

## The Biosphere – Living Organisms

43 slides, 7 Flash activities

This presentation is designed to teach:

- how an ecosystem and the food chains within it are structured
- how organisms are categorized into feeding groups
- how predator–prey numbers fluctuate in relation to each other
- how pyramids of numbers and biomass relate to the structure of an ecosystem
- what niches are and how organisms compete in the environment
- how competition can lead to changes in population numbers and evolutionary change.

**Ranking consumers**

Consumers eat plants or animals, or both. A food chain can be used to rank different types of consumers.

seaweed → limpet → crab → human

producer → primary consumer → secondary consumer → tertiary consumer

- Producers – make their own food.
- Primary consumers – eat producers.
- Secondary consumers – eat primary consumers.
- Tertiary consumers – eat secondary consumers.

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## The Biosphere – Decay and Recycling

42 slides, 11 Flash activities

This presentation is designed to teach:

- that organisms are interdependent
- that nutrients must be recycled to be made available again
- what decay is and how detritivores and saprotrophs are involved in the process
- how nitrogen and carbon are cycled through plant matter, consumers, the soil, the atmosphere and rocks.

**What is the nitrogen cycle?**

**The nitrogen cycle**

atmospheric nitrogen

lightning

fertilizers

nitrogen fixing bacteria

nitrites in the soil

nitrates in the soil

Nitrogen-fixing bacteria live in the roots of leguminous plants and convert nitrogen into nitrates.

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## The Biosphere – Human Impact

36 slides, 10 Flash activities

This presentation is designed to teach:

- the problems associated with human population growth
- what air pollution is and how it contributes to acid rain, damage to the ozone layer and smog
- how greenhouse gases contribute to the greenhouse effect
- the problems of water pollution, leading to eutrophication
- options for waste management.

### Global warming and greenhouse gases



One of the greatest threats caused by air pollution is **global warming**. Global warming is caused by a build-up of greenhouse gases, which leads to an increase in the Earth's temperature.

A **greenhouse gas** is an atmospheric gas that absorbs infrared light.

Key greenhouse gases include:

- carbon dioxide ( $\text{CO}_2$ )
- methane ( $\text{CH}_4$ )
- water vapour ( $\text{H}_2\text{O}$ )
- nitrous oxide ( $\text{N}_2\text{O}$ )



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## The Biosphere – Sustainability

45 slides, 7 Flash activities

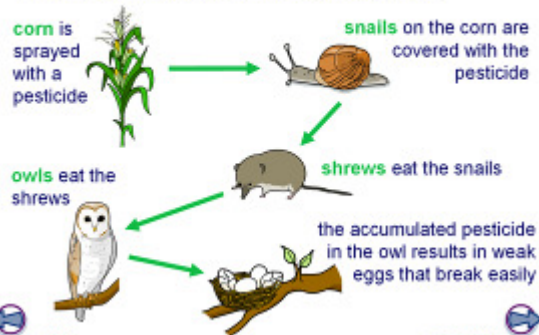
This presentation is designed to teach:

- what sustainability is
- what endangered species are
- how human actions, and efforts to protect the environment, are often in conflict
- that captive breeding programs, bans on hunting and sustainable forestry are conservation techniques
- how farming can be made sustainable.

### Pesticide accumulation



How do pesticides accumulate along food chains?



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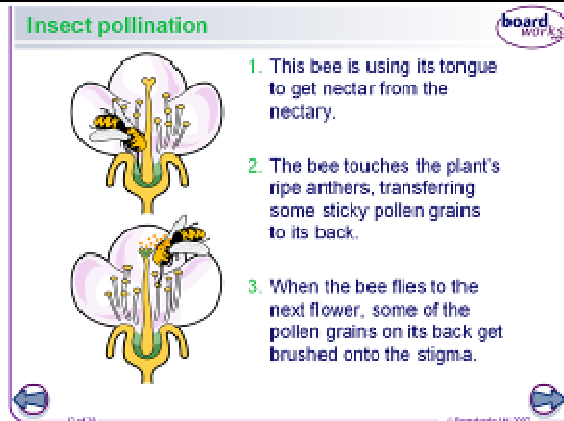


## The World of Plants - Reproduction

38 slides, 15 Flash activities

This presentation is designed to teach:

- why plant reproduction is useful to humans
- the structures of the typical reproductive parts of plants
- how pollination and fertilization occur
- what fruits and seeds are and how they are dispersed
- how seeds germinate and grow
- how plants reproduce asexually
- techniques for artificial propagation.



**Insect pollination**

1. This bee is using its tongue to get nectar from the nectary.
2. The bee touches the plant's ripe anthers, transferring some sticky pollen grains to its back.
3. When the bee flies to the next flower, some of the pollen grains on its back get brushed onto the stigma.

