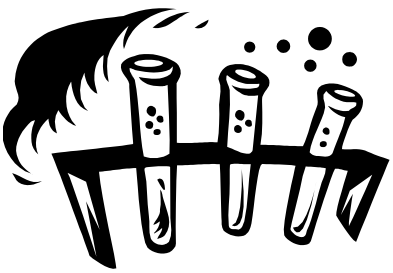
Shirebrook Academy Secondary Science

Y6 Transition workbook

A Guide to Basic Investigation Skills in Science

Name: _____

Primary School: _____



Safety in Science

Learning Outcomes – these are what you work through for each section	☺ or ☹
Identify at least 5 hazards in a science lab.	
List at least 10 safety rules for keeping safe in a science lab.	
Suggest how to correct unsafe practice in a science lab.	

Start here:

1. Draw circles around any safety problems you can see in this science lesson.

2. What could these students do to avoid being unsafe next lesson?

What rules do you think we should have in the science classrooms to ensure that all students are safe?

Extension

Look at your rules – which are the most important? Try to number them in order of importance. If you could only have 5 rules which would you choose? Why do you think this?

Which rules are these students breaking?

Safety Scenario Number One

Jake was sat down measuring out chemicals.

Some of the chemical went on his hands.

He couldn't see very well through his goggles so he took them off and rubbed his eyes.

Which safety rules did he break?

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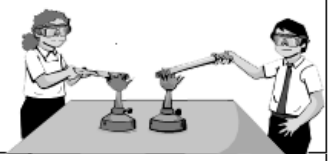
Safety Scenario Number Two

Richard was absent the day the investigation was planned.

He collected the equipment and watched Sarah to see what to do without reading the instructions so the test tube ended up pointing at him.

Which safety rules did he break?



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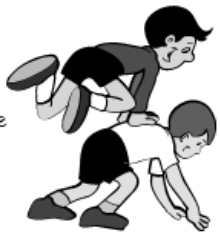
Safety Scenario Number Three

Sam and David had been playing during break and had to come in before they had decided who won.

They finished off the game in their science lesson.

Which safety rules did they break?



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Safety Scenario Number Four

Cindy spilled some of the chemicals from her experiment on the table.

She was worried she would get into trouble so she just covered it up with some paper towels.

Which safety rules did she break?

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Safety Scenario Number Five

Laura was taking part in a practical where she had to use a Bunsen burner.

Her hair was loose and almost set on fire when she turned around.

Which safety rules did she break?

_____

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Safety Scenario Number Six

Mike and Collette had a lot of chemicals left from their investigation.

They put the chemical in the sink and left the water running in the sink as they left the classroom.

Which safety rules did they break?

_____

_____

_____

_____

Safety Scenario Number Seven

John woke up late so didn't have time for breakfast.

During a science experiment he got really hungry so he ate his sandwich from his bag on the floor while the teacher wasn't looking.

Which safety rules did he break?

_____

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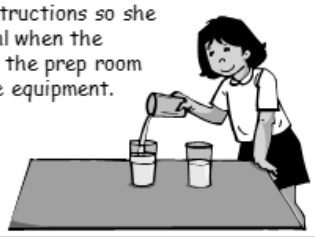
Safety Scenario Number Eight

Gina didn't pay any attention when the teacher was giving out safety instructions so she started the practical when the teacher had gone to the prep room to collect some more equipment.

Which safety rules did she break?



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Extra work

Design a safety poster to be displayed in your science classroom to make sure everyone stays safe.

You can hand draw it or use the computer.

Make sure you persuade people to stick to the rules.

Bring this poster along with your workbook in September

Lab Equipment

Learning Outcomes	☺ or ☹
Identify 10 different pieces of equipment.	
Describe what we use 10 different pieces of equipment for.	
Correctly draw and label equipment set up for a practical.	

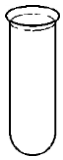
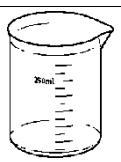
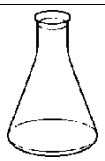
Around the room are a number of different pieces of lab equipment.

