

Term: Autumn 2

Year: 6

Physics: Light

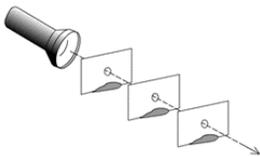
## BIG QUESTION: HOW DO WE SEE?

### How Light Travels

#### Speed of Light

Light travels as a **wave** or a **ray**. Unlike sound waves or water waves, it does not need any matter or material to carry its energy along. Nothing travels faster than **light energy**. It speeds through the vacuum of space at 186,400 miles (300,000 km) per second.

#### How can we prove light travels in straight lines?



Once **light** has been produced, it will keep travelling in a **straight line** until it hits something else. How can you prove it?

#### Alhazen (965-1039)



**Alhazen** was a physicist and mathematician. He is known as the **Father of Optics**. He proved light travels in straight lines by carrying out an experiment with two lanterns.

### Key Knowledge & Vocabulary

#### Light

Light is a type of energy known as electromagnetic radiation. It is given out by hot objects such as the sun, light bulbs and lasers.

#### Dark

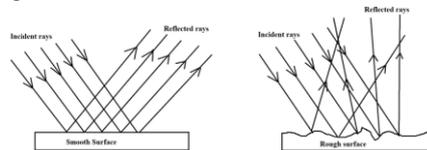
The absence of light.

#### Reflect

When light bounces back off a surface, changing the direction of a ray of light.

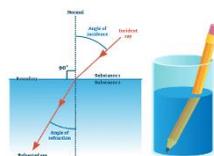
#### Reflective surface

Reflection is when light bounces off an object. If a surface is smooth and shiny, the light will reflect at the same angle as it hit the surface.



#### Refract

Refraction happens when light changes direction, or bends, when it moves from one material to another. For example, light traveling through the air refracts when it hits water.



#### Shadow

The dark shape made when an object blocks light.

#### Opaque

An object that does not allow light to pass through it so you cannot see through it.

#### Translucent

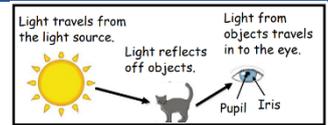
An object that you are not clearly able to see through because it only allows some light to pass through it.

#### Transparent

An object that allows light to pass through it so that objects behind it can be seen clearly.

### How Do We See?

#### How light is reflected



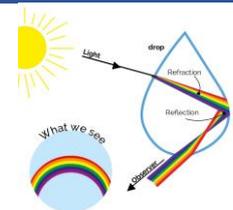
**Light** travels in **straight lines**. When light hits an object, it is **reflected** by that object and travels in straight lines to our **eyes**. Our eyes take in some of this light and information is sent to the brain. This is how we see the object.

#### Why can't we see in the dark?



We see an object when **light** falls on it and gets **reflected** from its surface and enters our eyes. In a dark room, there is **no source of light**. Thus, no light falls on the surface of objects and so we do not see them.

#### What is a rainbow?



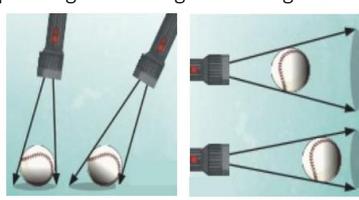
A **rainbow** is created when white light is **refracted** while entering a droplet of water, split into separate colours, and **reflected** back.

## Will an object's shadow always look the same?

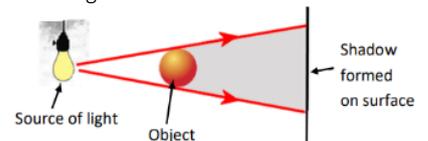
A shadow is always the same shape as the object that casts it.



Shadows can be elongated or shortened depending on the angle of the light source.



A shadow is larger when an object is closer to the light source because it blocks more of the light.



