

5.2

THE FIVE KINGDOMS

The features of each of the five kingdoms of the current classification system

Prokaryotes (kingdom *Prokaryota*)

The **prokaryotes** are the organisms which used to belong to the kingdom **Monera**. They include bacteria, and what are known as cyanobacteria (used to be 'blue-green algae'). All prokaryotes:

- have no nucleus and have a loop of naked DNA, that is not arranged in linear chromosomes
- have no membrane-bound organelles
- have organelles, but smaller than eukaryotes'
- respire in **mesosomes** rather than in mitochondria (see 1.4 Prokaryotic and Eukaryotic Cells)
- may be free-living or **parasitic** - some cause diseases

Protoctists (kingdom *Protoctista*)

The **protoctists** are eukaryotes. They are single-celled, except for a minority which are multicellular, such as algae. The protoctists:

- are all eukaryotes
- are (generally) single-celled
- show various animal-like or plant-like features
- have either **autotrophic** or **heterotrophic** nutrition (some *photosynthesise* and ingest prey, some feed using extracellular enzymes, and some are parasites)

This kingdom contains all the organisms which do not fit into the other four kingdoms. This explains the wide variety of features shown among the organisms, and is why many scientists believe a new division of this kingdom is necessary

Fungi (kingdom *Fungi*)

The **fungi** are a group of organisms in which the body consists of a **mycelium** – a network of strands called **hyphae**. The cytoplasm is surrounded by a wall of **chitin** and the cytoplasm is not divided into cells. It is **multinucleate** (has multiple nuclei). The organisms of this kingdom:

- are all eukaryotes
- usually multicellular, but some can be unicellular
- are mostly **saprophytic** (cause the decay of organic matter)

Plants (kingdom *Plantae*)

The **plants** (correctly, 'green plants') are *all* multicellular and are *photosynthetic*. This makes them autotrophic. Plants:

- are all eukaryotes
- are all multicellular
- have cells which are surrounded by a cellulose cell wall
- produce multicellular embryos from fertilised eggs

Animals (kingdom *Animalia*)

The **animals** are multicellular organisms that gain nutrition by digesting organic matter (heterotrophic). The animals:

- are all eukaryotes
- are all multicellular
- are usually able to move around
- have fertilised eggs that develop into a ball of cells called a **blastula**

Different organisms from the different kingdoms feed differently, as was described on the previous page. For example, animals and fungi are **heterotrophic**. A heterotroph is an organism which gains its nutrition from external sources. For animals, this is feeding on other animals, and plants, by feeding on organic matter we gain our nutrition. Fungi are **saprophytic** – this means they cause the decay of organic matter, and this is a type of heterotrophy.

Plants are **autotrophic**. This essentially means that they make their own food. With plants, autotrophy involves **photosynthesis**, making their own food using energy, water and carbon dioxide. Organisms belonging to the kingdoms Protocista and Prokaryota can be either autotrophic or heterotrophic.

The table below summarises each of the five kingdoms:

	Prokaryota	Protocista	Fungi	Plantae	Animalia
Size	All unicellular Microscopic	Can be either unicellular or multicellular	Can be either unicellular or multicellular	All multicellular Range from very small (but not microscopic) to very large	All multicellular Range from very small to very large
Feeding	Can be either autotrophic or heterotrophic	Autotrophic or heterotrophic Some are photosynthetic	Saprophytic – they cause the decay of organic matter	All autotrophic, gain their nutrition from photosynthesis	All heterotrophic, gain their nutrition from external organic matter
Cell structure	DNA in a loop in the nucleoid Contain ribosomes smaller than those of eukaryotes Respire in their mesosomes	Eukaryotic	Eukaryotic Have cell walls made of chitin Cytoplasm is multinucleate Have mycelium made of hyphae	Eukaryotic Have cell walls made of cellulose	Eukaryotic Contain centrioles used in cellular division
Example	E-coli (a bacterium)	Paramecium	Ergot fungus	Oak tree	Hare