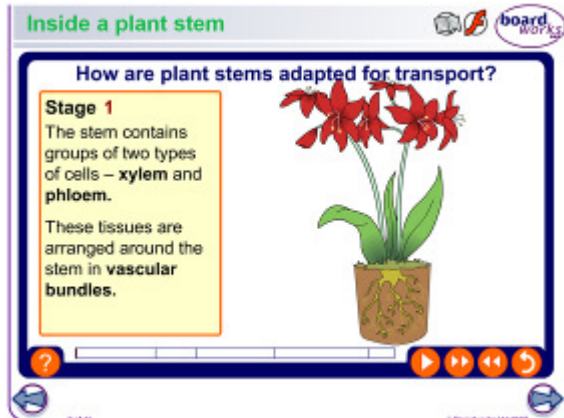
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## The World of Plants – Healthy Growth

46 slides, 20 Flash activities

This presentation is designed to teach:

- how plants meet their nutrient requirements
- how plant tissues are specialised to transport water and nutrients
- how gases enter and leave plants
- what photosynthesis is
- what factors affect rate of photosynthesis and what a limiting factor is.



**Inside a plant stem**

How are plant stems adapted for transport?

**Stage 1**  
The stem contains groups of two types of cells – **xylem** and **phloem**.  
These tissues are arranged around the stem in **vascular bundles**.

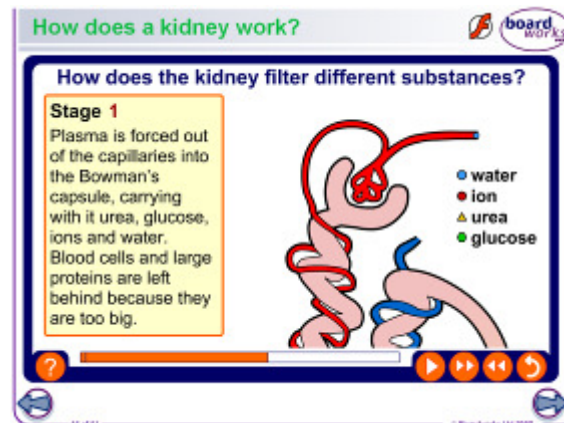
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## Animal Survival

61 slides, 26 Flash activities

This presentation is designed to teach:

- what nutrients are available in food
- what constitutes a balanced diet
- what metabolism and digestion are
- that digestion involves both physical and chemical breakdown of food
- which organs and enzymes are involved in digestion
- the stages of reproduction in fish and humans
- how the body excretes waste and regulates levels of water and other nutrients.



**How does a kidney work?**

**How does the kidney filter different substances?**

**Stage 1**  
Plasma is forced out of the capillaries into the Bowman's capsule, carrying with it urea, glucose, ions and water. Blood cells and large proteins are left behind because they are too big.

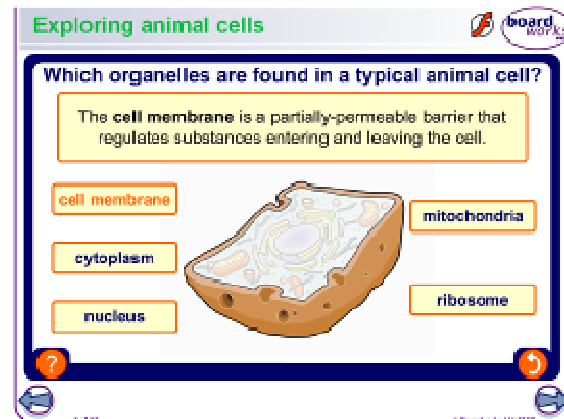
- water
- ion
- urea
- glucose

## Investigating Cells – Life's Basic Units

32 slides, 11 Flash activities

This presentation is designed to teach:

- what a cell is
- which organelles are found in animal and plant cells
- that respiration provides the energy for cell actions
- the stages of mitosis and what genetic material is
- why and how cells divide.



**Exploring animal cells**

**Which organelles are found in a typical animal cell?**

The **cell membrane** is a partially-permeable barrier that regulates substances entering and leaving the cell.

- cell membrane
- cytoplasm
- nucleus
- mitochondria
- ribosome

## Investigating Cells – Cell Activity

42 slides, 11 Flash activities

This presentation is designed to teach:

- what diffusion is
- the different ways the body is adapted to facilitate diffusion of nutrients and other substances
- what osmosis is and its effects on animal and plant cells
- what enzymes are and examples of how they are used in the body
- that enzymes have optimum working conditions
- that enzymes can be denatured.

**Osmosis and plant cells**

How do plant cells react to osmosis?

Water has entered the cell by osmosis because the water surrounding the cell is more concentrated than the cytoplasm inside the cell. The cytoplasm is pushing against the cell wall: the cell is turgid.

low medium high  
water concentration outside cell

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## The Body in Action – Movement

28 slides, 5 Flash activities

This presentation is designed to teach:

- what bones are made of and how they grow
- the functions of the skeleton
- the properties and functions of ligaments, tendons and cartilage
- the structures and ranges of movement of different synovial joints
- how joints and muscles enable movement.