### Learning Links

**Builds on:**  
Y3 Physics: Light

**What I am learning now:**  
Y6 Physics: Light

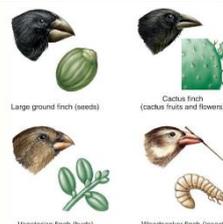
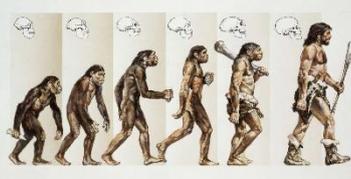
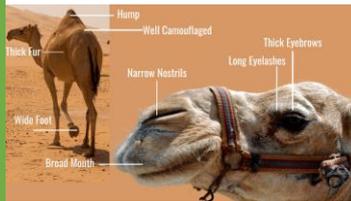
**Leads to:**  
KS3 Physics: Light Waves

Term: Spring 1

Year: 6

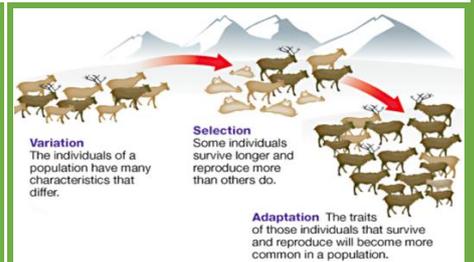
Biology: Evolution and Inheritance

## BIG QUESTION: HOW DO LIVING THINGS CHANGE OVER TIME AND PLACE?

Evolution & Inheritance	Key Knowledge & Vocabulary	Evolution & Inheritance
<h3>Inheritance</h3> <ul style="list-style-type: none"> <li>Fur</li> <li>Body markings</li> <li>Height</li> <li>Length</li> <li>Shape of eyes, ears, nose, body</li> </ul>  <p>Parents pass on their <b>physical traits</b> to their <b>offspring</b>. Offspring <b>vary</b> and are not <b>identical</b> to their parents.</p>	<p><b>Adaptation</b> The process of change through which an organism or species becomes better suited to its environment.</p> <p><b>Characteristics</b> The distinguishing features or qualities that are specific to a species.</p> <p><b>Environment</b> An environment contains many habitats and includes areas where there are both living and non-living things.</p> <p><b>Evolution</b> The process by which different kinds of living organisms are believed to have developed from earlier forms. Adaptation over a very long time.</p> <p><b>Fossil</b> The preserved remains or impression of ancient plants or animals embedded in rock and preserved in petrified form.</p> <p><b>Habitat</b> Refers to a specific area or place in which particular animals and plants can live.</p> <p><b>Inherit</b> Derive (a quality, a characteristic or a predisposition) genetically from a parent or ancestor.</p> <p><b>Natural Selection</b> The process where organisms that are better adapted to their environment tend to survive and produce more offspring.</p> <p><b>Offspring</b> The animal or plant that is produced by the reproduction of that species.</p> <p><b>Organism</b> An individual animal, plant or single-celled life form.</p> <p><b>Reproduction</b> When an animal or plant produces one or more individuals similar to itself.</p> <p><b>Species</b> Organisms with similar characteristics.</p> <p><b>Variation</b> The difference between individuals within a species.</p>	<h3>Evolution</h3>  <p>New <b>species</b> develop from a common <b>ancestor</b>, evolving over millions of years.</p>
<h3>Variation</h3>  <p>Differences between <b>individuals</b> of the <b>same species</b>.</p>		<h3>Humans</h3>  <p>What features make us human? Where, when and why did they <b>evolve</b>?</p>
<h3>Adaptive traits</h3>  <p><b>Characteristics</b> that help a living thing to <b>survive</b> in its <b>environment</b>.</p>		<h3>Fossils</h3>  <p><b>Hyracotherium (Eohippus)</b> is an ancestor of the modern horse (<i>Equus</i>).</p>  <p>Scientists use <b>fossils</b> to find similarities between <b>ancient species</b> and <b>modern species</b>.</p>

## The Theory of Evolution by Natural Selection

Charles Darwin and Alfred Wallace's observations led them to the conclusion that living things evolve over long periods of time rather than remaining fixed. They shared their research, discussing their evidence for **natural selection** and **evolution**. Their ideas shook Victorian society.



