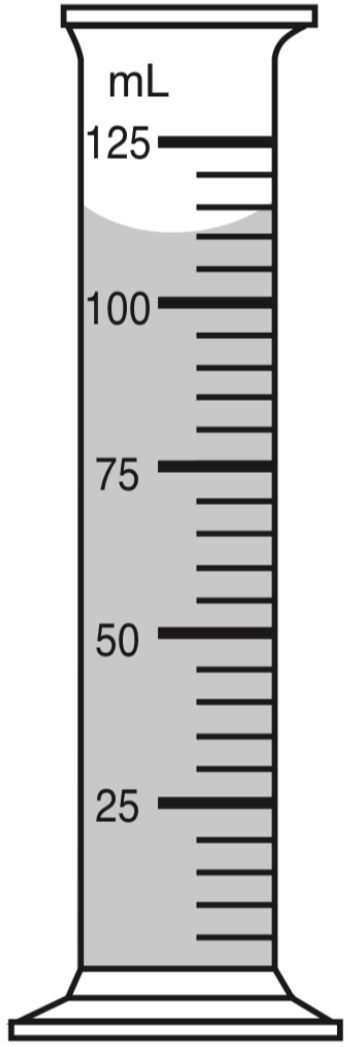
4.5 mL



12 mL



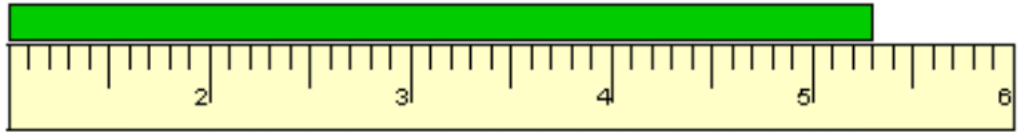
82 mL



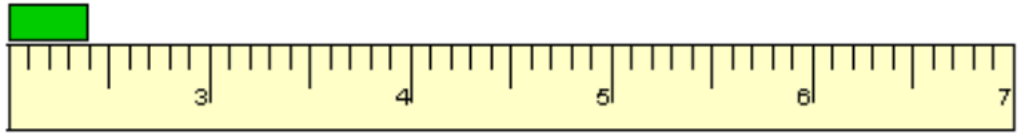
4.5 mL

Independent Practice

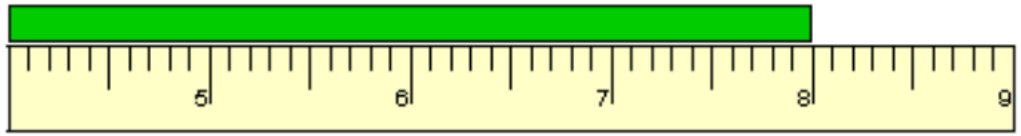
Your turn: How many centimetres?



