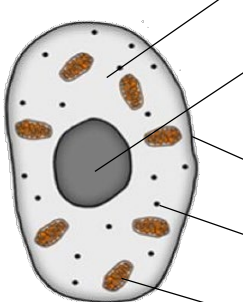


**AQA B1a Cell Structure**  
**Combined Foundation (page 1 of 2)**

**Required practical for this topic:**  
**Microscopy**

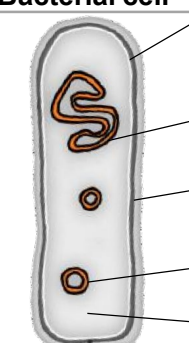
<b>prokaryotic cells</b>	These cells include bacterial cells and are much smaller in comparison. They have cytoplasm and a cell membrane surrounded by a cell wall. The genetic material is not enclosed in a nucleus. It is a single DNA loop and there may be one or more small rings of DNA called plasmids.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

**animal cell**



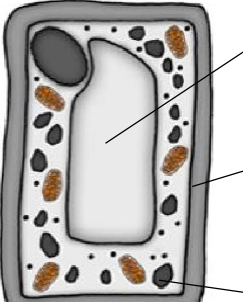
<b>cytoplasm</b>	Site of chemical reactions in the cell	Gel like substance containing enzymes to catalyse the reactions
<b>nucleus</b>	Contains genetic material	Controls the activities of the cell and codes for proteins
<b>cell membrane</b>	Semi permeable	Controls the movement of Substances in and out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

**Bacterial cell**



<b>cell membrane</b>	Semi permeable	Controls the movement of substances in and out of the cell
<b>bacterial DNA</b>	Not in nucleus. Floats in cytoplasm	Controls the function of the cell
<b>cell wall</b>	NOT made of cellulose	Supports and strengthens the cell
<b>plasmid</b>	Small rings of DNA	Contain additional genes
<b>cytoplasm</b>	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)**

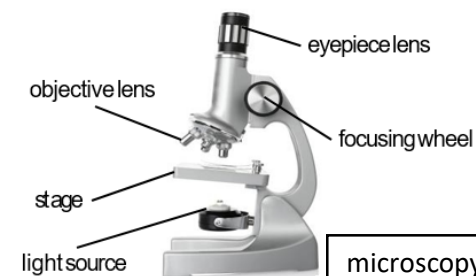
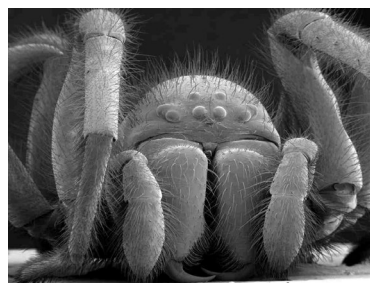
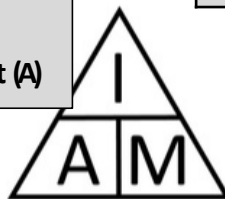


<b>permanent vacuole</b>	Contains cell sap	Keeps cell turgid, contains sugars and salts in solution
<b>cell wall</b>	Made of cellulose	Supports and strengthens the Cell (algal cells have a cell wall too)
<b>chloroplast</b>	Site of photosynthesis	Contains chlorophyll, absorbs light energy

<b>Cell differentiation</b>	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.
<b>Why is cell differentiation important?</b>	turn into different types so they can make up different tissues and organs. Without this ability our bodies wouldn't develop or function properly.
<b>Specialised cells</b>	As a cell differentiates it acquires different sub-cellular structures to enable it to carry out a certain function. It has become a specialised cell.
<b>Stem cells</b>	Undifferentiated cells. They can divide to form more cells of the same type or can differentiate to form other types of cells.

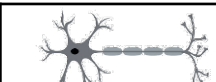

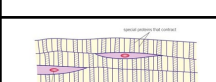
PREFIXES		
Prefix	Multiple	Standard form
<b>centi (cm)</b>	1 cm = 0.01 m	$\times 10^{-2}$
<b>milli (mm)</b>	1 mm = 0.001 m	$\times 10^{-3}$
<b>micro (<math>\mu\text{m}</math>)</b>	1 $\mu\text{m}$ = 0.000 001 m	$\times 10^{-6}$
<b>nano (nm)</b>	1nm = 0.000 000 001 m	$\times 10^{-9}$

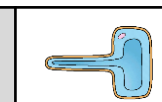
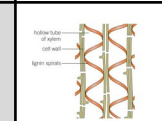
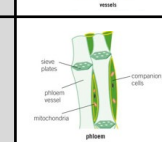
Remember this equation:  
**magnification (M) =  $\frac{\text{size of image (I)}}{\text{real size of the object (A)}}$**



