Prokaryotes or Eukaryotes

Prokaryote	a microscopic single-celled organism which has neither a distinct nucleus with a membrane nor any other specialised organelles
Eukaryote	an organism consisting of a cell or cells in which the genetic material is DNA in the form of chromosomes contained within a distinct nucleus

Animal Cells

Nucleus	contains genetic material that controls the activities of the cell
Cytoplasm	gel-like substance where most of the chemical reactions happen; it contains enzymes that control these chemical reactions
Cell Membrane	holds the cell together and controls what goes in and out
Mitoch-ondria	these are where most of the reactions for aerobic respir-ation take place; *respiration* transfers energy that the cell needs to work
Ribosomes	these are where proteins are made in the cell

Plant Cells

Cell Wall	a rigid wall made of cellulose; it supports the cell and streng-thens it
Permanent Vacuole	contains *cell sap*, a weak solution of sugar and salts

Plant Cells (cont)

Chloro plasts	these are where *photosynthesis* occurs, which makes food for the plant; they contain a green substance called *chlorophyll*, which absorbs the light needed for photosynthesis

Plants cells usually have all the same bits animal cells have plus the extra bits we just mentioned (see *Animal Cells*).

The Cell Cycle

1) In a cell that's not dividing, the DNA is all spread out in long strings.

2) Before it divides, the cell has to grow and increase the amount of subcellular structures (e.g.: *mitochondria*).

3) It then duplicates its DNA (one copy for each new cell).

4) The chromosomes line up at the centre of the cell and cell fibres pull them apart (two arms of each chromosome go to opposite ends of the cell).

5) Membranes form around each of the sets of chromosomes (these become the *nuclei* of the two new cells).

6) Lastly, the *cytoplasm* and *cell membrane* divide.

The has now produced two daughter cells. Their DNA is exactly the same as their parent's DNA.

Stem Cell Notes

Embryonic stem cells can turn into any type of cell.

Differentiation is the process by which a cell changes to become specialised.

Adult stem cells can only be found in certain places (e.g.: bone marrow).

Adult stem cells can only turn into certain types of cells (e.g.: blood cells).

Stem cells can be grown in a lab to create clones.

Stem Cell Notes (cont)

Stem cells in plants are called *meristems*.

Osmosis

Definition: **The movement of water molecules across a partially permeable membrane from a region of higher water concentration to a region of lower water concentration.**

-a partially permeable membrane is a membrane with very small holes in it (only tiny molecules, like water, can pass through them)

-*osmosis* is a type of *diffusion*

Bacteria Cells

Has a cell membrane (see *Animal Cells*).

Has cytoplasm (see *Animal Cells*).

Has a cell wall (see *Plant Cells*).

Don't have a 'true' nucleus - instead they have a single circular strand of DNA that floats freely in the cytoplasm.

Don't have chloroplasts or mitochondria.

May also contain one or more small rings of DNA called *plasmids*.

Microscopes

Light Micros-copes	uses light and lenses to form an image of a specimen and magnify it; lets us see individual cells and large subcellular structures
Electron Micros-copes	uses electrons to form an image and magnify it; lets us see smaller things in more detail (smaller than cell)
The Formula For Magnif-ication	image size = magnification x real size

Specialised Cells

Sperm Cells	Reproduction	Long tail and streamlined head (for swimming); A lot of *mitochondria* (to provide energy); Enzymes (to digest through egg *cell membrane*)
Nerve Cells	Rapid signalling	Long (to cover more distance); Branched connections (to connect to other nerve cells)
Muscle Cells	Contraction	Long (so they have space to contract); A lot of *mitochondria* (to provide energy)
Root Hair Cells	Absorbing water and minerals	Long "hairs" (gives the plant a big surface area)
Phloem Cells	Transporting substances	Form tubes (to transport substances around plants); Have very few subcellular structures (so stuff can flow through them)
Xylem Cells	Transporting substances	Form tubes (to transport substances around plants); Hollow in the centre (so stuff can flow through them)

Diffusion

Definition: **The spreading out of particles from an area of higher concentration to an area of lower concentration.**

-happens in both solutions and gases

-the bigger the concentration gradient (the difference in concentration), the faster the *diffusion* rate

-a higher temperature will also have a faster *diffusion* rate because the particles have more energy and thus move faster

Active Transport

Definition: **The movement of substances against a concentration gradient.**

-needs energy to be carried out (unlike *osmosis* and *diffusion*)

-needed to absorb nutrients from food

Preparing A Slide (Onion edition)

1) Add a drop of water to the middle of a clean slide.

2) Cut up an onion and separate it out into layers. Use tweezers to peel off some epidermal tissue from the bottom of one of the layers.

3) Using the tweezers, place the epidermal tissue into the water on the slide.

4) Add a drop of iodine solution. Iodine solution is a stain. Stains are used to highlight objects in a cell by adding colour to them.

5) Place a cover slip (a square of thin, transparent plastic or glass) on top. To do this, stand the cover slip upright in the slide, next to the water droplet. Then carefully tilt and lower it so it covers the specimen. Try not to get any air bubbles under there - they'll obstruct your view of the specimen.

How To Use A Light Microscope To View A Slide

1) Clip the slide you've prepared onto the stage.

2) Select the lowest-powered objective lens (i.e. the one that produces the lowest magnification).

3) Use the course adjustment knob to move the stage up to just below the objective lens.

4) Look down the eyepiece. Use the coarse adjustment knob to move the stage downwards until the image is roughly in focus.

5) Adjust the focus with the fine adjustment knob until you get a clear image of what's on the slide.

6) If you need to see the slide with greater magnification, swap to a higher-powered objective lens and refocus.

Notes On Chromosomes

Most cells in your body have a *nucleus*. The *nucleus* contains your genetic material in the form of chromosomes.

Chromosomes are coiled up lengths of DNA molecules.

Each chromosome carries a large number of genes. Different genes control the development of different characteristics.

Body cells normally have two copies of each chromosome.

There are 23 pairs of chromosomes.

Binary Fission

1) The circular DNA and *plasmid(s)* replicate.

2) The cell gets bigger and the circular DNA strands move to opposite 'poles' (ends) of the cell.

3) The *cytoplasm* begins to divide and new *cell walls* begin to form.

Binary Fission (cont)

4) The *cytoplasm* divides and two daughter cells are produced (each daughter cell has one copy of the circular DNA, but can have a variable number of *plasmids*).

Bacteria can divide very quickly if given the right conditions (a warm, moist environment with a lot of nutrients).

Arguments Around Stem Cell Research

Some people feel that human embryos shouldn't be used for experiments since each one is a potential human life.

Some people think that curing existing patients who are suffering is more important than the rights of embryos.

One argument in favour of stem cell research is that the embryos used in the research are usually unwanted ones from fertility clinics which would've otherwise been destroyed.

Campaigners against embryonic stem cells feel that scientists should concentrate more on finding and developing other sources of stem cells.

In some countries stem cell research is banned, it's legal in the UK as long as it follows strict guidelines.