Background information

Year 7, unit 2: Classification of organisms

Classifying involves the identification of significant features of an organism. This allows similar organisms to be grouped together.

First, an organism must be classified as living or non-living (the latter includes once living organisms). Living organisms show the following characteristics. They:

- **move** by themselves (eg flowers open during the day and close at night, and the heads of sunflowers follow the sun)
- **reproduce**
- need **nutrition** to survive
- **grow**
- **respond** to stimuli (eg plants grow towards sunlight, Venus Flytraps shut when a fly lands on them)
- **exchange** gases
- **produce** waste
- **need** water.

This can be remembered by the acronym **MR N GREWW**.

This allows known organisms to be identified as living or non-living and their survival to be tracked. Classification also allows new organisms to be identified, increasing our knowledge of biodiversity and increasing the chances of using the molecules produced by these organisms as possible medications.

Classification keys

Classification keys are used to aid in the identification of organisms. The most common of these is the binomial key where two choices are given for each characteristic, ie an insect may have ‘6 legs’ or ‘more than 6 legs’.

A hierarchical system of classification, created by Carl Linnaeus, is in current use in the scientific community. The development of this system (explained below) is an indication of how scientific methods may change over time through communication with other scientists.

- Aristotle (384–322 BC)

Each small town had their own names for every plant and animal they encountered. He collected samples and renamed them according to their importance (rock least important to god most important), where they lived and the shapes of their bodies. He ended up with over 500 groups of living organisms.

- John Ray (1627–1705)

Ray suggested plants vary over their lifetime and that they must be observed over their whole lives before classification.

- Augustus Quirinus Rivinus (1652–1723) and Joseph Pitton de Tournefort (1656–1708)

These scientists suggested using a series of hierarchies of names starting with large general groups and then dividing them into smaller groups depending on their characteristics. Each organism's name ended with a long Latin name that was a description of its characteristics.

- Carolus Linnaeus (1707–1778)

Linnaeus simplified Rivinus's and de Tournefort's system by changing the descriptions to single words and reducing the number of classification levels to seven. This system formed the basis of what is used today.

The seven levels of Linnaeus's classification system are: **kingdom, phylum, class, order, family, genus** and **species.**

Kingdom

There are five kingdoms. Their characteristics are listed in the table below.

Kingdom name	Multicellular or unicellular	Store genetic information in a nucleus	Have a protective cell wall	Make their energy from sunlight	Digest other organisms	Examples
Animalia	multicellular	yes	no	no	yes	humans
Plantae	multicellular	yes	yes	yes	no	plants
Fungi	multicellular or unicellular	yes	yes	no	yes	mushrooms, tinea, yeast
Monera	unicellular	no	yes	sometimes	sometimes	bacteria
Protista	multicellular or unicellular	yes	yes	sometimes	sometimes	ameobas, plankton, seaweed

Examples of the kingdom Animalia are used to distinguish between the next two levels.

Phylum

Those animals with endoskeletons (skeletons on the inside) belong in Chordata. Others with exoskeletons (hard or no outer shells/skeletons) are given the general term 'invertebrate'.

Class

There are five main classes in Animalia Chordata. **Mammalia** (fur/hair covered bodies, constant body temperature, feed young milk), **Reptilia** (dry, scale-covered bodies, lay eggs, non-constant body temperature), **Amphibia** (soft slimy skin, lay eggs, spend the first part of their life in water and the remainder on land), **Pisces** (non-constant body temperature, lay eggs, live in water) and **Aves** (constant body temperature, feathers, lay eggs). It is important to use the term 'non-constant body temperature' rather than 'cold-blooded' as a lizard in the sun does not have cold blood.

The scientific names that we often see at the zoo are due to the **binomial system** where only the genus and species of the organism is used. These names should be underlined or in italics. The genus should always start with a capital letter and the species with a lower case letter, eg *Homo sapiens*.

Distinguishing between species is often difficult. It requires trying to breed animals in natural conditions to determine if they can produce fertile, viable (living) offspring. Examples such as mules (the offspring of a horse and a donkey) or ligers (lion and tiger) are infertile (cannot breed).

Modern day taxonomists (scientists who classify organisms) are currently debating the addition of an eighth level of classification that allows for the comparison of the genetic material in organisms. Increasingly, a new level called **domain** (above kingdom) is used to distinguish between cells that have unique DNA and are able to live in extreme environments (extremophiles). The alternative is to create a new kingdom by splitting Monera into two – one kingdom for 'modern bacteria' and another for the extremophiles.

Images for activities in this lesson

The following links will take you to images, or links to websites with images for activities within the lessons of this unit.

Animals

elephant	http://www.flickr.com/photos/93014478@N00/3358790995/
frog	http://www.flickr.com/photos/christianhaugen/3485066869/
goldfish	http://www.flickr.com/photos/27330306@N08/3757843935/
dog	http://www.flickr.com/photos/mikebaird/3520568651/
cat	http://www.flickr.com/photos/danseprofane/7023222/
bear	http://www.flickr.com/photos/dobieks/3806861074/
grasshopper	http://www.flickr.com/photos/siamesepuppy/8022015758/
earthworm	http://www.flickr.com/photos/schizoform/93957792/sizes/sq/in/photostream/
dragonfly	http://www.flickr.com/photos/21644167@N04/3755575059/
magpie	http://en.wikipedia.org/wiki/File:Magpie_samcem05.jpg (362 KB)
kookaburra	http://www.flickr.com/photos/aussiegall/5271173132/
crowd of humans	http://www.flickr.com/photos/jamescridland/613445810/
kangaroo	http://commons.wikimedia.org/wiki/File:Grey_Roo_with_Joey_SMC_2006.jpg (586 KB)

Plants

jacaranda tree	http://commons.wikimedia.org/wiki/File:Jacaranda1212.jpg (2.25 MG)
blade grass	http://commons.wikimedia.org/wiki/File:Blade_grass.jpg (352 KB)
water lily	http://commons.wikimedia.org/wiki/File:Water_Lily_-_geograph.org.uk_-_483063.jpg (61 KB)
rose bush	http://www.flickr.com/photos/elisaself/5639699128/
blue green algae	http://www.flickr.com/photos/usace-kcd/6130724944/
Sturt's Desert Pea	http://www.flickr.com/photos/httpwwwflickrcomphotostopend/2824076831/

Fungi

tree fungus	http://www.flickr.com/photos/carl_mueller/3745691997/
toadstool	http://commons.wikimedia.org/wiki/File:Fresh_toadstool_growing_amongst_grass.jpg (318 KB)
edible mushroom	http://commons.wikimedia.org/wiki/File:Mushroom_001.JPG (5.26 MB)
field mushroom	http://www.flickr.com/photos/5k1nnyt1g3r/2639026296/
brewer's yeast	http://www.flickr.com/photos/8136496@N05/1469853757/

Protists

amoeba	http://www.photomicrographydurr.webspace.virginmedia.com/amoebaproteus.html
Euglena	http://en.wikipedia.org/wiki/File:Euglena_sp.jpg (62 KB)
algae	http://www.algae.info/Algaecomplete/tabid/1131/Default.aspx
Plasmodium malariae	http://en.wikipedia.org/wiki/File:Mature_Plasmodium_malariae_schizont_PHIL_2715_lores.jpg (522 KB)

Monera

E. coli	http://en.wikipedia.org/wiki/File:EscherichiaColi_NIAID.jpg (165 KB)
Salmonella	http://en.wikipedia.org/wiki/File:SalmonellaNIAID.jpg (166 MB)
Helicobacter pylori	http://bioweb.uwlax.edu/bio203/s2008/pluym_evan/