Lesson 4: Predator v Prey and Feeding relationships

Lesson Key Words

carnivore, herbivore, predator, prey, choice chamber, decomposer, producer, consumer, biomass, pesticide, bio-accumulation.

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1. What is a habitat?
2. What is biodiversity?
3. How many quadrats should you do to get an accurate and reliable result
4. Why do we estimate?
5. What factors within a habitat could change and cause plants to grow differently?
6. What calculation can be done to estimate the number of plants from quadrat sample results?
7. What are adaptations?
8. What happens to organisms that aren't adapted?
9. Give one example of adaptations animals or plants show to cope with seasonal change?
10. What conditions will woodlice choose in a choice chamber and why do they choose this chamber?

Reading

Food chains and food webs describe feeding relationships. The population of species in a food chain is shown using a pyramid of numbers. Organisms in an ecosystem affect each other's populations. The table describes some common terms used to describe living things in their environment:

Keyword	Definition
Environment	All the conditions that surround a living organism
Habitat	The place where an organism lives
Population	All the members of a single species that live in a habitat
Community	All the populations of different organisms that live together in a habitat
Ecosystem	A community and the habitat in which organisms live

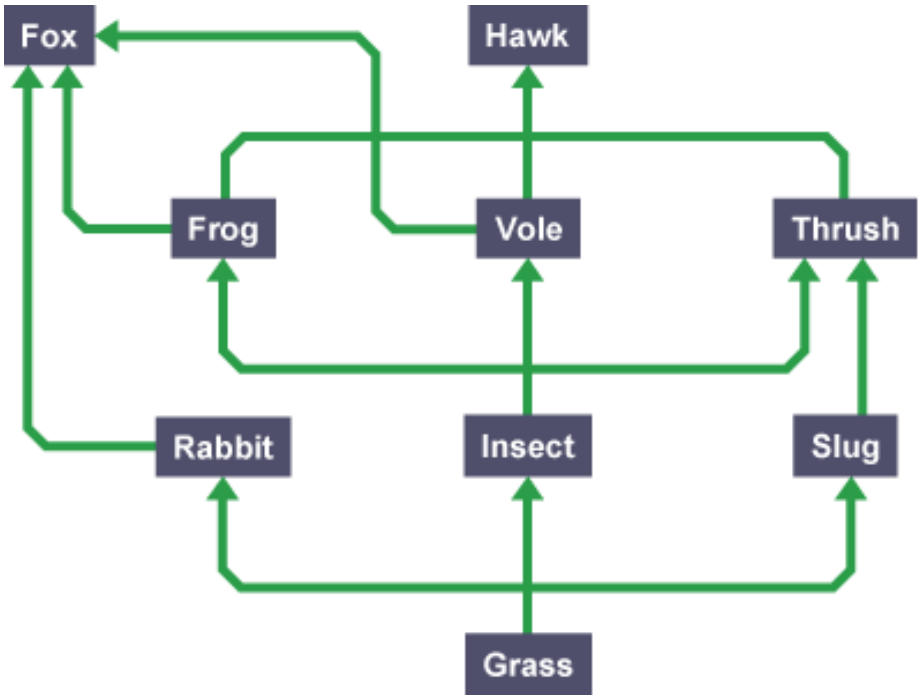
A food chain shows the different species of an organisms in an ecosystem, and what eats what. A food chain always starts with a producer, an organism that makes food. This is usually a green plant, because plants can make their own food by photosynthesis. A food chain ends with a consumer, an animal that eats a plant or another animal. Here is an example of a simple food chain:

Grass à rabbit à fox

The arrows in food chains show the way in which energy is moving. They do not show what eats what. A consumer that only eats plants is called a herbivore, and a consumer that only eats other animals is called a carnivore. An omnivore is an animal that eats both plants and animals and so can't be shown in a food chain but can be shown in a food web.

A predator is an animal that hunts and eats other animals, and the prey is the animal that gets eaten by the predator. In the food chain above, the fox is the predator and the rabbit are its prey.

When all the food chains in an ecosystem are joined up together, they form a food web. Here is an example of a food web:



Although it looks complex, it is just several food chains joined together. Here are some of the food chains in this food web:

Grass → insect → vole → hawk

Grass → insect → frog → fox

Grass → insect → vole → fox

Organisms in a food web depends on each other for nutrients. So, a change in one population leads to changes in others. The population of a species is affected by the number of its predators and prey, disease, pollution and competition between individuals for limited resources such as water and nutrients.

Core activity: Scientific eye video- Sci Eye Food Chains G53LS11 (youtube.com)

Answer the questions in your exercise book.

1. What do food chains always start with?
2. What will happen if there are too many rabbits?
3. What can happen to population of rabbits to cause their numbers to decrease?
4. What happens to the fox population if there's enough rabbits to eat?
5. What controls the size of the fox population?
6. What is the animal at the top of the food chain called?
7. What do we need to show how the numbers of each organism in the food chain balance out?
8. What could happen if there were fewer rabbits?
9. What could then happen to the number of rabbits?
10. What would happen if one year there was a bumper crop of lettuce?
11. What do foxes have to compete with for rabbits?
12. What do foxes also like to eat?
13. What do food chains link together to form?
14. What is Lake Windermere home to?
15. What do biologists use to measure the fish population?
16. When does this happen?
17. What is the technique called?
18. Where are the Arctic Char normally found in the lake?
19. Why are they found there?
20. When was Lake Windermere formed?
21. Why could the Arctic Char die out?
22. What do Arctic Char feed on?
23. What do those organisms eat?
24. Where do the plants get their energy from?
25. What's the top predator in the food chain?
26. What do scientists monitor about the water?
27. What is the bottom up solution to saving the Char?
28. What is a top down solution to saving the Char?
29. What are the problems with the top down solution?
30. What happens if toxins get into the food chain?

Lesson 1: Static Electricity

Lesson Key Words

charge positive negative conductor insulator opposite attract repel friction

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Reading

What happens when charge cannot flow?

In all our future experiments and investigations in this unit, you will see that electrical charge flows through circuits, this is because the materials in the circuit are conductors. This is not always the case. Some materials are insulators and so do not allow charges to move easily. Charges can be moved between the surfaces of objects by

friction, but charges cannot move inside insulators so the charges stay on the surface. When this happens, we say the object is statically charged.

Core questions

1. What do we call a material that allows charge to flow?
2. What do we call a material that is bad at allowing charge to flow?
3. How can charges move between materials?
4. What type of materials can become statically charged?
5. What happens to make an object statically charged?

Static Charges Investigation

Use a cloth to charge a balloon using friction.

Hold the cloth near the balloon and observe how the cloth behaves.

Hold the balloon near some small paper circles on the desk and observe how the paper circles behave.

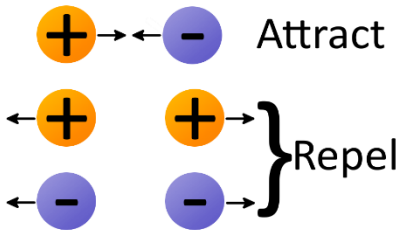
Your teacher will demonstrate what happens when two charged balloons are near each other.

1. Why can a balloon become charged?
2. What happened when the charged balloon was near the charging cloth?
3. What happened when the charged balloon was near the small paper circles?
4. What happened when the charged balloon was near another charged balloon?

Reading

Why do statically charged objects push and pull?

When friction transfers charges between two objects they end up with opposite charges, we call one of these charges positive and the other negative. Opposite charges attract each other, so objects with opposite charges will pull together. Like charges repel so objects with the same charge will be pushed apart. Light objects like the paper circles in our investigation, hair and dust are attracted to any charged surface, this is why dust clings to some surfaces.



Core questions

7. When the balloon was rubbed with the changing cloth it became positively charged, what charge did the cloth have?
8. Explain why the charged cloth tried to stick to the balloon
9. Why did the charged balloons repel each other?

Application Questions

10. State and explain what would happen if we left the charged balloons in the lab over time
11. Jesse is rubbing a copper pipe with a dusting cloth. Will she create a static charge? Give a reason for your answer
12. I am walking in my hall way wearing a new pair of slippers. When I get to the door I get a shock as I go to touch the metal handle. Write a simple paragraph to explain why I got a shock
13. Sam's dad is complaining that the television screen is always dusty. Sam says that the screen is dusty because it is positively charged and if they make the screen negatively charged the dust will go away. Explain why Sam is wrong.

