

1.1.1 - Eukaryotic Cell Functions

All living things are made of cells, which can either be **prokaryotic** or **eukaryotic**.

Animal and plant cells are **eukaryotic**. They have a:

- Cell membrane
- Cytoplasm
- Nucleus containing DNA

Bacterial cells are **prokaryotic** and are much smaller. They have a:

- Cell wall
- Cell membrane
- Cytoplasm
- Single circular strand of DNA and plasmids (small rings of DNA found in the cytoplasm)

The structures mentioned above (**e.g. cell membrane**) are examples of **organelles** - structures in a cell that have different functions. These **organelles** all have a specific function.

In animal and plant cells...

Structure	Function
Nucleus	• Contains DNA coding for a particular protein needed to build new cells. Enclosed in a nuclear membrane.
Cytoplasm	• Liquid substance in which chemical reactions occur. • Contains enzymes (biological catalysts, i.e. proteins that speed up the rate of reaction). • Organelles are found in it
Cell membrane	• Controls what enters and leaves the cell
Mitochondria	• Where aerobic respiration reactions occur, providing energy for the cell
Ribosomes	• Where protein synthesis occurs. • Found on a structure called the rough endoplasmic reticulum.



1.14 - Size, Scale and Estimations and 1.15 - Units and Standard Form

Common calculations in microscopy:

1. Magnification of a light microscope: **magnification of the eyepiece lens x magnification of the objective lens**
2. Size of an object: **size of image/magnification = size of object** (this formula can be rearranged to obtain the other values, make sure you are in the same units!)

When working with calculations, it is common to come across very large or small numbers.

Standard form can be useful when working with these numbers.

Through multiplying a certain number by a power of 10, it can get bigger or smaller. To be able to compare the size of numbers while using standard form, the 'number' which being multiplied by a power of 10 needs to be between 1 and 10.

Examples:

- $1.5 \times 10^{-5} = 0.000015$
- $3.4 \times 10^3 = 3400$

Cells and organelles are extremely small, and we can use **orders of magnitude** to understand how much bigger or smaller one is from another:

If an object is **10** times bigger than another then we say it is **10** times bigger.

If an object is **1000** times bigger than another then we say it is **10³** times bigger.

If an object is 10 times smaller than another then we say it is **10⁻¹** times smaller.

Prefixes go before units of measurement (such as 'centimetres') to show the multiple of the unit.

Prefix	Multiply unit by...
Centi	0.01
Milli	0.001
Micro	0.000, 001
Nano	0.000, 000, 001

Estimations are useful in Biology when we don't know how many of something there is, or if it would take too long to count. For example, if we take a 1m x 1m square **sample** of grassland and count the number of a particular species of plant (e.g dandelions) in that square, we can estimate the number of dandelions in the whole field by **multiplying** that number by however many 1m x 1m squares can fit in the field. For example:

One 1m x 1m square contains **15 dandelions**

The entire field measures 50m x 50m, so it fits **50 of the 1m x 1m squares**



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