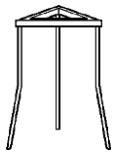
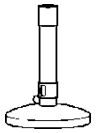
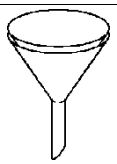
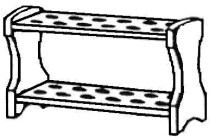
You must **name** them using the keywords and **describe** what you think we use the equipment for.

When we conduct an experiment we use scientific apparatus, you will need to draw these objects before an experiment. They are drawn according to a set of rules:

1. Use a sharp lead pencil.
2. Draw objects in two dimensions.
3. Draw clean, single lines.
4. Don't close off openings of glassware.
5. Use a ruler to draw straight lines.
6. Don't shade or colour in.
7. Don't 'float' objects.
8. Label objects with simple straight lines.

Balance	Measuring cylinder	Mortar and pestle	Test tube holders
Stand boss and clamp	Tripod	Boiling tube	Bunsen burner
Dropping pipette	Glass rod	Beaker	Test tube holder
Balance	Thermometer	Gauze	Test tube
Tongs	Mortar and pestle	Funnel	Conical flask

Equipment	**Name**	**Used for?**
		
		
		
		

Draw a diagram of some water being heated in a beaker. Label your equipment.

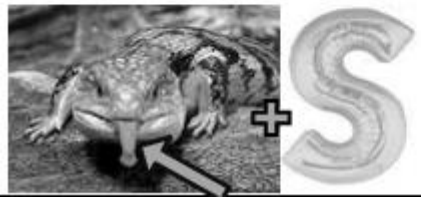
Measuring

Learning Outcomes	☺ or ☹
List different units of measurement.	
Correctly use different pieces of equipment to get different measurements.	
Describe how we can make our measuring more precise.	

Can you work out what these words might be?

_____

_____



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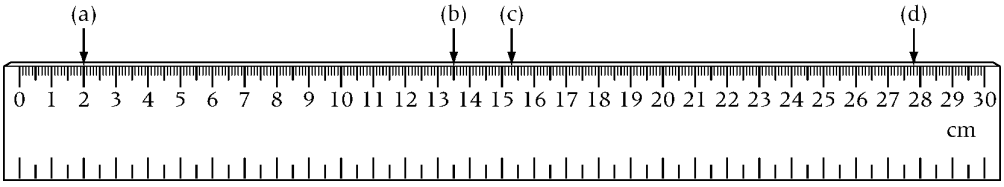
Can you think of any alternative units for these quantities? For example length might be measured in miles or inches

Quantity being measured	Name of unit	Symbol	Alternative Units	Alternative Symbols
length	metre	m		
mass	kilogram	kg		
time	second	s		
force	Newton	N		
temperature	degrees Celsius	°C		
speed	metres per second	m/s		
area	square metres	m^2		
volume	cubic metres	m^3		

Measuring length:

You must make sure that you measure any readings accurately. You will have used a ruler to measure in primary school. What are the accurate readings on this ruler?



(a) _____ (b) _____ (c) _____ (d) _____

Use a ruler at home to measure your handspan (from tip of thumb to tip of little finger)

My handspan: ……cm

Measure someone else's handpsan in your house as well (more if you can)

Name: ……handpsan ……cm

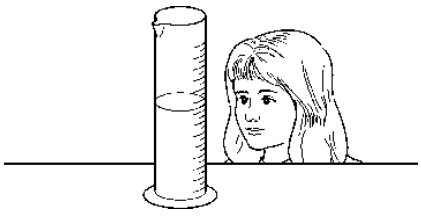
Name: ……handpsan ……cm

Name: ……handpsan ……cm

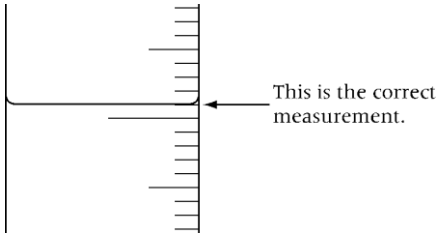
Measuring volume:

When you need to measure an exact volume of a liquid you use a **measuring cylinder**.