Lesson 2: The Electron

Lesson Key Words

charge positive negative insulator opposite attract repel atom electron nucleus

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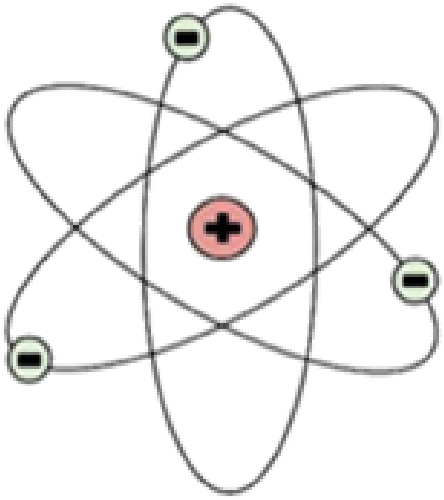
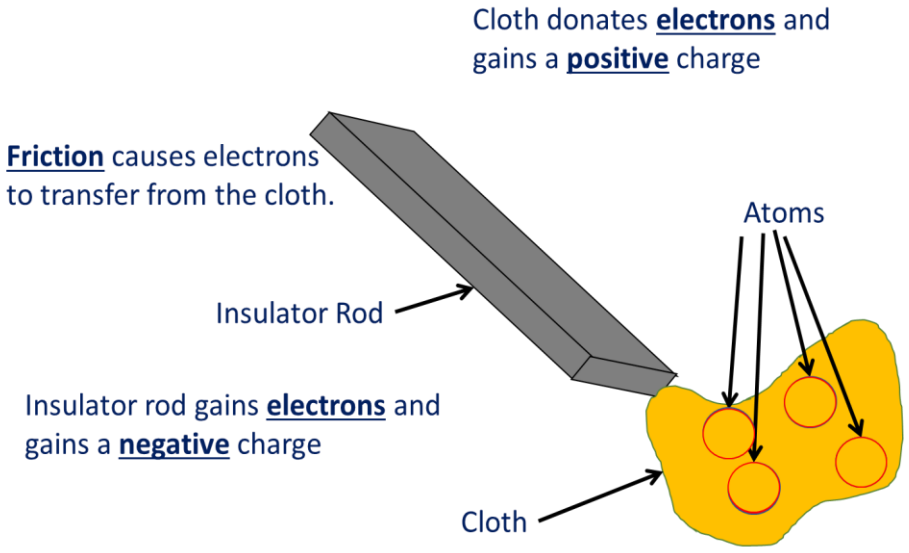
FRAYER - atom

Reading

Everything is made of atoms, atoms are the smallest part of any material. To explain static electricity, we need to know about the structure of the atom. The atom has two parts; The positive nucleus at the centre and the negative electrons around the outside.



The electrons can move out of the atom, but the nucleus can't. This means all static electricity charges are caused by materials having lost some elections or having extra electrons. If we use a cloth to charge a plastic rod, friction causes electrons to be transferred from the cloth to the rod. Both the rod and the cloth start out with no overall charge, we call this neutral. The rod gains negative electrons, so is more negative, this makes its overall charge negative. The cloth has lost negative electrons, so is less negative, this makes its overall charge positive.



Core questions

14. Draw and label a diagram of an atom, including the charge of each part.
15. Describe the structure of the atom
16. Which part of the atom can move?
17. When we charged the balloon it gained electrons, state what charge this gave the balloon.
18. State the charge of the cloth used to charge the balloon and explain how it gained this charge.

Application Questions

19. A student combed their hair and held it near the charged balloon, the balloon moved away from the comb. Explain why this happened.

Reading

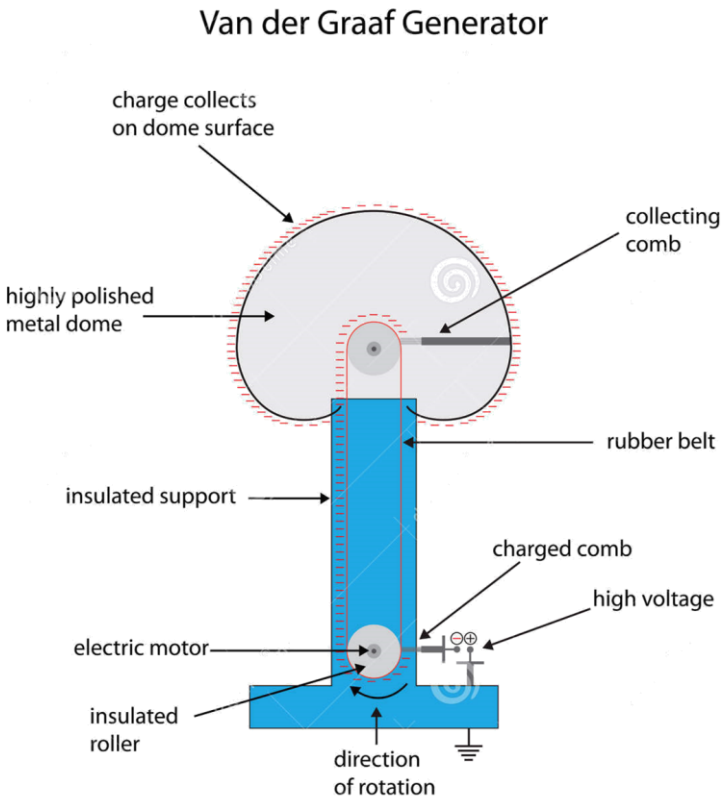
Why can a build up of static be dangerous?

A positively charge object is attracting the electrons of the atoms in the air, as the charge builds up this attraction gets stronger and stronger. If the charge continues to build up it will eventually pull the electrons from the atoms nearest to it. This turns them positive so they attract other electrons, starting a chain of atoms to lose their electrons in turn all the way back to a conductor or the Earth. We see this as a spark and is the effect that causes lightning. This can shock us or start fires. Shocks can be dangerous as they can disrupt the signals sent along our nerve cells by our brains. We can use the Van der Graaf Generator to experiment with large static charges. The dome is supported by insulating materials so charge gets trapped there. The dome is metal so the charge is easily moved to other objects.

Van der Graff Generator Investigation

Your teacher will demonstrate the Van der Graaf Generator (with help from some volunteers)

1. Describe what happened when the sphere was brought close to the charged dome
2. Describe what happened when the pie cases were placed on the uncharged dome and then the generator was turned on
3. Describe what happened when a volunteer placed their hands on the dome and then the dome was charged (or the fake hair was attached to the dome).
4. Explain what happened in 1, 2 or 3 using ideas about attraction, repulsion, charge and electrons.



Lesson 3: Electrical current

Lesson Key Words

charge positive negative conductor insulator attract repel electron current

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Core ideas- Reading, models, activities

Reading

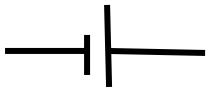
For an electric current to flow easily we need a circuit made of conductors, these are materials that charge flows through easily. Insulators are materials that charge does not flow through easily, although we can still make charge flow through them if we try hard enough.

We have learned that some particles carry an electric charge. Most of the time the particles carrying the electric charge in a circuit are the electrons. In an electrical circuit the electricity follows along a path made by the conducting material (normally a metal wire) in a loop until it returns back to the start. A source of potential difference such as a battery is needed to get the electrons to move.

The battery has a positive connection which attracts the electrons and a negative connection which repels the electrons. When there is a break in the circuit the electrons can't move as they repel each other so stay the same distance apart. When the circuit is complete electrons flow from the negative connection to the positive connection. We call the rate at which the electrons flow the current, it is measured with an ammeter and has the unit amps (A). The electrons are pushed though other components by the attraction and repulsion of the electrons, this transfers energy to the component.

Measuring Current Investigation

A special set of equipment diagram symbols is need for electrical circuits. We call these circuit symbols, today we will be using these symbols.

		
Cell	Lamp	Ammeter

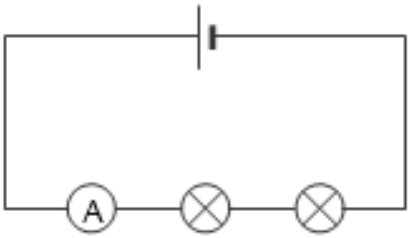
Circuit 1

Build the first circuit.

Show it to your teacher before you switch on.

Write down the reading on the ammeter.