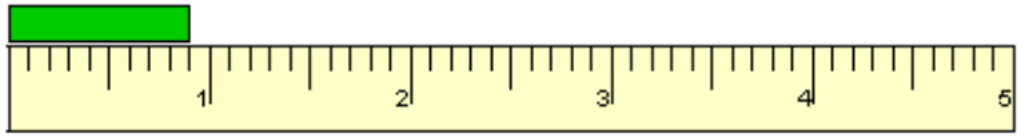
_____



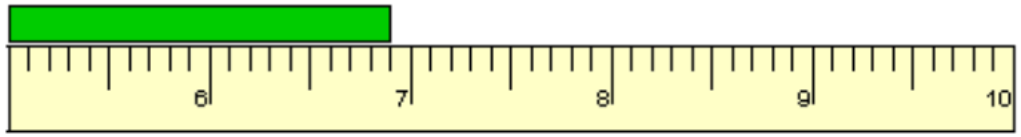
_____



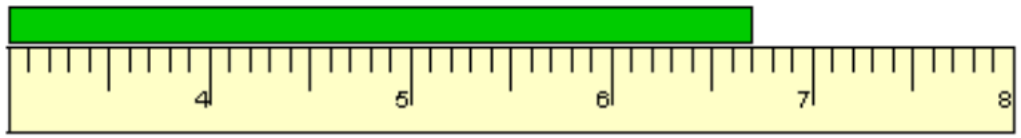
_____



_____



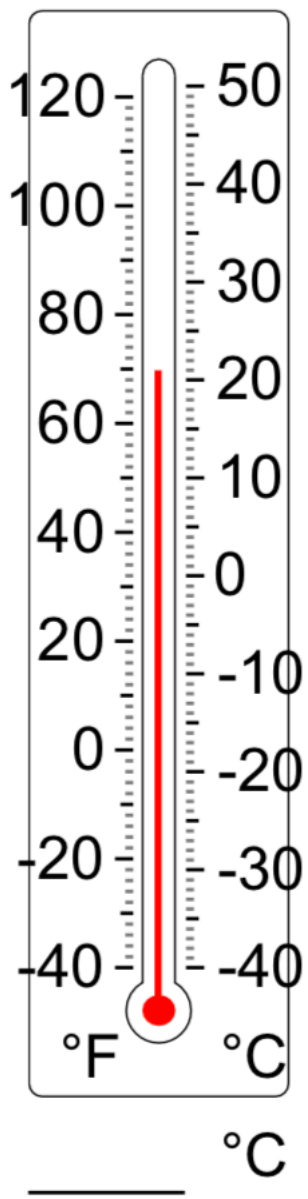
_____



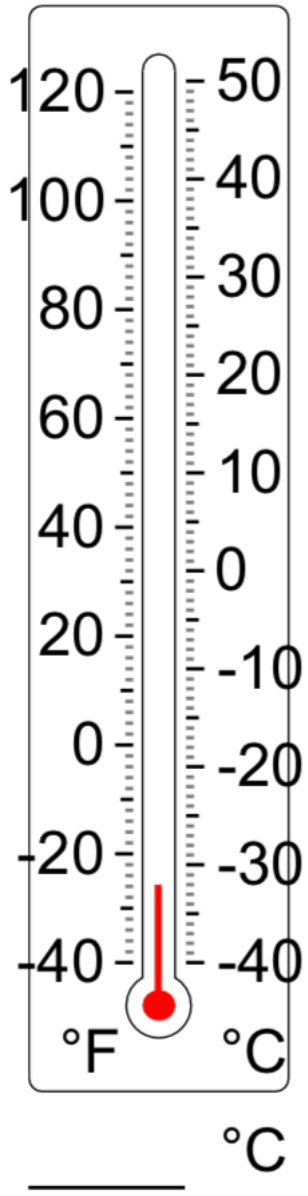
_____

Independent Practice

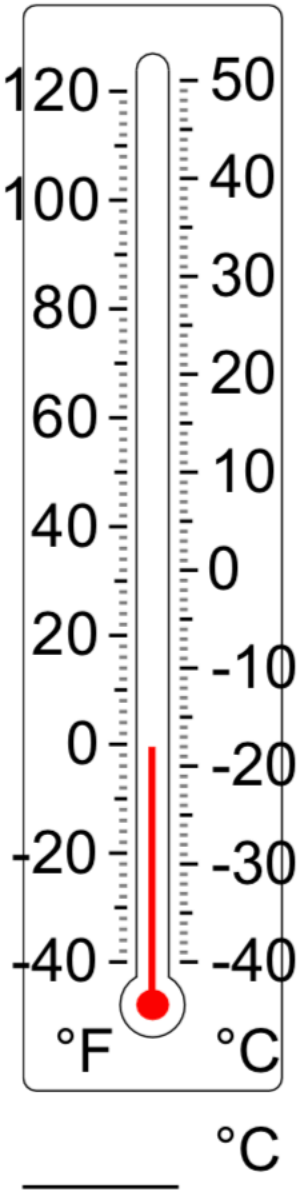
Your turn: How many degrees Celsius?



_____ °C



_____ °C



_____ °C

Independent Practice

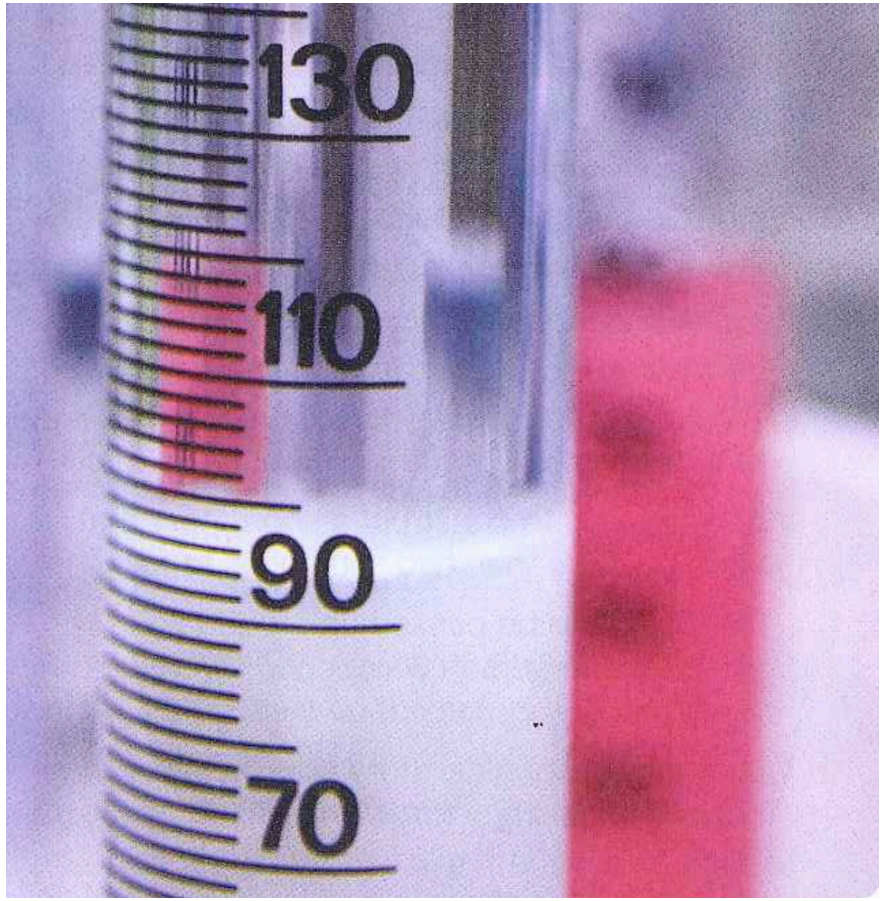
Taking measurements

Purpose

To observe that not everyone takes the same measurement.

Materials

- access to a range of equipment that shows different quantities (such as a 250 mL beaker, 100 mL conical flask or a 100 mL measuring cylinder containing different quantities of water, a beam or electronic balance with a mass on it, a sheet of paper with a ruler to measure its length)
- A4 sheet of paper next to each piece of equipment



Independent Practice

Procedure

Move around the laboratory and read the measurement for each piece of equipment.

Results

1 Construct a table similar to the one below in your workbook.

Name of equipment	Measurement	Units

2 Record your measurement in the table and on the paper next to each piece of equipment.

3 After you finish, check all the measurements written on the pieces of paper and determine if they are all exactly the same.

Independent Practice

Discussion

1 Everyone in a team will take slightly different measurements, even when measuring exactly the same thing. **Propose** reasons why.

2 **Describe** a way of using all the results on the paper to obtain an even better result.