How Science Works...

Hazard Symbols

These symbols are found on chemical substances.

				
Caution	**Flammable**	**Toxic**	**Corrosive**	**Environmental Hazard**

The Scientific Method

Science isn't just a list of facts. It's actually a method used to prove facts. This is done by creating valid experiments.

This is the method:

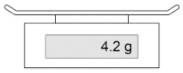
1. Hypothesis	Create a statement you can test.
2. Experiment	Design an experiment to test your statement
3. Results	Analyse your results
4. Conclusion	Do your results support your hypothesis?

The hypothesis should turn a question into a statement you can see if it is true or not.

- E.g. Do plants grow better when its dark or light?
- Hypothesis: Plants grow better in light

You then design an experiment to test this.

Apparatus (Equipment)

Diagram	Name	Function
	Beaker	Mix substances together
	Top-pan Balance	Measure Mass
	Measuring Cylinder	Measure volumes of liquid
	Conical Flask	Hold samples of liquid
	Bunsen Burner	Heat substances

Designing Experiments

To test a hypothesis you need to create an experiment. Experiments need to have three variables: independent, dependent and control.

The independent variable:
This is the variable that you **change** or make **different** in an experiment.

The dependent variable:
This is the variable that you **measure** during an experiment.

The control variable:
These are the variables that you need to **keep the same** so that your experiment has valid results. If they aren't the same in each test, this might affect your results.

Example 1	
A student investigates how long it takes to freeze different volumes of water.	
Independent	Volumes of water
Dependent	How long it takes to freeze
Control	The temperature of the freezer

Example 2	
A student investigates how changing the intensity of light affects the growth of the plant.	
Independent	The light intensity
Dependent	Growth of the plant
Control	Temperature of the room, amount of water.

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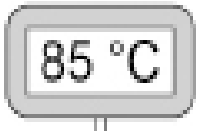
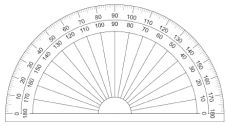
Resolution

The resolution is the smallest possible change on the measuring device.

Look at the examples. The more decimal place, the higher the resolution.

	 Stopclock	 Protactor	
1 °C	**0.01 s**	**1 °**	**0.01 A**

Accuracy

Accurate results must be as close as possible to the true value.

For example:
Image two students measured the time it takes for someone to run 10m.

The true time was 9.8 seconds
- Student A said the time was 10.1 seconds
- Student B said the time was 9.1 seconds.
- Student A is closer to the true value, making it more accurate.

To make experiments more accurate you should:
- Repeat the experiment 3 times
- Calculate a mean

Precision

Results which are precise are close together.

Look at student A and student B's temperature readings in 3 experiments.
- *Student A*: 20 °C, 21 °C, 19 °C
- *Student B*: 20 °C, 24 °C, 18°C

Student A's results are more precise as they are closer together

Variables

In experiments, you need to make sure you plan your three variables so the results are valid:

- **Independent** Variable – the variable being made **different**
- **Dependent** Variable – the variable being **measured, counted or recorded**
- **Control** Variable – the variable being kept the **same**

Understanding Line Graphs

When your experiment has continuous data with numbers your need to draw a line graph.

Use the table to plot the line graph. Then draw a line of best fit with a ruler.

The right column tells us what goes on the x axis

The left column tells us what goes on the y axis

The right column also tells you the independent variable

This is what you change in the experiment

Angle of ramp in degrees	Force in newtons
0	0
5	1
10	2
15	3
20	4
25	5

The left column also tells you the dependent variable

This is what you measure in the experiment