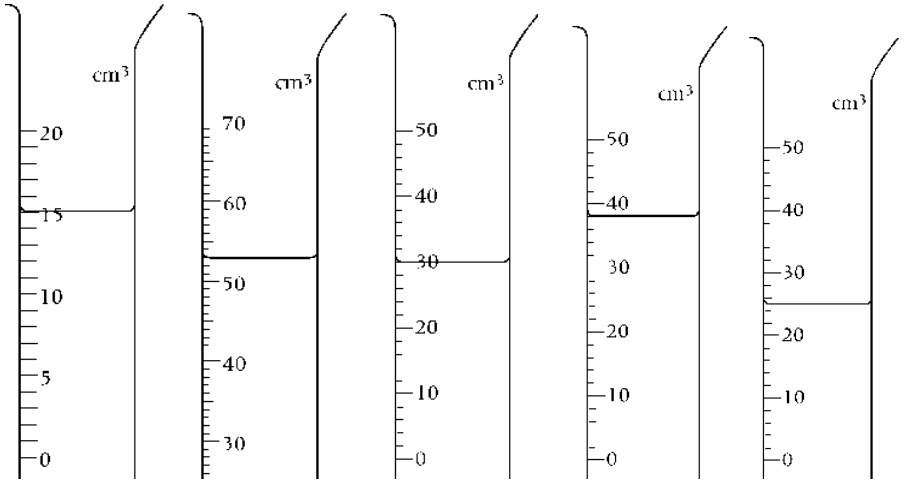
You get a more accurate reading if you bend down so that your eye is level with the liquid in the measuring cylinder.



If you look carefully at the liquid in a tube, it seems to go up at the sides of the tube. The curved shape it makes is called the **meniscus**.
You should take your reading from the bottom of the meniscus.



How much liquid is in these measuring cylinders?



_____ _____ _____ _____ _____

Measuring Mass:

Mass is measured using a top pan balance. It is a digital reading. We use grams as the standard units.

If you have access to a balance at home have a go at measuring the mass of a teaspoon of sugar. (you probably know a balance at home better as your kitchen scales!)

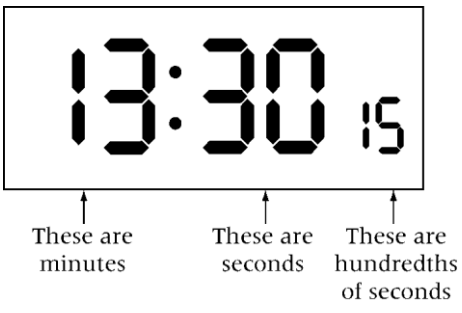
spoon 1 _____ spoon 2 _____ spoon 3_____ spoon 4 _____ spoon 5 _____

Measuring Time:

Seconds are the standard unit for time, but sometimes we use minutes, hours, or even days, depending on what we are measuring.

Most stop clocks give a reading like this:

The clock is *not* showing 13.30 minutes; it is showing 13 minutes and 30 seconds. They are not the same! 30 seconds is half a minute, so the clock is showing 13.5 minutes.



Have a go at measuring how fast a flat piece of paper falls to the floor at arms length. Repeat 5 times. (your phone, tablet or wrist watch can be used for this)

Drop 1 _____ Drop 2 _____ Drop 3_____ Drop 4 _____ Drop 5 _____

Can you convert the times into another unit, e.g. minutes or hours?

How do you turn 30s into minutes?

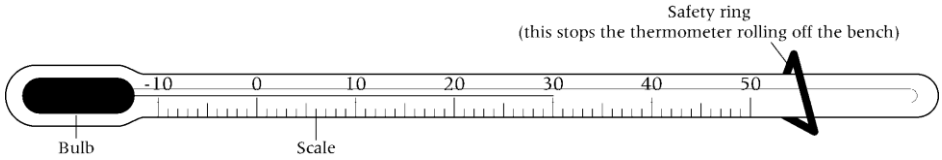
How many seconds are there in 4 minutes?

How many minutes are there in 5 hours?

Measuring Temperature

Thermometers contain a liquid that expands (gets bigger) when it gets hotter. The expanding liquid moves up a narrow tube. We use the **scale** to see how far the liquid has moved, and this tells us the temperature.

