B1

AQA Cell Structure

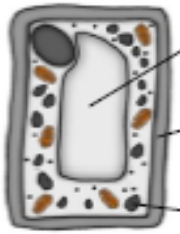
Eukaryotes complex organisms

animal cell

plant 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 fro 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

contains all the parts of animal cells plus 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
chloroplast	*site of photosynthesis*	contains chlorophyll, absorbs light energy

Prokaryotes simpler organisms

cell membrane	*site of chemical reactions in the cell*	gel like substance containing enzymes to catalyse the reactions
bacterial DNA	*not in nucleus floats in the 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	*semi permeable*	controls the movement of substances in and out of the cell

Bacterial cells are much smaller than plant and animal cells

Spedalised cells

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 long

specialised plant cells

root hair		*absorb water and minerals from soil*	hair like projections to increase the surface area
xylem		*carry water and minerals*	TRANSPIRATION - dead cells cell walls toughened by lignin flows in one direction
phloem		*carry glucose*	TRANSLOCATION - living cells cells have end plates with holes flows in both directions

Cell differentiation

how a cell changes and becomes specialised
Undifferentiated call are called STEM cells

animal cell differentiation

early stages of development only for repair and replacement

plant cell differentiation

all stages of life cycle the stem cells are grouped together in meristems

Microscopy

magnification = size of image / real size of the object

Feature	Light (optical) microscope	Electron microscope
Radiation used	Light rays	Electron beams
Max magnification	~ 1500 times	~ 2 000 000 times
Resolution	200nm	0.2nm
Size of microscope	Small and portable	Very large and not portable
Cost	~£100 for a school one	Several £100,000 to £1 million plus

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}

B1

AQA Cell Biology

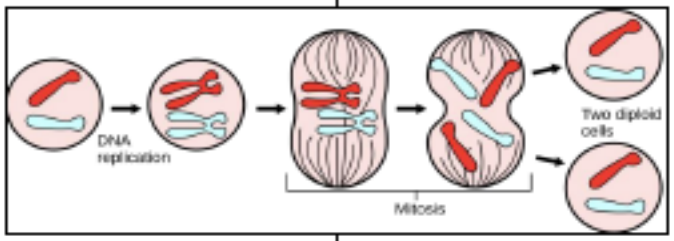
cell	The smallest structural and functional unit of an organism.
nucleus	A structure that contains genetic material and controls the activities of the cell.
chromosome	A thread like structure of coiled DNA found in the nucleus of eukaryotic cells.
DNA	A polymer made up of two strands forming a double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

Cell division

MITOSIS AND THE CELL CYCLE

Cells divide in a series of stages. The genetic material is doubled and then divided into two identical cells.

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 cells that are identical to the parent cell.



Mitosis occurs during growth, repair, replacement of cells. Asexual reproduction occurs by mitosis in both plants & simple animals.

STEM CELLS

Undifferentiated cell of an organism

Divides to form more cells of the same type, and can differentiate to form many other cell types.

Human Embryonic stem cells	*Can be cloned and made to differentiate into most cell types*	Therapeutic cloning uses same genes so the body does not reject the tissue. Can be a risk of infection
Adult bone marrow stem cells	*Can form many types of human cells e.g. blood cells*	Tissue is matched to avoid rejection, risk of infection. Only a few types of cells can be formed.
Meristems (plants)	*Can differentiate into any plant cell type throughout the life of the pant.*	Used to produce clones quickly and economically, e.g. rare species, crop plants with pest /disease resisitance

Treatment with stem cells may be able to help conditions such as diabetes and paralysis. Some people object to the use of stem cells on ethical or religious grounds

Transport in cells

Diffusion <u>No</u> energy required	*Movement of particles in a solution or gas from a higher to a lower concentration*	E.g. O_2 and CO_2 in gas exchange, urea in kidneys. Factors that affect the rate are concentration, temperature and surface area.
Osmosis <u>No</u> energy required	*Movement of water from a dilute solution to a more concentrated solution*	E.g. Plants absorb water from the soil by osmosis through their root hair cells. Plants use water for several vital processes including photosynthesis and transporting minerals.
Active transport <u>ENERGY</u> required	*Movement of particles from a dilute solution to a more concentrated solution*	E.g. movement of mineral ions into roots of plants and the movement of glucose into the small intestines.

ADAPTATIONS FOR DIFFUSSION

The greater the difference in concentrations the faster the rate of diffusion.

Small intestines	*Villi – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Lungs	*Alveoli– increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Gills in fish	*Gill filaments and lamella – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Roots	*Root hair cells - increase surface area.*
Leaves	*Large surface area, thin leaves for short diffusion path, stomata on the lower surface to let O_2 and CO_2 in and out.*