## Learning Links

### Builds on:

Y5 Biology: Living Things & their Habitats

### What I am learning now:

Y6 Biology: Evolution and Inheritance

### Leads to:

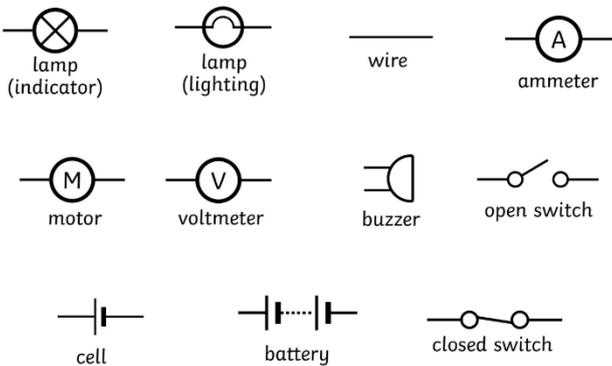
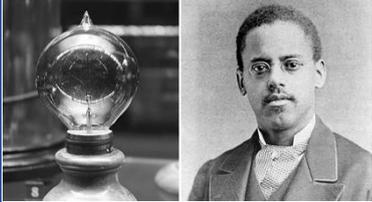
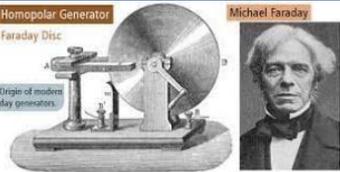
KS3 Biology: Genetics and Evolution

Term: Spring 2

Year: 6

Physics: Electricity

## BIG QUESTION: CAN WE VARY THE EFFECTS OF ELECTRICITY?

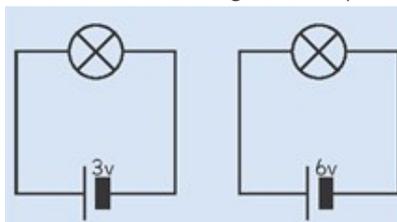
Electricity Timeline	Key Knowledge & Vocabulary	Electricity Timeline
<p><b>Benjamin Franklin (1706 - 1790)</b></p>  <p>Benjamin Franklin made key discoveries between <b>lightning</b> and <b>electricity</b>. He invented the <b>lightning rod</b>, which redirected lightning, protecting buildings.</p>	<p><b>Electricity</b> A form of energy that can be carried by wires and used for heating, lighting and sound.</p> <p><b>Amps</b> How electric current is measured.</p> <p><b>Cell and Battery</b> A device that stores electrical energy as a chemical. A cell is a single unit and a battery is a collection of cells.</p> <p><b>Circuit</b> A complete route which an electrical current can flow around.</p> <p><b>Current</b> A flow of electricity through a wire or circuit.</p> <p><b>Electrons</b> Very small particles that travel around an electrical circuit.</p> <p><b>Energy</b> A supply of power. The ability to do work.</p> <p><b>Resistance</b> The difficulty that the electric current has when flowing around a circuit.</p> <p><b>Voltage</b> The force that makes the electric current move through the wires. The greater the voltage, the more current will flow.</p> <p style="text-align: center;"><u>Electrical Circuit Symbols</u></p> 	<p><b>Thomas Edison (1847 - 1931)</b></p>  <p>Thomas Edison was an American inventor. His best-known inventions are the first long-lasting <b>lightbulb</b>, the <b>phonograph</b>, the <b>kinetoscope</b> and a <b>moving-image projector</b>.</p>
<p><b>Alessandro Volta (1745 - 1827)</b></p>  <p>Volta was a pioneer of electricity and power. He invented the <b>electric battery</b>, proving that electricity could be generated chemically.</p>		<p><b>Lewis Latimer (1848- 1928)</b></p>  <p>Lewis Latimer played an important role in the development of the <b>telephone</b> and the <b>incandescent lightbulb</b>.</p>
<p><b>Michael Faraday (1791 - 1867)</b></p>  <p>Michael Faraday invented the <b>electric motor</b> in 1821. He also discovered how to make <b>electro-magnets</b>.</p>		<p><b>Nikola Tesla (1856 - 1943)</b></p>  <p>Nikola Tesla discovered that electrical machines work better using <b>alternating current</b>.</p>

### What will make a bulb brighter or a buzzer quieter?

**Brighter bulbs and louder buzzers:**

- create **more power** by using more batteries or a higher voltage
- use shorter wires so electrons have **less resistance** to flow through

Which bulb is brighter? Why?