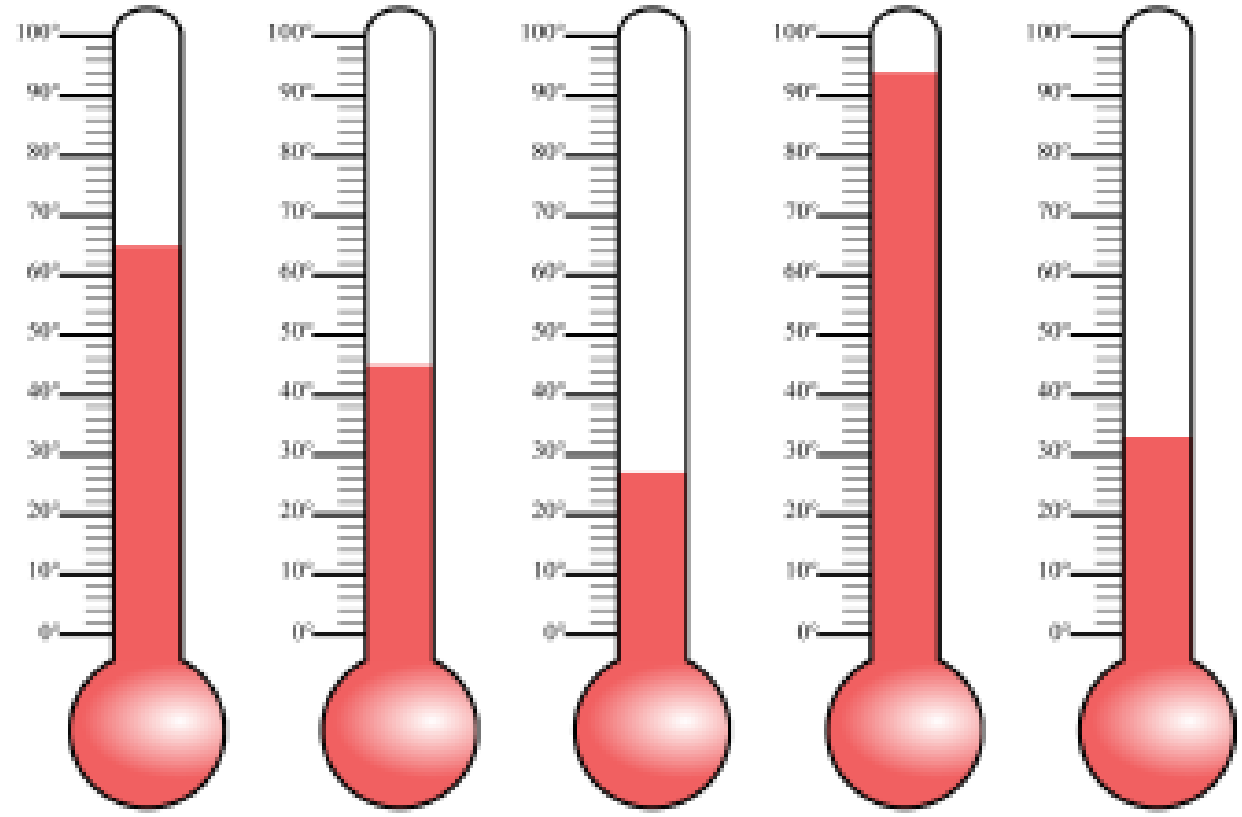
The thermometer measures the temperature of the liquid in the **bulb**. If a thermometer is lying on a bench in the lab, it will be reading the temperature of the room.



