Classification

Classifying organisms, species and the binomial system, dichotomous keys, the five kingdoms, the main groups of vertebrates and arthropods, ferns and flowering plants, and viruses.

1.2 Concept and use of a classification system

Classification is sorting organisms into groups, based on the features that they share. It makes it easier to study the huge number of different living things, and it shows how closely related they are.

> **A species is a group of organisms that can reproduce to produce fertile offspring.**

A horse and a donkey can breed, but the offspring (a mule) is **sterile**, so they are different species.

The binomial system

> **The binomial system is an internationally agreed way of naming species. The scientific name has two parts: the genus (starts with a capital letter) and the species (all in lower case). It is written in italics or underlined.**

Humans are *Homo sapiens*: the genus is *Homo* and the species is *sapiens*. Using one agreed name avoids confusion, because common names differ between languages and places.

Dichotomous keys

A **dichotomous key** is a series of paired statements, each with two choices, used to identify an organism from features that you can see. Each choice leads either to another pair of statements or to the name of the organism.

Example of how a key is used:

1. (a) Has wings: go to 2. (b) No wings: go to 3.
2. (a) One pair of wings: **fly**. (b) Two pairs of wings: **bee**.
3. (a) Six legs: **ant**. (b) Eight legs: **spider**.

To **construct** a key: choose features that are easy to see and that divide the group into two, and write the statements so that each pair is clear. Use features that do not change (such as the number of legs), and not features such as size or colour that can vary.

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1.3 Features of organisms

The five kingdoms

Kingdom	Main features
animal	multicellular; no cell walls or chloroplasts; feed on other organisms (heterotrophic); move around
plant	multicellular; cellulose cell walls; chloroplasts; make their own food by photosynthesis
fungus	mostly multicellular; cell walls (not cellulose); no chloroplasts; feed by absorbing nutrients from dead or living organisms; body made of threads called hyphae
prokaryote	single-celled; no nucleus (DNA lies free); includes the bacteria
protoctist	mostly single-celled with a nucleus; some have chloroplasts (algae) and some do not (such as *Amoeba*)

Animals: vertebrates

Vertebrates have a **backbone**.

Group	Features
mammals	hair or fur; give birth to live young (most); feed young on milk from mammary glands; constant body temperature
birds	feathers; wings; lay eggs with hard shells; beak and no teeth; constant body temperature
reptiles	dry scaly skin; lay eggs with leathery shells (on land); body temperature varies with surroundings
amphibians	moist, smooth skin; lay jelly-covered eggs in water; larval stage (tadpole) lives in water, adult on land
fish	scales; gills for gas exchange; fins; lay eggs in water; body temperature varies with surroundings

Animals: arthropods

Arthropods have **jointed legs**, a **hard exoskeleton** and a **segmented body**.

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Group	Features
insects	3 body parts (head, thorax, abdomen); **6 legs**; usually 2 pairs of wings; one pair of antennae
arachnids	2 body parts; **8 legs**; no antennae and no wings
crustaceans	**more than 8 legs** (usually 10 or more); two pairs of antennae; usually live in water
myriapods	many segments, each with one or two pairs of legs; one pair of antennae (centipedes and millipedes)

Plants

Group	Features
ferns	have leaves called fronds; no flowers; reproduce using **spores**
flowering plants	have flowers; reproduce using **seeds** inside fruits

Flowering plants are divided into two groups.

	Dicotyledons	Monocotyledons
seed leaves (cotyledons)	two	one
leaf veins	branching network	parallel
flower parts	in fours or fives	in threes
examples	beans, roses, oak	grasses, maize, lilies

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> TRY IT
>
> An animal has jointed legs, eight legs in total, two body parts and no wings. Which group is it in?

It has jointed legs, so it is an arthropod, and eight legs and two body parts make it an **arachnid** (for example a spider).

Viruses

Viruses are **not** placed in the five kingdoms, because they are not made of cells and do not carry out the characteristics of living things on their own.

- A virus has a **protein coat** around its **genetic material** (DNA or RNA).

- Viruses can only **replicate inside living cells** of a host. They take over the cell's machinery to make more viruses.
- Antibiotics do not work against viruses.

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