**Dimmer bulbs and quieter buzzers:**

- give **less power** to the circuit by using fewer batteries or a lower voltage
- use longer wires so electrons have **more resistance** to travel through

### Learning Links

**Builds on:**  
Y4 Physics: Electricity

**What I am learning now:**  
Y6 Physics: Electricity

**Leads to:**  
KS3 Physics: Electricity & Electro-magnetism

Term: Summer 1

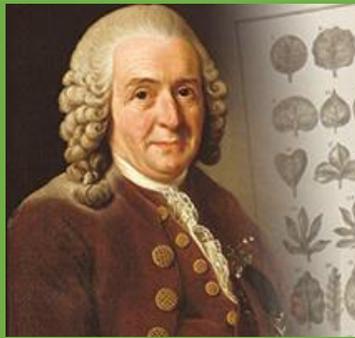
Year: 6

Biology: Living Things and their Habitats

## BIG QUESTION: LIVING THINGS, WHAT'S THE SAME, WHAT'S DIFFERENT?

### What is Taxonomy?

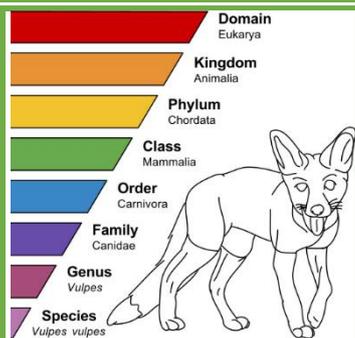
#### Linnaeus (1707 – 1778)



#### Classification

Carl Linnaeus was a Swedish naturalist. He created the modern method of **classifying living things** by grouping similar species together. He also gave each plant and animal a name made up of two Latin words e.g. he gave humans the scientific name Homo sapiens (wise man).

#### The Linnaean System



### Key Knowledge & Vocabulary

#### Bacteria

A single-celled **micro-organism**.

#### Characteristics

The distinguishing features or qualities that are specific to a species and make an individual or group of things different from others.

#### Classify

To sort things into different groups.

#### Classification

Grouping living things by similarities and differences.

#### Fungi

Fungi are a group of micro-organisms (including yeast, mould and mushrooms) which eat organic material.

#### Key

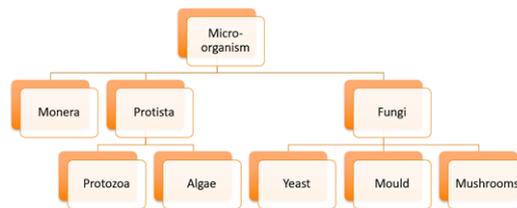
A **key** is a series of questions about the **characteristics** of living things. It is used to **identify** a living thing or decide which **group** it belongs to by answering 'yes' or 'no' questions.

#### Life processes

The things that all living things do: **M**ovement, **R**espiration, **S**ensitivity, **G**rowth, **R**eproduction, **E**xcretion, **N**utrition.

#### Micro-organism

An **organism** that can only be seen using a microscope.



#### Organism

Another word for a living thing (plant or animal).

#### Species

A group of similar plants and animals that are able to reproduce.

#### Taxonomist

A scientist who classifies different living things into categories.

### Micro-organisms

#### Types of Micro-organism

- Monera: **bacteria**, single celled micro-organisms with no nucleus
- Protista: **protozoa** (animal) or **algae** (plant) with a nucleus
- **Fungi**: yeast, mould and mushrooms

#### Helpful Micro-organisms



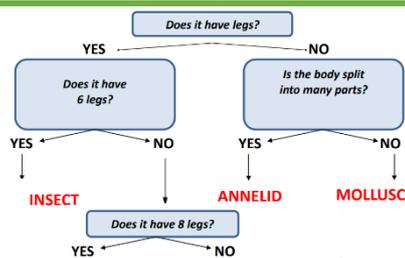
**Micro-organisms** help in decomposition, breaking down material from dead plants and animals to create soil. They help us to digest our food.

#### Harmful Micro-organisms

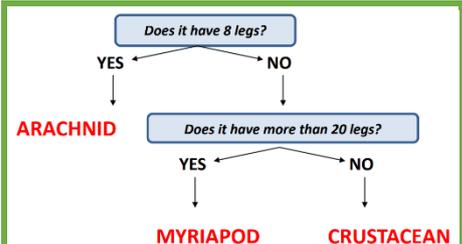


**Bacteria** and **fungi** can cause infections. **Viruses** are not living organisms, but they are sometimes classified as micro-organisms.

### Classification Keys



A **classification key** is used to group things and help us to identify them. The key will first ask you a general question about obvious **characteristics** that you can answer easily. When you answer one question, you move to the next point and answer the next question or identify the organism.



