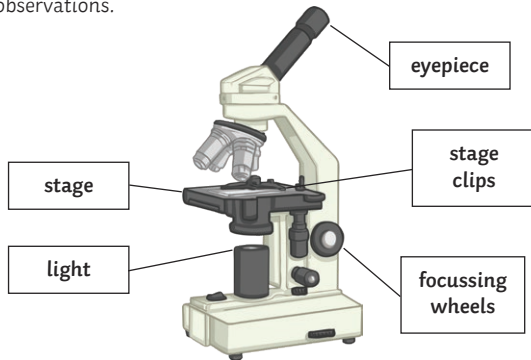


# Cell Biology Knowledge Organiser – Separate Science

## Required Practical

### Microscopy Required Practical

- Includes preparing a slide, using a light microscope, drawing any observations – use a pencil and label important observations.



### Osmosis and Potato Practical

- Independent variable – concentration.
- Dependent variable – change in mass.
- Control variable – volume of solution, temperature, time, surface area of the potato.

The potato in the sugar solution will lose water and so will have less mass at the end; the potato in the pure water solution will gain water.

**Culturing Microorganisms in the Lab:** Use agar jelly which contains nutrients. The bacteria will form colonies on the agar. Use inoculating loops to add the bacteria to the agar jelly. In a school lab the microorganisms are kept at 25°C to prevent the growth of any harmful bacteria.

**Investigating the Effect of Antibiotics on Bacterial Growth:** Place paper disks that have been soaked with different antibiotics on an agar plate that has bacteria on it. The antibiotics should diffuse on to the agar. The most effective antibiotic at killing the bacteria will have the largest inhibition zone. Be sure to use a control that has sterile water on the disk (to compare to). Leave in an incubator for 48 hours at 25°C.

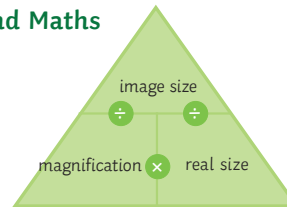
## Specialised Cells

When a cell changes to become a specialised cell, it is called differentiation.

Specialised Cell	Function	Adaptation
sperm	To get the male DNA to the female DNA.	Streamlined head, long tail, lots of mitochondria to provide energy.
nerve	To send electrical impulses around the body.	Long to cover more distance. Has branched connections to connect in a network.
muscle	To contract quickly.	Long and contain lots of mitochondria for energy.
root hair	To absorb water from the soil.	A large surface area to absorb more water.
phloem	Transports substances	Pores to allow cell sap to flow. Cells are long and joined end-to-end.
xylem	Transports water through the plant.	Hollow in the centre. Tubes are joined end-to-end.

## Equations and Maths

### Equation



### Maths Skills

Conversions:  
Micrometres to millimetres: divide by 1000.

Standard Form:  
 $0.003 = 3 \times 10^{-3}$

$5.6 \times 10^{-5} = 0.0056$

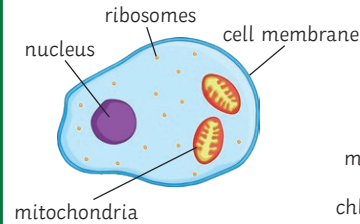
**Area** (to calculate the area of the inhibition zone around an antibacterial disk): **Area =  $\pi r^2$**

Use a ruler to measure the diameter and then half it to find the radius.

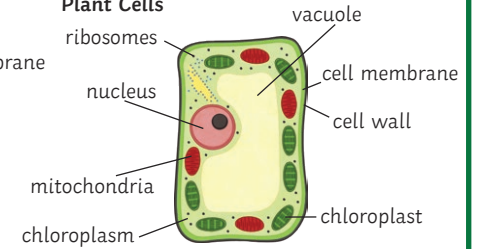
## Prokaryotic and Eukaryotic Cells

Eukaryotic cells have membrane-bound organelles, for example, plant cells, animal cells and fungus cells. Prokaryotic cells do not contain a nucleus, for example, a bacterial cell.

### Animal Cells



### Plant Cells



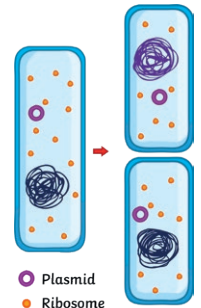
Plant and animal cells have similarities and differences:

	Animal	Plant
nucleus	✓	✓
cytoplasm	✓	✓
chloroplast	✗	✓
cell membrane	✓	✓
permanent vacuole	✗	✓
mitochondria	✓	✓
ribosomes	✓	✓
cell wall	✗	✓

### Bacterial Cells

Bacterial cells do not have a true nucleus, they just have a single strand of DNA that floats in the cytoplasm. They contain a plasmid.