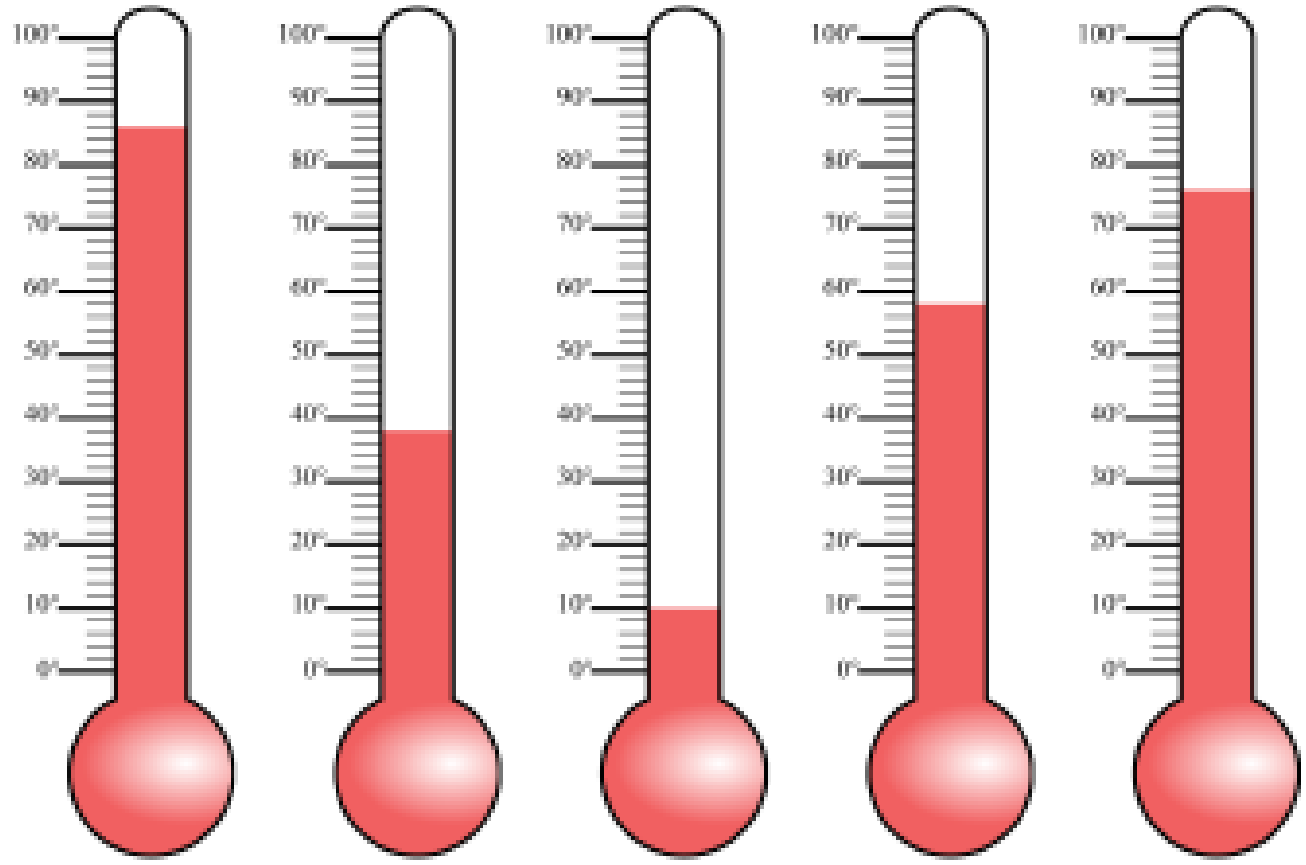
We measure temperature in degrees Celsius (^0C). What is the reading on this thermometer?

_____

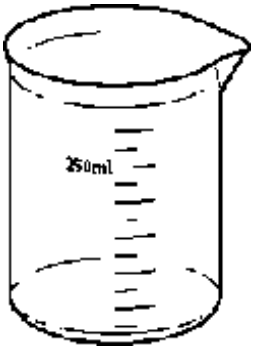
Determine what temperature each thermometer shows.

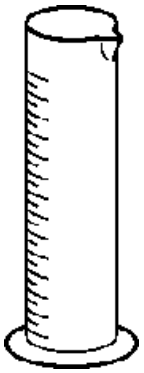


1) _____ 2) _____ 3) _____ 4) _____ 5) _____



Which piece of equipment would give you the most precise measurement? Justify your choice.





Repeats

Learning Outcomes	☺ or ☹
Explain why we should repeat an investigation.	
Calculate a mean average.	
Carry out an investigation into stopping distances.	