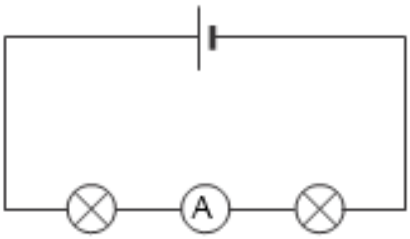
Current = A



Circuit 2

Build the second circuit.

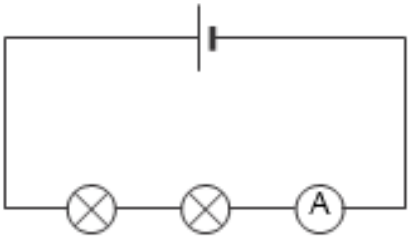
Current =



Circuit 3

Build this circuit

Current =



Conclusion

How did the current change when you moved the ammeter to different position in the circuit?

Core questions

7. Which particle carries charge in an electrical conductor
8. Define current
9. State the equipment used to measure current and draw its circuit symbol
10. What are the conditions for current to flow in a circuit?
11. What affect does the battery or cell have on the electrons
12. How is energy transferred to the lamps?
13. What energy store do cells and batteries have?
14. If a circuit is left on the battery eventually go flat. Explain why
15. Draw a circuit diagram that has 2 cells and 2 bulbs in one loop

Part 2 Flame tests and fireworks

Lesson Key Words

metal, flame test, oxygen, oxide,

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Activity: Burning metals

Copy and complete the sentences using the words at the top. You may not need all the words.

oxides carbonates oxygen hydrogen

a When metals burn in air, they react with ..... gas.

b Metals form new substances called metal ..... when they react with oxygen gas.

c Other materials can react with oxygen and they make ..... as well.

Reading

Metals that are used in fireworks will burn in oxygen with a particular colour to form oxides. The metal gives the firework its colour.

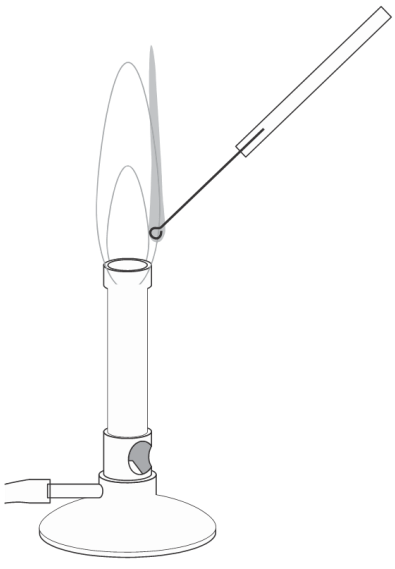
Working scientifically: Flame test demonstration

In this experiment you are going to look at some of the colours you get when different metals burn.

Method:

- Wet the end of a wooden spill with water
- Dip the wet spill into the metal chloride
- Put the spill and metal chloride into the roaring blue Bunsen burner flame.
- Make a note of the colour of the flame
- Repeat steps 1 to 5 using a new wooden spill and a different metal chloride.
- Record your observations in a table

Copy the results table below into your exercise book and record the colours.



Metal	
sodium	
potassium	
calcium	
barium	
magnesium	
copper	
strontium	

Core Questions: Conclusion

Copy and complete the following sentences by choosing words form the box below:

4. When metals burn they are reacting with_____.

5. The chemical Iron makes when it burns is called Iron _____.
6. You see a _____ colour whenever you change the metal you are burning.
7. When _____ metal burns it gives a blue/green coloured flame.
8. Metals are used in _____ to make the colours in the sky.

planes, oxide, fireworks, sodium, oxygen, copper, air, similar, different, sulphate

Application Questions

Fireworks

Fireworks contain mixtures of chemicals. Different colours and explosions are obtained by using different combinations of chemicals and different shaped containers. A firework is just like any other fire: it still needs heat, fuel and oxygen, and the products of the reactions are oxides.

1 Where does the heat come from when a firework is set off?

2 The sparks from a sparkler are tiny pieces of burning iron.

a Where does the oxygen come from that is reacting with the iron?

b Copy and complete the word equation for the reaction: iron + oxygen ⟶

3 Very bright fireworks are often made using magnesium. Write a word equation to show what happens when magnesium burns.

Once a firework is lit, the chemical reaction starts. The firework contains the oxygen it needs to burn, as part of the chemicals inside the tube. The heat from the flame is used to split up some of the chemicals and release the oxygen. The oxygen can then react with the fuel and the firework will 'go off'. This reaction is happening inside the tube of the firework, so there is no way to know when the firework will go off. Once a firework has started to react, it is very difficult to stop it – it will keep burning until all the chemicals have reacted.

4 How is the oxygen supply in the firework different from the bonfire?

5 Which part of the passage describes:

a a decomposition reaction **b** a combustion reaction?

6 Why is it dangerous to return to a firework if you think the flame might have gone out?

7 Explain why storing fireworks in a closed tin box is much safer than leaving them in the open.

8 When does a firework stop burning?

9 Fireworks can be very dangerous. Write a plan for either a website or a video that would give safety advice to young children who are 5–7 years old.

Part 3 Burning and the fire triangle

Lesson Key Words

Combustion, extinguisher, density, crucible, triangle, fuel, oxygen

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Core activity: Word jumble

15. Rearrange the letters to make some science key words. What links these words?
    a. deix**O**
    b. nigrnu**B**
    c. gnexy**O**
    d. clamieh**C**
    e. niotae**R**c
    f. te**H**a

Reading

Fire is one of the most important discoveries in human history. Combustion is the scientific name for burning. In KS2 you will have looked at burning as an example of a chemical reaction. A substance that we burn for heat is called a fuel. Fuels generally contain carbon. This is one of the reactants. They also contain hydrogen. Oxygen is also needed, so is another reactant.

Burning is a chemical reaction between a fuel and oxygen. This reaction usually needs heat to start it off.

Core activity: Think, pair, share:

16. What are the 3 things needed for fire to happen?

The fire triangle

The fire triangle shows the three things needed for a fire to burn. Take one away and the fire goes out and the burning stops.

Core activity: Chip pan fire demonstration

Core questions

17. Why would putting water on a fire put it out?
18. Why do firemen remove flammable items when there is a fire?
19. If you stamp on a fire or roll someone who is on fire, the fire goes out, why?
20. What should you use to put out an oil fire and why?

Reading

What happens during burning?

Candles are made of wax. The wax is a fuel and is made of hydrogen and carbon.
When we burn any fuel, we always get the same products. Eg:

Candle wax + Oxygen $\longrightarrow$ Carbon dioxide + water

Gas + Oxygen $\longrightarrow$ Carbon Dioxide + Water

Core questions

21. What is the scientific name for burning?
22. What is a fuel?
23. Why are fuels useful?
24. Name the two reactants needed in a combustion reaction
25. Give 3 examples of fuels from your own knowledge

Core summary

Copy and complete these sentences by filling in the gaps using words from the box.

add burn cooling covering cutting off electrical energy extinguisher fire triangle fuel increasing oil oxygen powder take away water

Three things are needed for a fire to _____:

- the _____ (something that burns)
- _____ to start the fire
- _____, usually from the air.

These three things are known as the _____.

You need to _____ one of the sides of the fire triangle to put a fire out.

Water fire extinguishers work by _____ the fire. Carbon dioxide, foam and dry powder extinguishers work by _____ the supply of oxygen.

Different types of fire _____ are needed for different types of fire.
_____ should not be used on _____ fires and electrical fires.

An oil fire should be put out by _____ it to keep oxygen away. Dry _____ or carbon dioxide are used to cut off the supply of oxygen in _____ fires.

