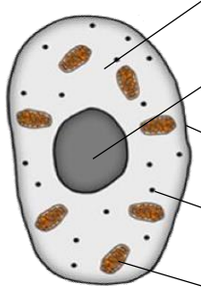
AQA B1a Cell Structure
Combined Foundation (page 1 of 2)

Required practical for this topic:
Microscopy

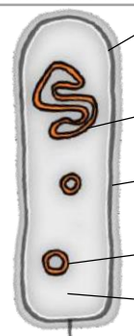
prokaryotic cells	These cells include bacterial cells and are much smaller in comparison. They have cytoplasm and a cell membrane surrounded by a cell wall. The genetic material is not enclosed in a nucleus. It is a single DNA loop and there may be one or more small rings of DNA called plasmids.
eukaryotic cells	These cells include plant and animal cells. These cells have a cell membrane, cytoplasm and genetic material enclosed in a nucleus.

animal cell



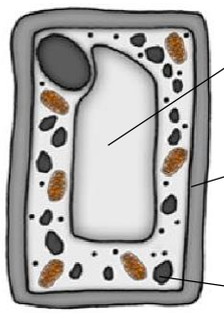
cytoplasm	Site of chemical reactions in the cell	Gel like substance containing enzymes to catalyse the reactions
nucleus	Contains genetic material	Controls the activities of the cell and codes for proteins
cell membrane	Semi permeable	Controls the movement of Substances in and out of the cell
ribosome	Site of protein Synthesis	MRNA is translated to an amino acid Chain
mitochondrion	Site of respiration	Where energy is released for the cell to function

Bacterial cell



cell membrane	Semi permeable	Controls the movement of substances in and out of the cell
bacterial DNA	Not in nucleus. Floats in cytoplasm	Controls the function of the cell
cell wall	NOT made of cellulose	Supports and strengthens the cell
plasmid	Small rings of DNA	Contain additional genes
cytoplasm	Site of chemical reactions in the cell	Gel like substance containing enzymes to catalyse the reactions

plant cell *(contain all the parts of an animal cell plus these extras)*



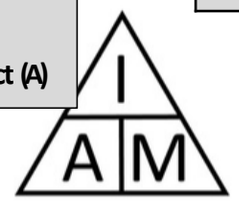
permanent vacuole	Contains cell sap	Keeps cell turgid, contains sugars and salts in solution
cell wall	Made of cellulose	Supports and strengthens the Cell (algal cells have a cell wall too)
chloroplast	Site of photosynthesis	Contains chlorophyll, absorbs light energy

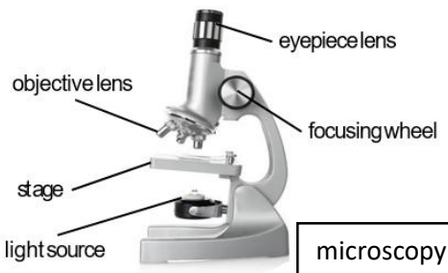
Cell differentiation	Cells change to form different types of cells. Many types of plant cells can differentiate throughout life. Animal cells differentiate at an early stage of development.
Why is cell differentiation important?	turn into different types so they can make up different tissues and organs. Without this ability our bodies wouldn't develop or function properly.
Specialised cells	Specialised cells have special features to help them function, for example sperm cells have a tail to swim to the egg.
Stem cells	They can divide to form more cells of the same type or can differentiate to form other types of cells.

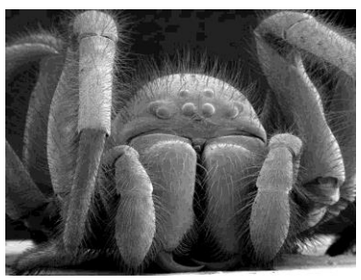
PREFIXES		
Prefix	Multiple	Standard form
centi (cm)	1 cm = 0.01 m	x 10^{-2}
milli (mm)	1 mm = 0.001 m	x 10^{-3}
micro (µm)	1 µm = 0.000 001 m	x 10^{-6}
nano (nm)	1nm = 0.000 000 001 m	x 10^{-9}