How many words can you make out of the word:

Investigation

Calculate the mean average for the following data, to do this add the value for each trial together, then divide the answer by 3 (the number of trials)

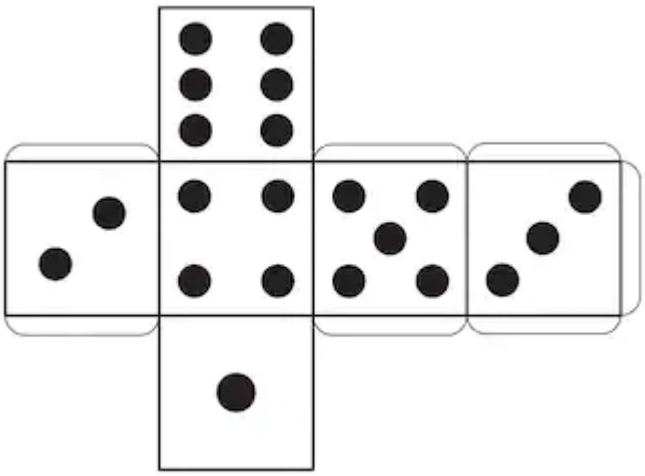
For time 0 min, trial 1 = 23, trial 2= 24 and trial 3 = 23, if you add those together you get 70, 70 divided by 3 = 23.3, this is the mean, the mean has to be between the largest and smallest number

Time (min)	Temperature (degrees celcius)			
	Trial 1	Trial 2	Trial 3	Mean
0	23	24	23	
5	30	32	33	
10	36	36	37	
15	42	44	42	
20	51	52	53	

Investigating average dice score

Roll a dice ten times, record the score each time below, then calculate the average

If you dont have a dice then there is a template for you to make one at home here



Score:

Average:

Heating safely

Learning Outcomes	☺ or ☹
Label a diagram of a Bunsen burner.	
Explain how to use a Bunsen burner safely.	
Predict what will happen during an experiment.	

Bunsen Burners are important in science labs, we use them for heating substances, chemical reactions and for testing substances. We will be using them in September so this is an opportunity to learn how to light one safely.

Watch this video and have a go at the tasks: https://www.youtube.com/watch?v=hL6Js_ZCvjY

(the video is called lighting a Bunsen burner)

Think about the science safety rules. Which rules do you think will be especially important when we use a Bunsen burner?

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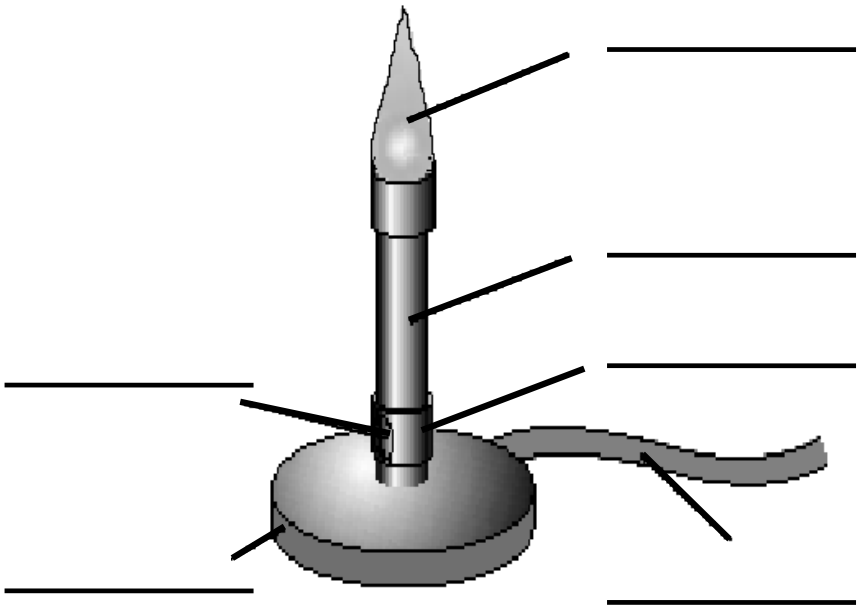
Label the Bunsen burner using the words below

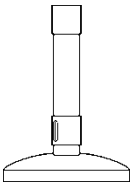
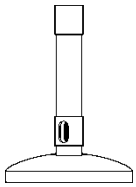
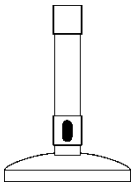


* Air Hole * Base * Chimney * Collar * Flame * Rubber tubing

Sort these steps to light a Bunsen burner into the correct order.