Lesson 4 Separating Solutions: Chromatography

Lesson Key Words

chromatography, chromatogram, solvent, dyes

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FRAYER: Chromatography

Reading

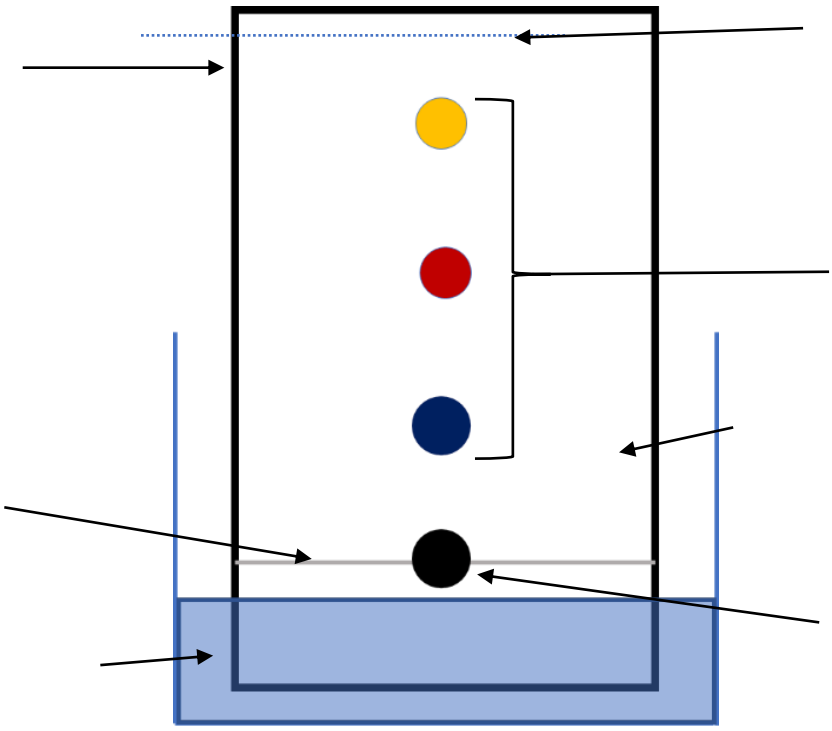
How can we separate a mixture of soluble substances?

Sometimes we have a mixture of substances that all dissolve in water. This is often the case for forensic scientists. They need to decide what ink is used for a ransom note, what paint was in graffiti or which drugs were in an unlabelled pill. All of these can be found by using **chromatography**. Chromatography works because although all the substances in the mixture dissolve, smaller molecules tend to dissolve easier and move faster. The inks are placed on the **stationary phase**, often a piece of paper. The stationary phase has its end placed into a small amount of **solvent**, often water, called the **mobile phase**. As the water soaks up the paper the dyes spread out. The smaller dyes move faster so are near the top of the paper sooner than the heavier dyes. This means that when the mobile phase reaches the top of the stationary phase the dyes have spread out. People often imagine it like running a race through an obstacle course.

One of the key things about chromatography is that if two dyes move the same distance then they must be made of the same thing. This is also used by food scientists to check the colourings used in foods are safe to eat. Once finished the paper is removed and dried. It is called a **chromatogram**.

Core Activity

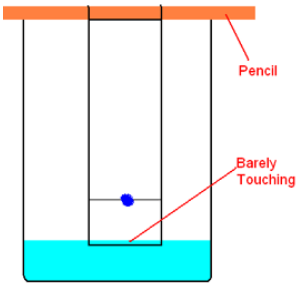
4. Copy the diagram below into your book and label the diagram with the important information about chromatography.



Working Scientifically: Separating colours in felt tip pens

Method

1. Using a pencil and ruler, draw a **baseline** 2cm from the bottom of the paper **(stationary phase).**
2. Put a dot of the colour on the middle of the baseline.
3. Measure 10ml of water **(solvent)** with the measuring cylinder and pour into the 100ml beaker. (The water level must be below the baseline.)
4. Stick the top of the paper onto a pencil
5. Place the paper into the beaker so that the water just touches the bottom of the paper. (The pencil should rest over the top of the beaker, keeping the paper steady and in place)



REMEMBER:

DO NOT let the paper bend so that the line and colours go into the water

DO NOT let any part of the paper touch the side of the beaker.

Core Questions

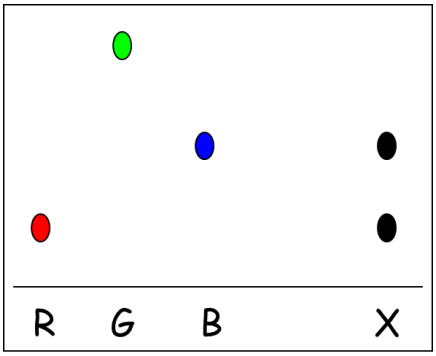
5. Using a pencil and a ruler, draw a fully labelled diagram of your experiment set up in your books
   Labels: Paper; stationary phase; sample spot; solute; baseline; solvent; water; pencil; beaker.

6. Underneath your diagram in your books, explain:

a) Why the baseline was drawn in pencil?
b) Why the water (mobile phase) should not cover the colour spot?
c) How the mixture of solutes will be separated?

7. Look at the chromatogram on the right and answer the below questions in your book:

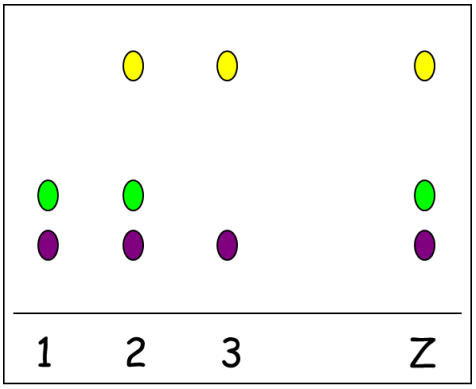
a) How many different colours are in X?
b) What colours are they?
c) Which colour was the most soluble?



Application Questions

8. Look at the chromatogram on the right and answer the below questions in your book:

a) How many inks in Z?
b) Which pen was the same as Z?
c) How do you know?
d) In your book draw a particle diagram for the solution of mixture 1
   (Hint 1: use different colours for each ink in the mixture)
   (Hint 2: remember it is dissolved in water)



Lesson 7 Working scientifically: Displaying data on graphs

Lesson Key Words

continuous independent catagorical dependent discrete variable scales

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Activity: What's wrong with these tables?

Find and correct all the mistakes in the tables below.

1

Mass	Spring length
50g	2.5cm
100g	3.0cm
150g	3.5 cm
200g	4.0 cm

2

Temperature (°c)	Height of bounce (cm)			
	1.	2.	3.	Mean
20	46.5	59	49	47.8
40	54	59	61	58
60	65	42	71	59

3

Temperature (°c)	Solubility (g per 100g)
0	35.6
20	35.833
40	36
80	38.0
100	39.4

4

Catalyst	Time for reaction.			
	1	2	3	Mean
none.	30	25	27	27
A	5	3.2	4	4.1
B	27	26	35	29
C	15	17	14	16

5 The table below shows data collected when lamps were added in series to a circuit and the current was measured.

Current	Number of bulbs.
10	1
5.0	2
3.3	3
2.5	4
2	5

Reading

Presenting Data

How should you present your data?

Graphs and charts are used to display data. They help to make trends and patterns easier to spot.

It is important to use the correct type of graph to display your data. There are some simple rules to follow:

Rule 1:

If the **dependent variable is not a number** data should be presented in a **table**.

For example, the colour of flame that different metal compounds produce when burned.

Rule 2:

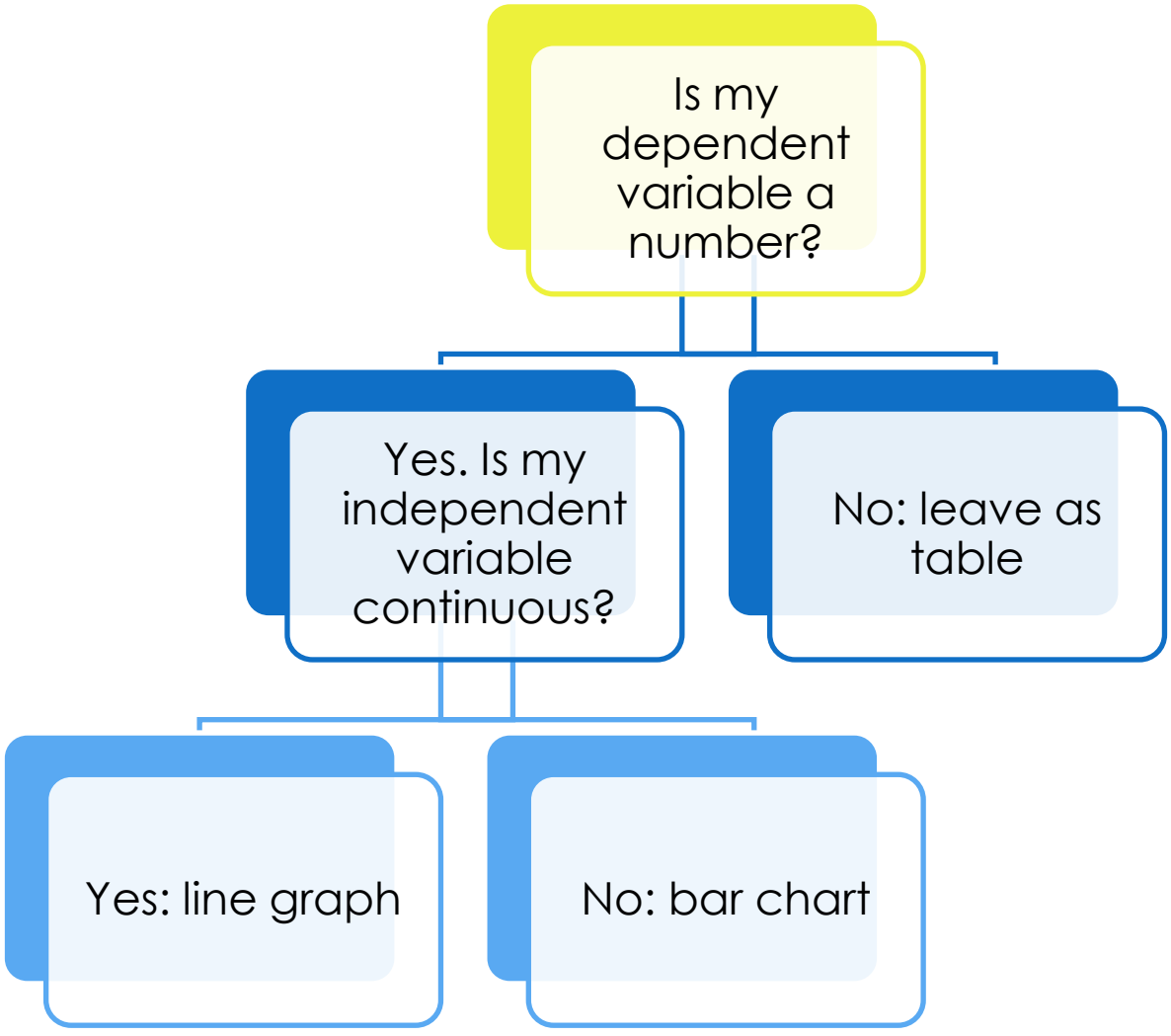
If the **dependent variable is a number** data should be presented in a **bar chart** or **line graph**.

Rule 3:

A **bar chart** is used if the dependent variable is a number and the **independent variable is not continuous**.

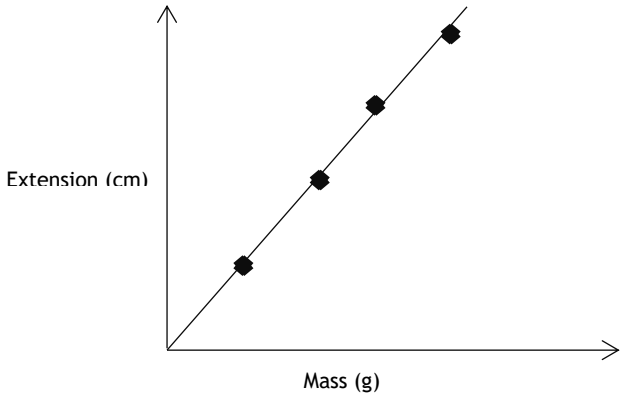
For example, the populations of different animals in a forest.

A **line graph** is used if the dependent variable is a number and **the independent variable is continuous**.



For example 1, adding masses to a spring and measuring the length of the spring……

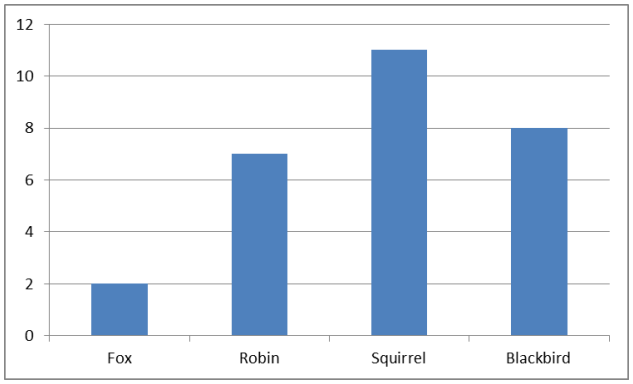
Mass added (g)	Spring extension (cm(
10	5
20	10
30	14
40	19



Is dependent variable is a number? YES; Is my independent variable continuous? YES LINE GRAPH

For example 2, number of animals on a field

Animal	Number
Fox	2
Robin	7
Squirrel	11
Blackbird	8



Is dependent variable is a number? YES; Is my independent variable continuous? NO BAR GRAPH

For example 3, What happens when different metals are added to acid?

Metal	Observation
Magnesium	Bubbled a lot
Iron	Bubbled a little bit
Copper	Didn't bubble
Aluminium	Didn't bubble

Is dependent variable is a number? NO; Leave as TABLE

Activity: How should you present your data

Copy and complete the table below to show how data should be presented – table, bar chart or line graph?

Don't forget: continuous and discrete data are NUMBERS, categorical are NO numbers

	Dependent Variable	**Independent Variable**	**Table/bar chart/ line graph?**
1	Continuous	Continuous	Line graph
2	Continuous	Discrete	
3	Categorical	Discrete	
4	Continuous	Categorical	
5	Discrete	Categorical	
6	Categorical	Categorical	
7	Time	Mass	
8	Mass	Time	
9	Temperature	Colour of compound	
10	Number of bubbles	Mass of plant	
11	Height	Length	
12	Brightness of bulb	Number of batteries	

How would you present the following sets of data?

13. How the extension of a spring varies with mass.
14. Number of people in a class vs their average height.
15. Number of people in a class vs the number of late marks.
16. Mass of different coloured cars.
17. Number of different coloured cars.
18. Whether or not a metal bubbled in acid.
19. Mass of metal against time taken to finish reacting.
20. Change in mass with time.

Reading

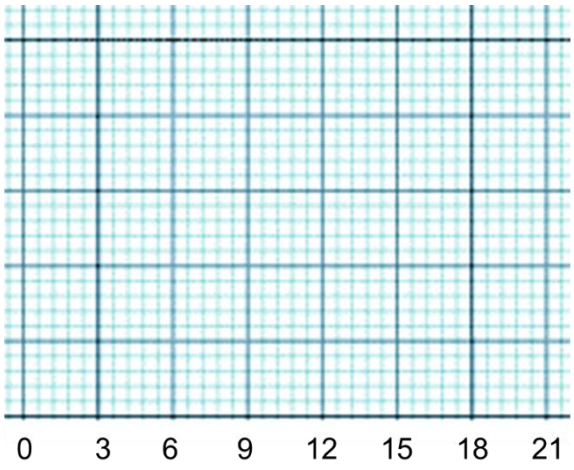
Drawing scales

Drawing scales is the first step in constructing bar charts and line graphs. You must use a pencil and ruler.

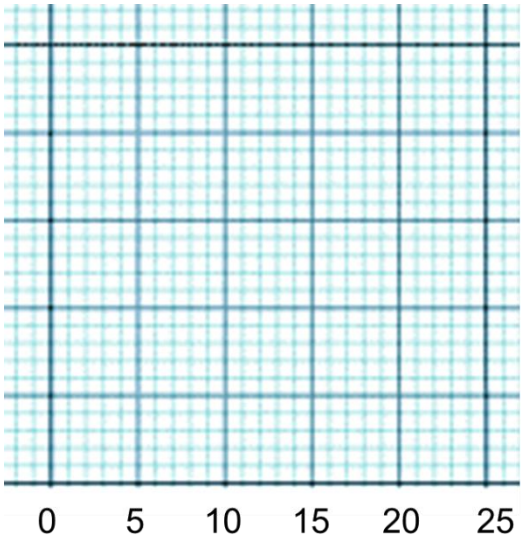
The scale is how the boxes on the graph relates to the values. Your scale is what you put the data **into**, you do not write your data **as** the scale. Each medium box should represent 1, 2, 5 or their multiples with 10 (e.g. 20, 40, 60). You should always fill as much of the graph page as you can

Example: A student wants to put the following measurements on a graph: 3, 5, 10, 12 and 20.