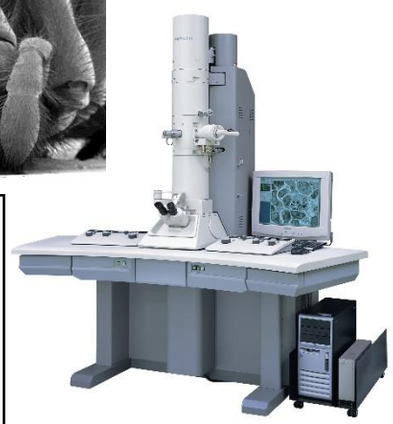
Remember this equation:

magnification (M) = size of image (I) / real size of the object (A)



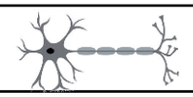
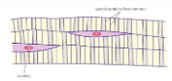




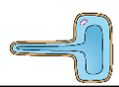
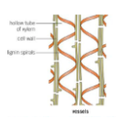
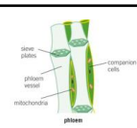


microscopy techniques have developed over time. Electron microscopy has increased our understanding of sub-cellular structures because they have a much **higher magnification and resolution** than a light microscope. This means that they can be used to study cells in much finer detail. This has enabled biologists to see and understand many more sub-cellular structures.

Specialised animal cells

nerve		Carry electrical signals	Long branched connections and insulating sheath
sperm		Fertilise an egg	Streamlined with a long tail acrosome containing enzymes large number of mitochondria
muscle		Contract to allow movement	Contains a large number of mitochondria. They are also long

Specialised plant cells

root hair		Absorb water and minerals from the soil	hair like projections to increase the surface area
xylem		Transports water and minerals from the roots to the stem and leaves. This process is called TRANSPIRATION	The xylem is made of dead cells with cell walls toughened by lignin. The water and minerals flow in one direction only
phloem		Carry dissolved sugars from the leaves to the rest of the plant to use or store – this process is called TRANSLOCATION	The phloem is made of elongated living cells which have end plates with pores (holes). Cell sap can move through these pores in the end plates

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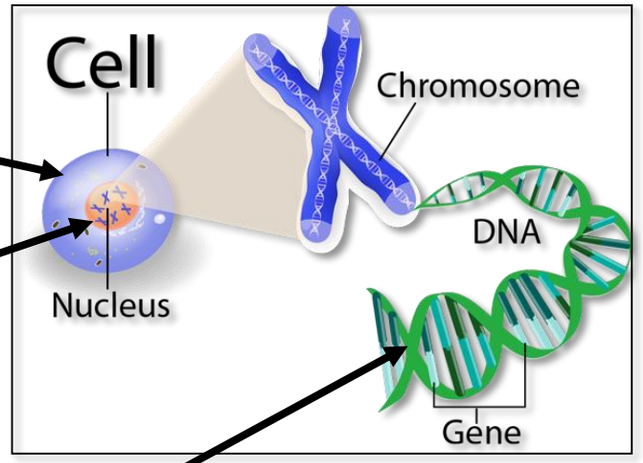
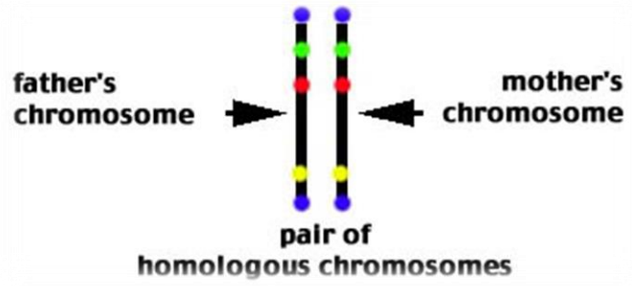
largest

cell	The smallest structural and functional unit of an organism.
nucleus	A structure that contains genetic material and controls the activities of the cell.
chromosome	A thread like structure of coiled DNA found in the nucleus of eukaryotic cells.
DNA	A polymer made up of two strands forming a double helix.
gene	A section of DNA that codes for a specific protein or characteristic.