Quickly light the gas with the splint	
Turn the collar to get the correct flame for the experiment	
Close the air hole completely	
Place the Bunsen burner onto a heatproof mat	
Light a splint	
Turn on the gas tap	
Put on your eye protection	
Once a flame appears from the Bunsen burner, move your hand away quickly	
Attach the rubber tubing firmly onto a gas tap	
Always leave the air hole closed when you walk away from the Bunsen burner	

The Bunsen burner has three different flames. Complete the table using your lit Bunsen burner.
This video will support the different flame colours
https://www.youtube.com/watch?v=VLpClJHT9bQ

Type of flame	**Safety**	**Medium**	**Roaring Flame**
Type of air hole	Closed	Half open	Open
Diagram of flame			
Amount of air mixing with gas			
Amount of noise			
Main colour of flame			

Drawing Tables

Learning Outcomes	☺ or ☹
Describe why we need to draw tables for experiments.	
Identify characteristics of an outstanding table.	
Draw a suitable table and record experimental data correctly.	

Is this a good data table?

What are good points and bad points about it?

Concentration	Time to react
1M	3.34 minutes
0.5M	4mins 8 seconds
2M	1min 23secs
0.7M	0.03.56.09
1.3M	156 seconds

Put this data in a table:

Red, blue, silver x 2, black, red, silver, red x 2, white, black.

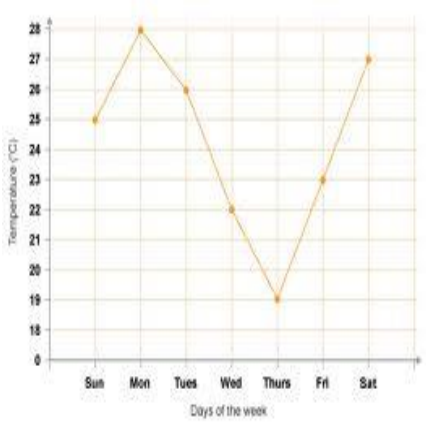

Great tables
have...

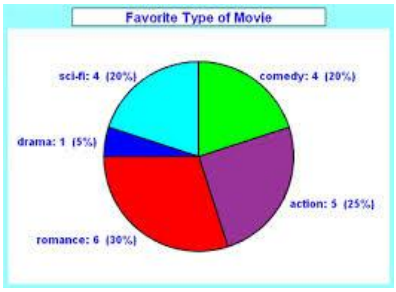
Drawing Graphs

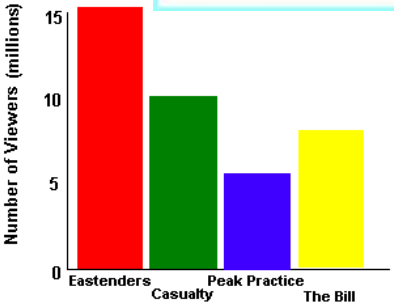
Learning Outcomes	☺ or ☹
Identify continuous and discontinuous data.	
Describe characteristics of an outstanding graph.	
Select and draw the correct graph type for continuous and discontinuous data.	

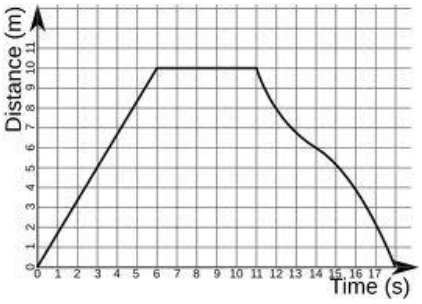
What do all these graphs have in common?

What is different about them?