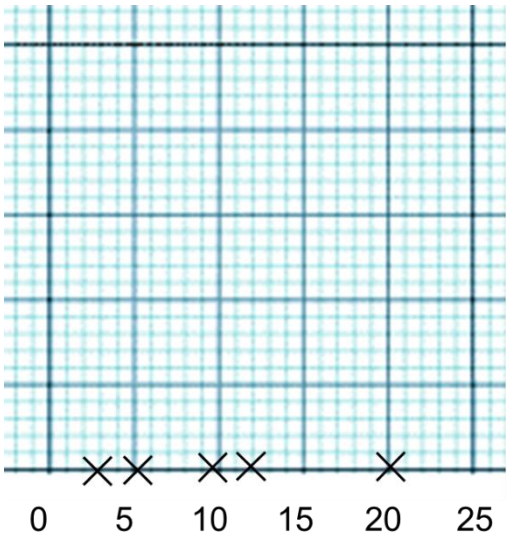
They write the scale down on graph paper. Where would 5 or 7 or 11 be on the scale? Can you see the problem?



This is an appropriate scale.



They can now plot their points.



Activity: Drawing scales

On the graph paper overleaf:

a) Draw scales to plot each of the following sets of values.
b) Use crosses to mark the values on your scale.

1. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

2. 2, 4, 6, 8, 10

3. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

4. 3, 5, 9, 12, 15, 16, 21

5. 50, 100, 180, 200, 300, 450

6. 23, 48, 70, 90, 110, 115

7. -10, -3, 0, +4, +15, +20

Lesson 8 Working scientifically: Displaying data - Line graphs

Lesson Key Words

axis independent data dependent plot anomaly scales

RETRIEVAL AND WCSI/WPS

Reading

Line graphs and lines of best fit

When you have plotted the points on a line graph, you need to decide whether there is a trend (does the data follow a pattern?). If there is a trend, then you need to add a best fit line or curve to show this.

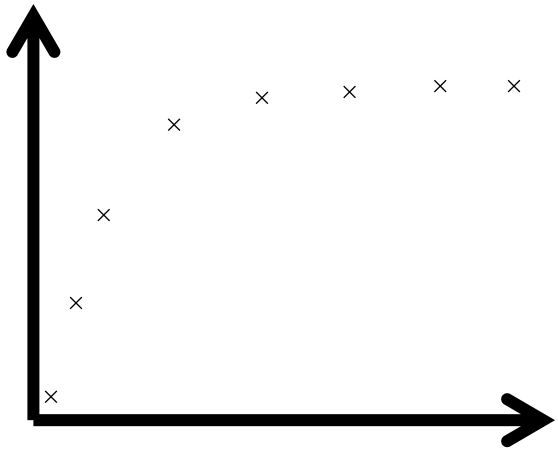
To help us produce accurate line graphs we need to remember that:

1. The line or curve must go through or close to as many points as possible.

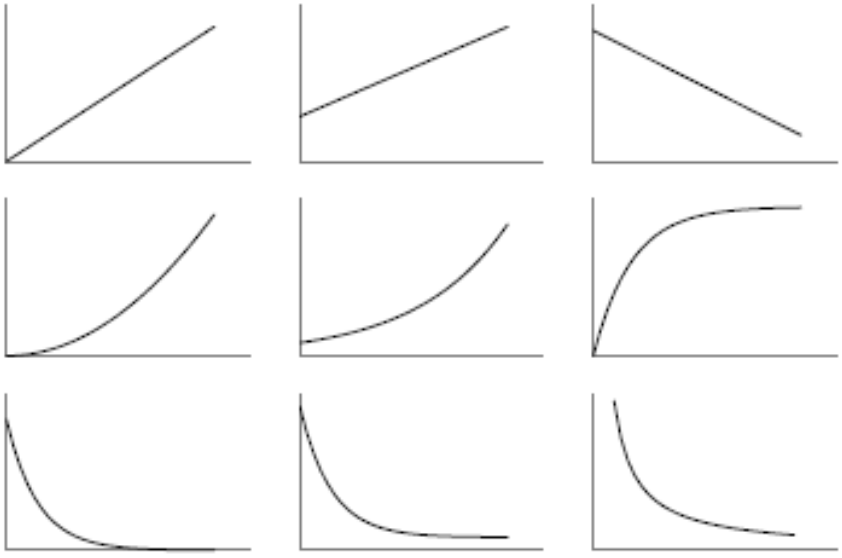
2. There should be a similar number of points on each side of the line.

3. You should draw the line in pencil and use a ruler if you think it is a straight line.

Lets look at an example. What sort of line should be drawn?

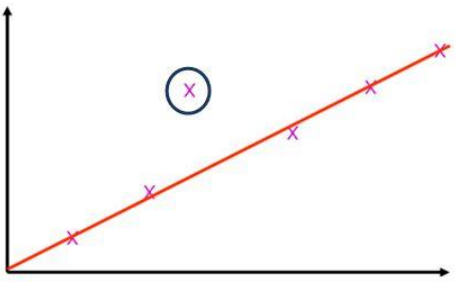


You draw the line that best fits your data – it does not have to be a straight line!



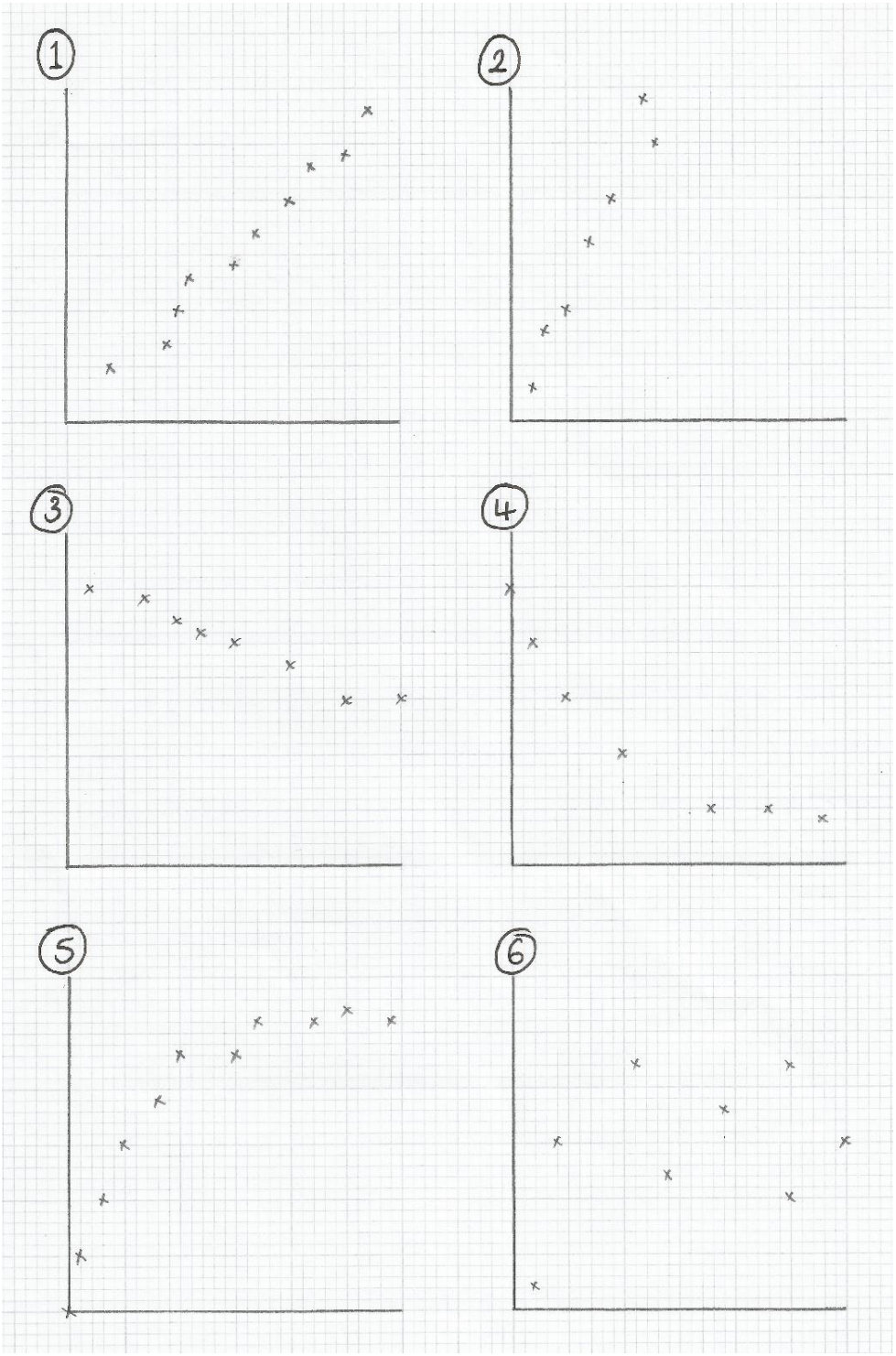
Anomalies

Anomalies are results that do not fit the pattern. Do not include them in calculations or lines of best fit. You can just circle them



Activity: Drawing lines of best fit.