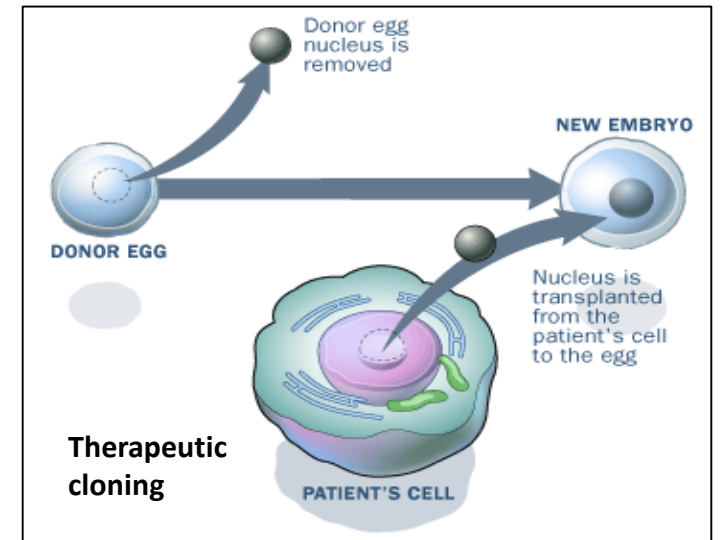
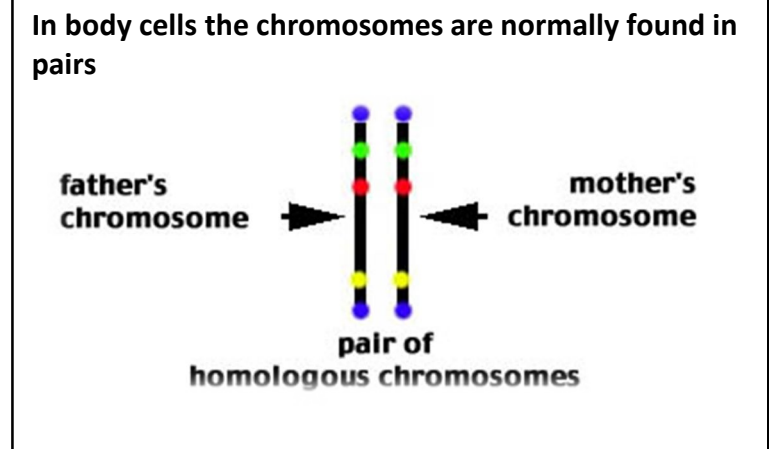
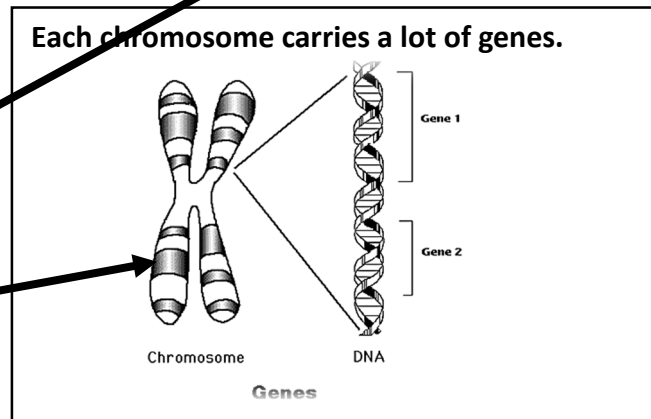
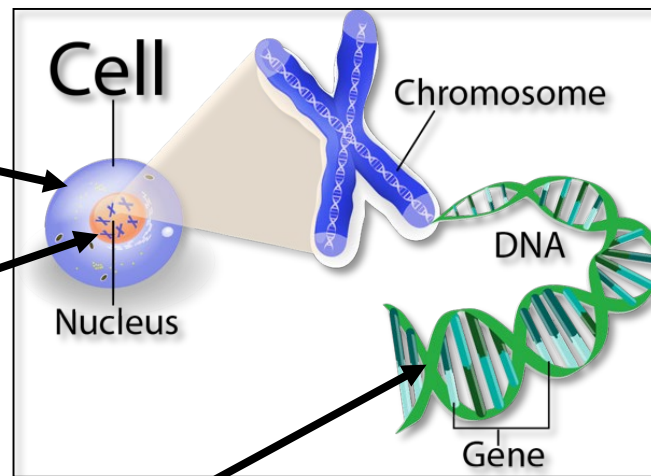
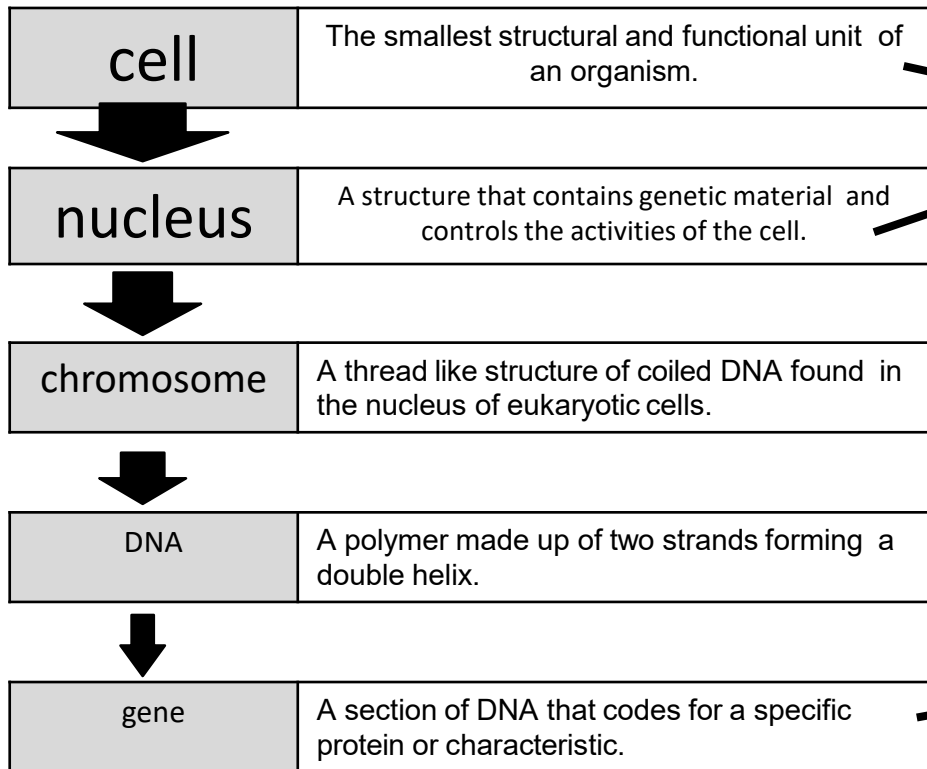
microscopy techniques have developed over time. Electron microscopy has increased our understanding of sub-cellular structures because they have a much **higher magnification and resolution** than a light microscope. This means that they can be used to study cells in much finer detail. This has enabled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