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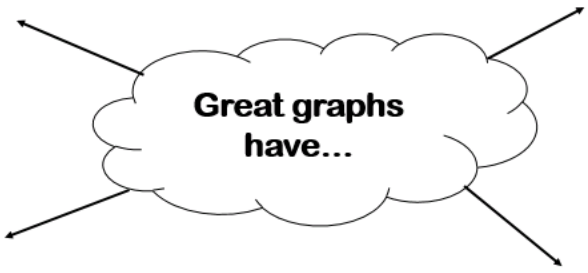
Which type of graph?

Continuous data goes onto a _____.

Discontinuous data goes onto a _____.



SQUIRRELS

This table shows you how many squirrels can be spotted in Oldham at different times of the year. Draw a bar graph of this data.

Months	Number of Squirrels (thousands)
May	5
June	11
July	18
August	25
September	13
October	6

Answer the following questions

1) Write a sentence to explain the pattern shown in the graph
2) What is the possible explanation for this pattern?
3) Can you predict how many squirrels there would be in April?
4) Why do you think there are no results for the rest of the year?

CUP OF TEA

Owen made a cup of tea and placed a thermometer in to measure the temperature. Owen recorded the temperature every minute for 12 minutes. Draw a graph of his results and draw a curve through the points to show the pattern

Time (minutes)	Temperature (°C)
0	70
1	65
2	60
3	56
4	51
5	47
6	44
7	42
8	41
9	40
10	39
11	39
12	39

1) Write a sentence to explain the pattern shown in the graph
2) What is the possible explanation for this pattern?
3) Would the temperature of the tea ever reach the bottom of the y axis? Why/ Why not?

NOTES:

Science Investigation Glossary

Accuracy	An accurate measurement is considered to be close to the true value. Accurate readings are done by using suitable equipment.
Anomalies	These are values in a set of results that are not judged to be part of the variation caused by random uncertainty.
Calibration	Marking a scale on a measuring instrument.
Categoric variables	Categoric variables are **labels**. For instance, type of material, brand of shoe or name of plant.
Continuous Variable	A variable that can have a **quantity**, and can be given magnitude by counting (e.g. number of fish) or measuring (e.g. light intensity).
Control Variable	A variable which is kept **constant** so that it does not affect the outcome of the investigation.
Data	Quantitative or qualitative information that has been collected.
Dependent Variable	The variable that is **measured** for each and every change of the Independent Variable.
Evidence	Data which has been shown to be valid.
Fair Test	A test where only the independent variable has been allowed to affect the dependent variable.
Hypothesis	A proposal intended to explain certain facts or observations.
Independent Variable	The variable that has values **changed** or selected by the experimenter.
Interval	The quantity between readings. (e.g. Six readings equally spaced between 0 and 50cm would give an interval of 10cm)
Measurement Error	The difference between a measured value and the true value
Precision	Precise Measurements are ones in which there is very little spread about the mean value.
Prediction	A prediction is a statement suggesting what will happen in the future, based on observation, experience or a hypothesis.
Random Error	Cause readings to unpredictably spread about the true value. Reduced by repeat measurements and the calculation of the mean.
Range	The minimum and maximum values of the Independent and Dependent Variables. Important to detect any existing patterns.
Repeatable	A measurement is repeatable if the experimenter can use the same method and equipment and obtain the same result
Reproducible	A measurement is reproducible if the investigation is repeated by a different person, or by using different equipment or techniques, and the same results are obtained
Resolution	The smallest change in the quantity being measured (input) of a measuring instrument that gives a perceptible change in the reading
Sketch graph	A line graph, not necessarily on a grid, showing the relationship between two variables. No plots or scales used, but axes labelled.
Systematic Error	Measurements that differ from the true value by a consistent amount. Caused by the method used, equipment or the environment.
True Value	This is the value that would be obtained in an ideal experiment.
Uncertainty	The interval within which the true value can be expected to lie, with a given level of confidence or probability. (e.g. The temp. is 20°C ± 2°C)
Valid Conclusion	A conclusion supported by valid data, obtained from an appropriate experimental design and based on sound reasoning.
Validity	Suitability of the investigation to answer the question being asked.
Zero Error	Any indication that a measuring instrument gives a false reading when the true value of a quantity is zero.