Add a line of best fit, if appropriate to each of the following graphs.



Reading

Constructing a line graph

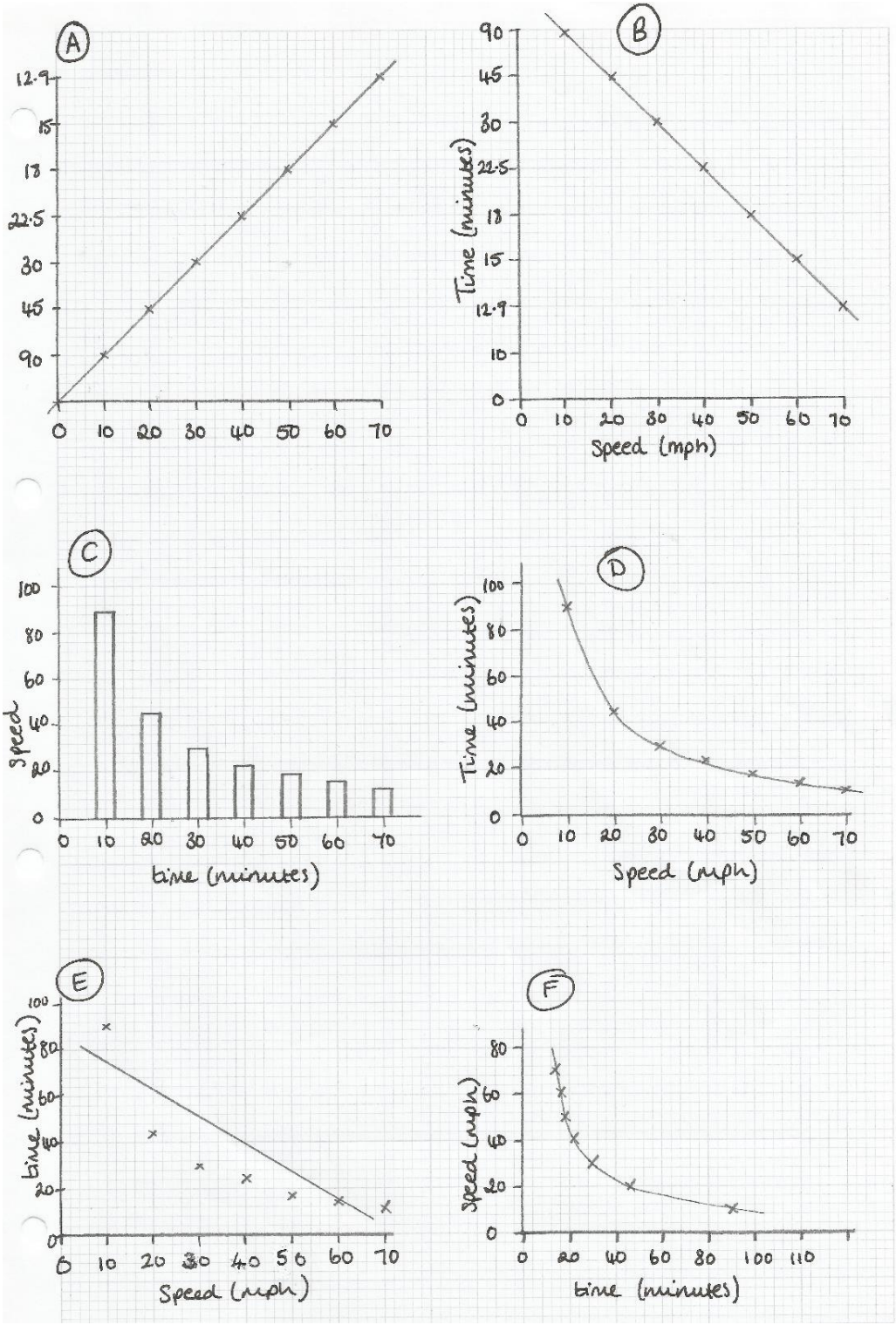
Features of a good line graph include:

- On graph paper
- All drawn in pencil
- Title
- Labelled axes
- Units in brackets
- Independent variable on the x axis
- Dependent variable on the y axis
- Medium boxes go up by 1,2,5 or their multiples with 10
- Uses at least half the paper
- Points correctly plotted
- Anomalies circled (if appropriate).

Activity: What's wrong with these graphs?

Six students timed how long it took a car to travel between two points along a motorway at different speeds. They plotted the results in a graph, but all their graphs looked different. Which graph is correct and what is wrong with all the others?

Speed (mph)	10	20	30	40	50	60	70
Time (minutes)	**90.0**	**45.0**	**30.0**	**22.5**	**18.0**	**15.0**	**12.9**



Activity: Drawing graphs

Draw appropriate graphs for the following sets of data:

1. The length a spring stretches by when different weights are added to it.

Weight (N)	0	1	2	3	4	5	6	8	10
Stretch (cm)	0	0.4	1.0	1.5	1.9	2.5	2.1	4.0	4.9

2. The time taken for a car to drive along a length of road at different speeds.

Speed (km/h)	10	20	30	40	50	60	70	80
Time (s)	80	40	27	20	16	13	11	10

3. The current flowing through wires of different length.

Length (cm)	10	20	30	40	50	75	100	125
Current (mA)	600	300	200	150	120	83	65	54

4. Volume of hydrogen produced when different masses of magnesium react with acid.

Mass of Magnesium (g)	0	0.1	0.2	0.3	0.4	0.5	0.55	0.6	0.7	0.8	0.9	1.0
Volume of hydrogen (cm^3)	0	100	185	295	410	490	545	595	590	605	595	600

5. The percentage of people in a population with different colour eyes.

Eye Colour	Brown	Blue	Hazel	Amber	Green
Percentage of population	79	9	5	5	2

6. The rate of digestion of starch at different temperatures.

Temperature (^oC)	10	20	32	40	49	60	71	80
Speed of digestion (g/min)	0.40	0.80	1.50	3.30	1.95	0	0	0

Lesson 6 Parts of a Flower

Lesson Key Words

Carpel Stamen Style Ovule Pollen Anther Filament Stigma Petal Stem Sepal

RETRIEVAL AND WCSI/WPS

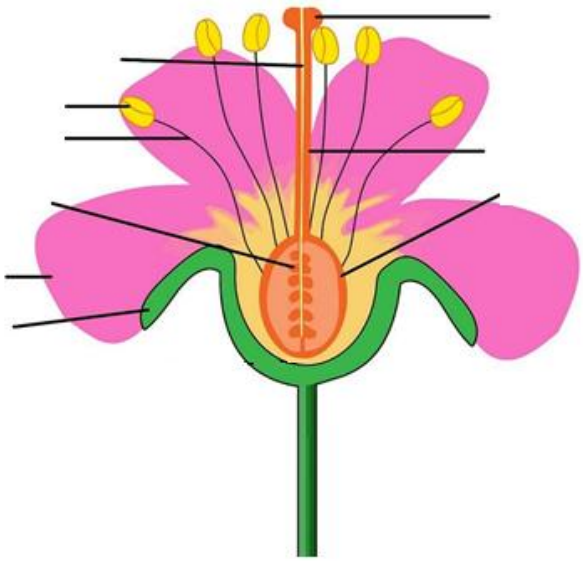
Core ideas- Reading, models, activities

Reading

Like humans' flowers also reproduce using sexual reproduction through a process called pollination. This means they have male and female sex cells, each of which provides half of the genetic information for the offspring. Both the male and female reproductive organs can be found in the flower, which have bright colours, smells and nectar to encourage pollinators, such as honeybees, to visit the plant. The male sex organs, called the stamen, includes the anther and the filament. The anther contains pollen, the male gamete, the filament holds the anther up so that it's at the top of the flower. The female parts are called the carpel and is made up of the stigma, style and ovary. Pollen lands on the stigma and a pollen tube grows down the style to take the nuclei of the pollen to the female gamete, the ovules, in the ovary. Below the reproductive organs is the sepal, which helps to protect the flower when it's a bud.