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

Specialised plant cells			
<b>root hair</b>		Absorb water and minerals from the soil	hair like projections to increase the surface area
<b>xylem</b>		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
<b>phloem</b>		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

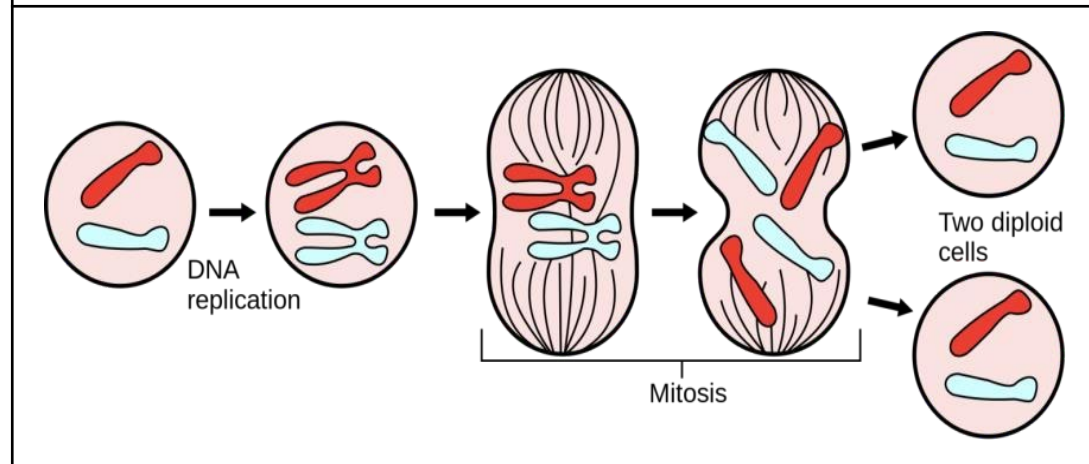
largest  
 smallest



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	Process	Description
Stage 1	growth	Increase the number of sub-cellular structures e.g. ribosomes and mitochondria.
Stage 2	DNA synthesis	DNA replicates to form two copies of each chromosome.
Stage 3	mitosis	One set of chromosomes is pulled to each end of the cell and the nucleus divides. Then 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 ( <b>including therapeutic cloning</b> ) 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 plant.	Used to produce clones quickly and economically for: <ul style="list-style-type: none"> <li>Rare species can be cloned to protect from extinction</li> <li>crop plants with pest or disease resistance can be cloned in large quantities for farmers to use.</li> </ul>

Stem cell advantages	Stem cell disadvantages
<ul style="list-style-type: none"> <li>In therapeutic cloning, an embryo is made with the same genes as the patient so the body does not reject the tissue.</li> <li>With adult bone marrow tissue can be matched to avoid rejection.</li> </ul>	<ul style="list-style-type: none"> <li>There is a risk of infection with therapeutic cloning e.g. transfer of viruses.</li> <li>With adult bone marrow only a few types of cells can be formed.</li> <li>Some people object on religious grounds</li> <li>Some people object on ethical grounds.</li> </ul>