**Prokaryotic cells** reproduce by **binary fission** - the cell splits in two.

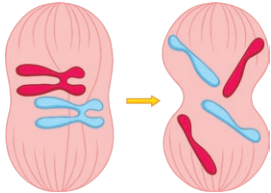


**Chromosomes and Mitosis**

In the nucleus of a human cell there are 23 pairs of **chromosomes**. Chromosomes contain a double helix of **DNA**. Chromosomes have a large number of genes.



The **cell cycle** makes new cells. Mitosis: DNA has to be **copied/replicated** before the cell carries out mitosis.



**Key Vocabulary**

- active transport
- alveoli
- chromosome
- diffusion
- eukaryotic
- gas exchange
- mitosis
- multicellular
- osmosis
- prokaryotic
- undifferentiated
- replicated
- specialised
- villi

**Stem Cells**

**Embryonic stem cells** are **undifferentiated** cells, they have the potential to turn into any kind of cell.



**Adult stem cells** are found in the bone marrow, they can only turn into some types of cells e.g. blood cells.

**Uses of stem cells:**

- Replacing faulty blood cells;
- making insulin producing cells;
- making nerve cells.

Some people are against stem cell research.

For Stem Cell Research	Against Stem Cell Research
Curing patients with stem cells - more important than the rights of embryos.	Embryos are human life.
They are just using unwanted embryos from fertility clinics, which would normally be destroyed.	Scientists should find other sources of stem cells.

**Stem Cells in Plants**

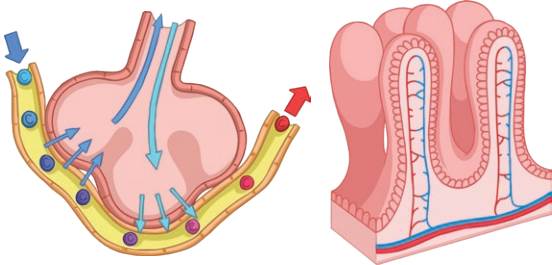
In plants, stem cells are found in the **meristem**. These stem cells are able to produce clones of the plant. They can be used to grow crops with specific features for a farmer, e.g. **disease resistant**.

**Exchange – Humans**

**Multicellular** organisms have a large surface area to volume ratio so that all the substances can be exchanged.

**Gas exchange: Lungs**

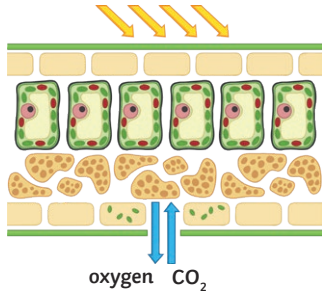
The alveoli are where gas exchange takes place. They have a large surface area, moist lining, thin walls and a good blood supply.



**Villi: Small Intestine**

Millions of villi line the small intestine increasing the surface area to absorb more digested food. They are a single layer of cells with a good blood supply.

**Exchange in Plants**

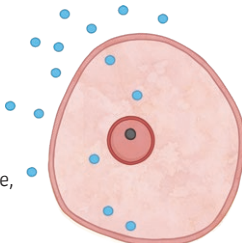


The surface of the leaf is flattened to increase the surface area for more gas exchange by diffusion.

Oxygen and water vapour diffuse out of the stomata. Guard cells open and close the stomata, controlling water loss.

**Key Processes**

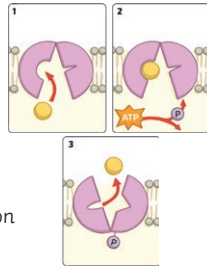
**Diffusion** is the spreading out of particles from an area of higher concentration to an area of lower concentration.



Cell Diffusion

**Cell membranes** are semi-permeable, only small molecules can get through.

**Osmosis** is the movement of water molecules across a partially permeable membrane from a region of higher concentration to a region of lower concentration.



Active Transport in Cells

**Active transport** is the movement of substances against the concentration gradient. This process requires energy from respiration.

**Exchange in Fish**

Fish have a large surface area for gas exchange. These are called **gills**. Water enters the fish through the mouth and goes out through the gills. The oxygen is transported from the water to the blood by **diffusion**. Carbon dioxide diffuses from the blood to the water. Each gill has **gill filaments** which give the gills a large surface area. **Lamellae** cover each gill filament to further increase the surface area for more gas exchange. They have a **thin surface layer** and **capillaries** for good blood supply which helps with diffusion.