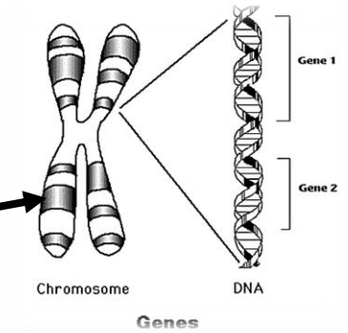
smallest

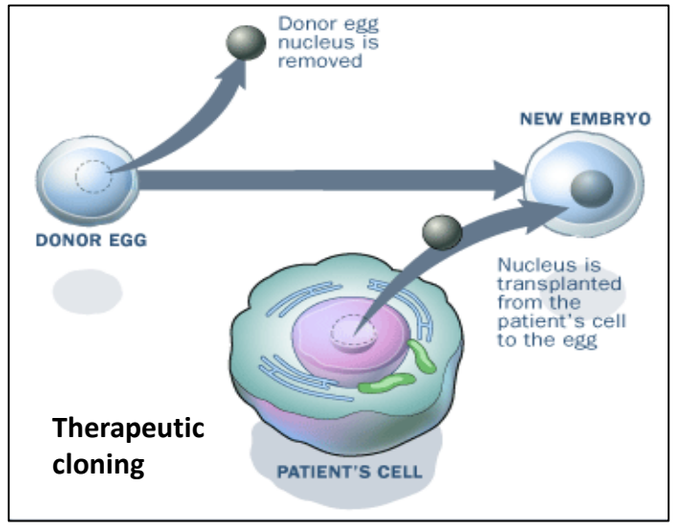


In body cells the chromosomes are normally found in pairs



Each chromosome carries a lot of genes.



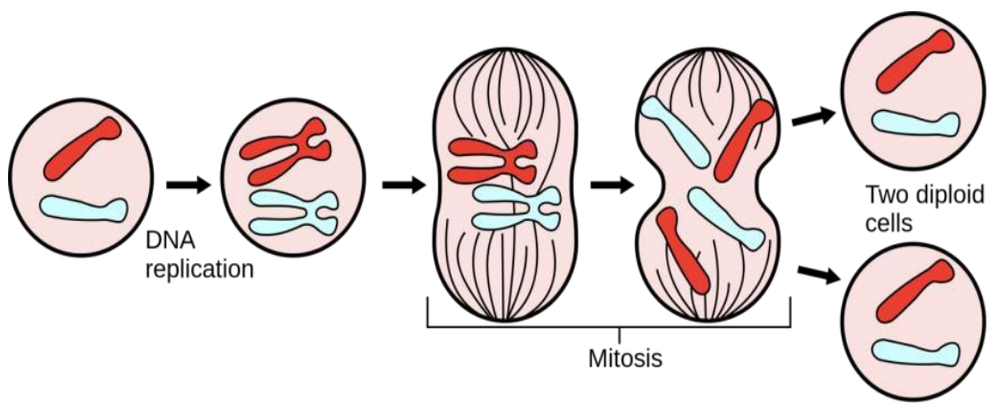


Therapeutic cloning

Cells divide in a series of stages called the cell cycle.
During the cell cycle the genetic material is doubled and then divided into two identical cells. There are three stages:

Stage 1	Growth and DNA synthesis	Increase the number of sub-cellular structures e.g. ribosomes and mitochondria. DNA replicates to form two copies of each chromosome.
Stage 2	Mitosis	One set of chromosomes is pulled to each end of the cell and the nucleus divides (two nuclei in one cell)
Stage 3	Cell division	The cytoplasm and cell membranes divide to form two identical cells.

Mitosis is important in the growth and development of multicellular organisms (organisms with many cells)



Stem cell type	function	Uses
Human Embryonic stem cells (from human embryos)	Can be cloned and made to differentiate into most cell types	Treatment with stem cells **(including therapeutic cloning)** may be able to help conditions such as diabetes and paralysis.
Adult bone marrow stem cells	Can form many types of human cells e.g. blood cells	
Meristems (plants – in the growing tips of shoots and roots)	Can differentiate into any plant cell type throughout the life of the pant.	Used to produce clones quickly and economically for: • Rare species can be cloned to protect from extinction • crop plants with pest or disease resistance can be cloned in large quantities for farmers to use.

Stem cell advantages	Stem cell disadvantages
• In therapeutic cloning, an embryo is made with the same genes as the patient so the body does not reject the tissue. • With adult bone marrow tissue can be matched to avoid rejection.	• There is a risk of infection with therapeutic cloning e.g. transfer of viruses. • With adult bone marrow only a few types of cells can be formed. • Some people object on religious grounds • Some people object on ethical grounds.