**Other synovial joints**

In **saddle joints**, the ends of the two bones fit together in a special way, allowing movement forwards and backwards and left to right, but not rotation. The thumb is the only example of this joint type.

**Pivot joints** have a ring of bone that fits over a bone protrusion, around which it can rotate. These joints only allow rotation. The joint between the atlas and axis in the neck, which allows shaking of the head, is an example.

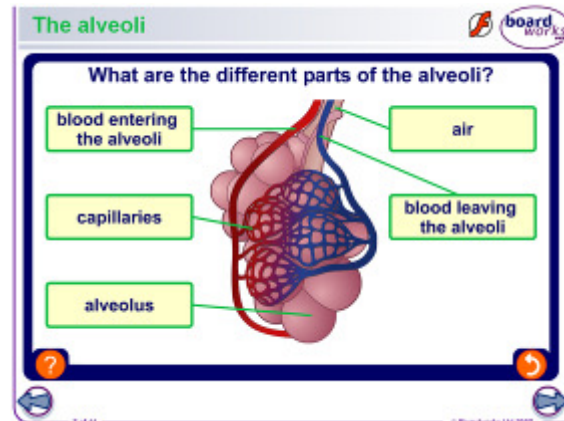
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## The Body in Action – The Need for Energy

44 slides, 10 Flash activities

This presentation is designed to teach:

- what breathing is and how gas exchange occurs
- that the circulatory system acts to carry nutrients and oxygen around the body
- how the heart works as a pump
- the different types of blood vessel
- the constituents of blood and their purposes
- the effects of exercise on the circulatory system; and lactic acid and glycogen levels in muscles.

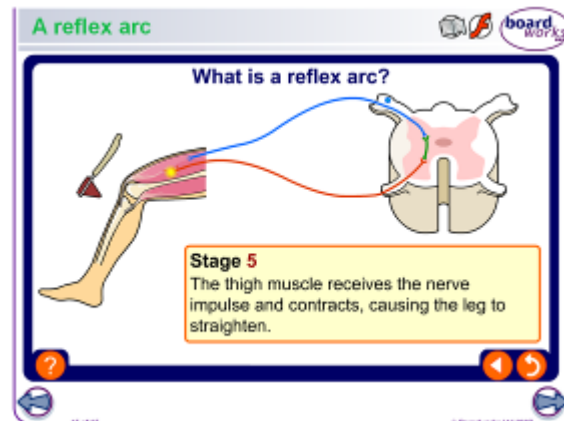


## The Body in Action – Co-ordination

34 slides, 11 Flash activities

This presentation is designed to teach:

- what the central nervous system is
- what sensory, motor and relay neurones are, and how nerve impulses are transmitted
- what reflexes are, and how a reflex arc works
- what monocular and binocular vision is
- the functions of the different parts of the eye
- how we hear and how we balance
- the functions of different parts of the ear.



## Variation

27 slides, 6 Flash activities

This presentation is designed to teach:


- that differences within species can be acquired or inherited
- how variation occurs due to environmental factors and genetics
- how genotype and phenotype relate to each other
- what continuous and discontinuous variation is
- what type of variation genetic mutations introduce
- how genetic characteristics can be chosen by selective breeding.

**Inherited and acquired characteristics**

Some characteristics, such as eye colour and earlobe shape, are only determined by genes. These are called **inherited characteristics**.

Other types of characteristics, such as scars and hair length, are not inherited but depend on environmental factors. These are called **acquired characteristics**.

Differences in some characteristics are due to a combination of **both** inherited and environmental factors. In some cases, it can be difficult to say how much influence each factor has.



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## Inheritance

39 slides, 12 Flash activities

This presentation is designed to teach:

- what genes and alleles are
- the concepts of heterozygous and homozygous, and dominant and recessive alleles
- how alleles are passed from parents to offspring
- how a test cross can determine the unknown genotype of an organism
- the effects of incomplete and co-dominant alleles
- what sex chromosomes are
- the experiments of Mendel
- the effects of certain chromosome mutations.

**Homozygous alleles**

If the alleles for a characteristic in a homologous pair are the same, the organism is said to be **homozygous** for that characteristic.

What colour eyes will these homozygous pairs of alleles produce?



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## Biotechnology


36 slides, 9 Flash activities

This presentation is designed to teach:

- what bacteria, viruses, fungi and yeast are
- how microbes are used to produce food and drink
- what transgenics is
- how bacteria and viruses are used in genetic engineering
- what enzymes are and how they are produced
- how antibiotics work.

**What is transgenics?**

Foreign DNA, including DNA from humans, can be inserted into animals. This is called **transgenics**.



The protein encoded by the DNA can then be produced in a specific tissue of the transgenic animal at a specific time.

This method produces higher levels of antibody, more easily and cheaply, than by using genetically-engineered bacteria or mammalian cells.

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