### Learning Links

#### Builds on:

Y5 Biology: Living Things and their Habitats

#### What I am learning now:

Y6 Biology: Living Things and their Habitats

#### Leads to:

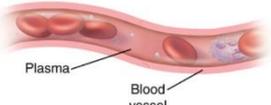
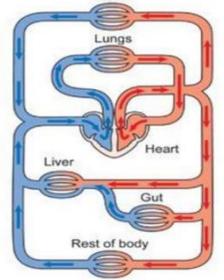
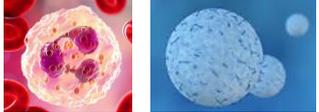
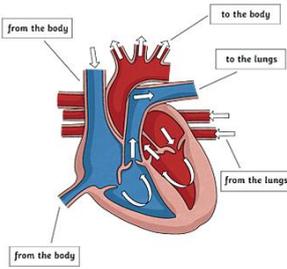
KS3 Biology: Interactions and Interdependencies

Term: Summer 2

Year: 6

Biology: Animals including Humans

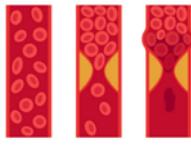
## BIG QUESTION: HOW DO OUR CHOICES AFFECT HOW OUR BODIES WORK?

What is Blood?	Key Knowledge & Vocabulary	The Circulatory System
<p><b>Plasma</b></p>	<p><b>Alcohol</b> A drug produced from grains, fruits or vegetables when they are put through a process called fermentation.</p>	<ul style="list-style-type: none"> <li>➤ Blood is pumped from the heart to the lungs to collect oxygen.</li> </ul>
 <p>Plasma is liquid. The other parts of your blood are solid.</p>	<p><b>Blood</b> A liquid that transports gases and nutrients around the body.</p> <p><b>Blood vessels</b> The tube-like structures that carry blood through the tissues and organs. Veins, arteries and capillaries are the three types of blood vessels.</p>	<ul style="list-style-type: none"> <li>➤ Blood is transported back to the heart.</li> <li>➤ Blood is pumped around the body in arteries, carrying oxygen and dissolved nutrients.</li> </ul>
<p><b>Red Blood Cells</b></p>	<p><b>Circulatory system</b> A system which includes the heart, veins, arteries and blood which transports substances around the body.</p>	
 <p>Red blood cells carry oxygen around the body.</p>	<p><b>Deoxygenated</b> To have oxygen removed from it. Deoxygenated blood is blood where most of the oxygen has already been transferred to the rest of the body.</p> <p><b>Drug</b> A substance containing natural or man-made chemicals that has an effect on your body when it enters your system. They can be harmful or beneficial.</p>	<p>— Blood carrying carbon dioxide in veins — Blood carrying oxygen in arteries</p>
<p><b>White Blood Cells</b></p>	<p><b>Heart</b> An organ which constantly pumps blood around the circulatory system.</p>	<ul style="list-style-type: none"> <li>➤ Some blood passes by the small intestine where it collects more dissolved nutrients.</li> </ul>
 <p>White blood cells defend against bacteria, viruses and unwanted materials.</p>		<ul style="list-style-type: none"> <li>➤ After distributing oxygen around the body, particularly muscles, blood returns to the heart in veins.</li> </ul>
<p><b>Platelets</b></p>	<p><b>Nutrients</b> Substances that animals need to stay alive and healthy.</p>	<ul style="list-style-type: none"> <li>➤ Blood is pumped to the lungs again to collect oxygen and to breathe out carbon dioxide. The cycle continues.</li> </ul>
 <p>Platelets help to stop bleeding when the skin is cut.</p>	<p><b>Oxygenated</b> To be full of oxygen. Oxygenated blood is pumped from the heart to the rest of the body.</p>	

### Lifestyle and Health



Exercise increases the heart rate and helps to keep the heart, lungs and muscles healthy.



Humans need a variety of foods. Some fats can clog arteries and veins, preventing efficient blood flow.




Drugs like prescribed medicines, can be beneficial. Some, like alcohol and tobacco, can be harmful and addictive.

### Learning Links

**Builds on:**  
Y5 Biology: Stages of Human Development

**What I am learning now:**  
Y6 Biology: Animals including Humans

**Leads to:**  
KS3 Biology: Structure and Functions of Living Organisms