Core questions

1. What is meant by sexual reproduction?
2. Label the diagram.



3. What is the function of the flower in a plant?
4. What is a gamete?
5. Name the male and females gametes in a plant.
6. What is the function of the anther?
7. Where do you find the female gamete in a flower?
8. What is the function of the stigma and style in the flower?

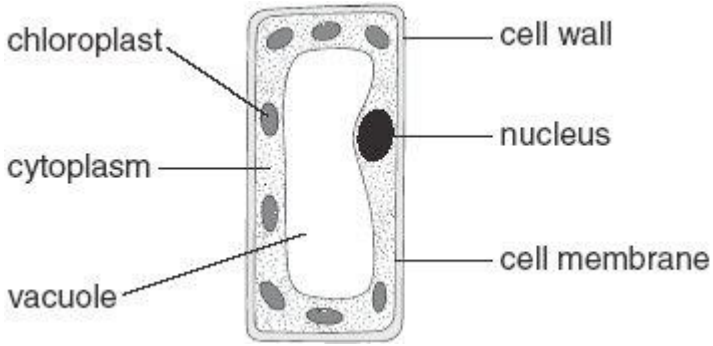
Core activity

- Use the scalpels to carefully dissect the flower the way you were shown by your teacher.
- Identify as many parts of the flower as you can, but you must at least identify the anthers, stigma and style.
- Cut into the style and see if you can find the ovules in the ovary.
- Stick the parts onto the paper and label, explaining the function of each part.

Application questions

9. How many chromosomes are in a human gamete?
10. Name three plant organs.
11. Order these from smallest to largest: Cell, Organ, Organ System, Organelle, Organism, Tissue
12. Why are honeybees important?

13. The diagram below shows a plant cell.



a) In which part of a plant would you find this type of cell?
b) Give the function of the nucleus.
c) How would the number of chromosomes in this cell differ from the number of chromosomes in a pollen cell?
d) Give the function of the chloroplasts.
e) Give the function of the cell wall.
f) Give the names of **two** labelled parts that are **not** present in animal cells.

Lesson 7 Plant Reproduction

Lesson Key Words

Carpel Stamen Style Ovule Pollen Anther Filament Stigma Petal Stem Sepal

RETRIEVAL AND WCSI/WPS

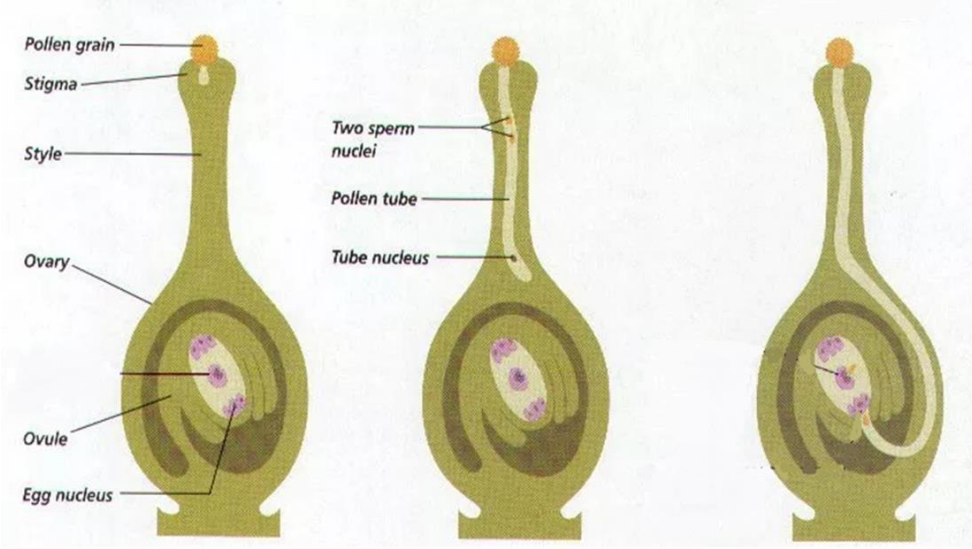
Core ideas- Reading, models, activities

Reading

Pollination is the transfer of pollen from the male part of the plant to the female parts. There are 2 types of pollination-

- Self-pollination- where the pollen is transferred to the stigma of the same plant.
- Cross-pollination- where the pollen is transferred to another plant either by insects or the wind.

When the pollen lands on the stigma, a pollen tube grows so that the nuclei of the pollen can travel to the ovary where it can fertilise and ovule. Once fertilisation has taken place the zygote (fertilised ovule) becomes a seed, and the ovary becomes a fruit. The petals die and fall off and the plant seeds are in the fruit.



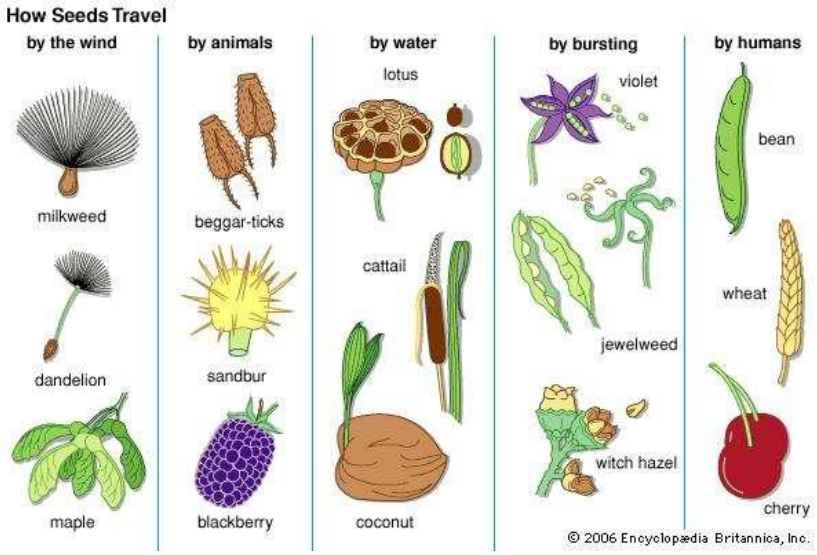
Core questions

14. What is meant by pollination?
15. How is pollen transferred from one plant to another?
16. Where do you find the pollen in a plant?
17. What attracts insects to the flower to pick up the pollen
18. Explain how pollination and fertilisation happens in a plant. Key words: pollen, tube, nuclei, fertilisation, stigma, ovary
19. What happens to the fertilised ovule and ovary?
20. What is another name given to the fertilised ovule?
21. How does the amount of DNA change between the ovule and the fertilised ovule?

Reading

Seed dispersal is how a plant spreads its seeds. They can do this in a number of ways-

- **Animal dispersal**
  - Some fruits have hooks, such as foxtails. These can attach themselves to animals who then move them.
  - Hard nuts, such as acorns from oak trees, are usually destroyed if chewed or eaten. However, animals such as squirrels may bury them to eat later and forget to go back to get them, giving them a chance to germinate.
  - Fleshy fruits, such as berries, are eaten by animals. The seeds are then dispersed after passing through the digestive system of animals that have eaten the fleshy fruits.
- **Wind dispersal**
  - some plants, such as the dandelion, have seeds that act as parachutes, which are carried away by the wind.
  - Acorns fall from trees and roil, if they are not destroyed by animals, white oak acorns can sprout rapidly after falling from the tree.
  - maple fruits are winged, two-seeded pods. They spin like helicopters as they fall from the tree, providing a longer time for dispersal by wind.
- **Bursting-** Plants such as violets forcefully eject their seeds, sending them flying as far away from the plant as possible.
- **Water dispersal-** Plants such as the coconut tree, drop their fruits/seeds into the water which then carries it away.



Core activity

Copy and complete the table below, using the information above to help.

Example	Characteristics that help the seed to be dispersed in this way	How is the Seed Dispersed?
Dandelion	Parachute like structures. Very light.	
Coconut	Hard outer case and has air spaces inside	
Tomato		
	Pod splits open and seeds are thrown out	
	Has hooks to cling to animal fur	
	Fruits have wings to move with wind	