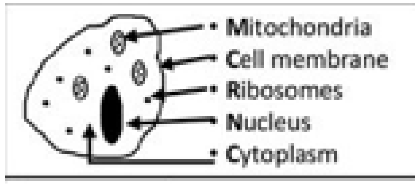
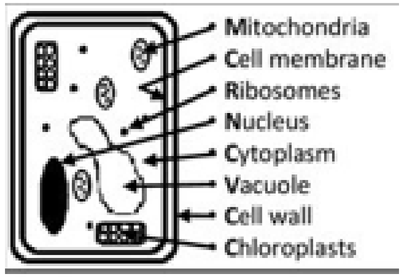
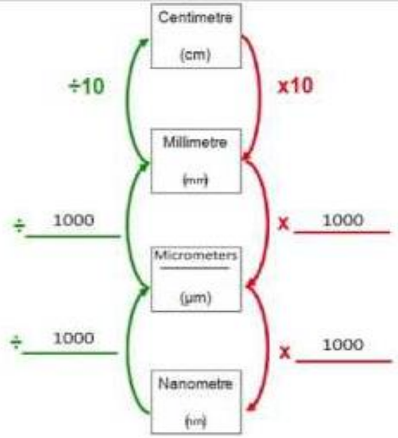
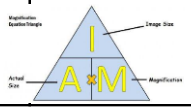
Subject: Science	Topic: Cells (1)	Year Group: 9

A=animal cell only, P= plant cell only, B= both

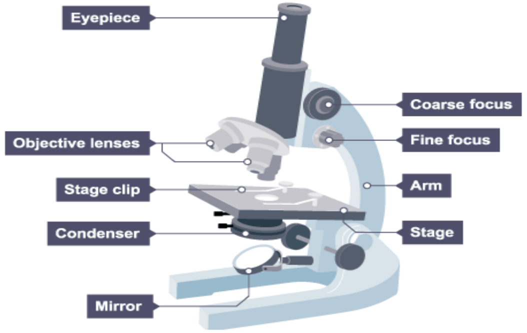
Cells

1	Typical animal cell	
2	Typical plant cell	

Maths Skills (conversions and magnification)

1	Conversions Standard form cm- x10^{-2} mm- x10^{-3} µm- x10^{-6} nm- x10^{-9}	
2	Magnification	Magnification = image size / object size  (watch out for units)

Microscopes (Required practical)

1	Light microscope	Use light and lenses. Require glass slide preparation. Have a magnifications of 40x, 100x and 400x, low magnification and resolution, used to view living cells 
2	Electron microscope	More modern, uses a beam of electrons, cannot be used to view living cells, much higher magnification and resolution. Eg: can see tiny structures such as ribosomes and mitochondria in cells

Specialised cells

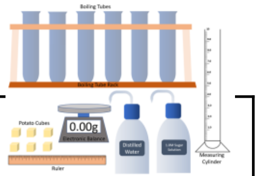
1	Specialised animal cells	**Sperm**- has a tail with lots of mitochondria for energy to swim **Nerve**- long to carry electrical impulses **Muscle**- contracts and relaxes for movement
2	Specialised plant cells	**Root hair**-large surface area to absorb minerals and ions **Xylem**- continuous hollow tube, carry water and minerals **Phloem**- tubes with sieve like ends connected end to end, carry glucose to cells

Key Vocabulary

1	Eukaryotic cell	Have cell membrane, cytoplasm and nucleus, eg: animal and plant cells
2	Prokaryotic cell	Do not have a nucleus, genetic material is looped, eg: bacteria
3	Sub cellular structures	Small structures inside a cell e.g. nucleus
4	Nucleus (B)	Controls cell activities, contains DNA
5	Cytoplasm (B)	Where chemical reactions take place
6	Cell membrane (B)	Controls what enters and leaves the cell
7	Cell wall (P)	Made from cellulose fibres. Strengthens the cell and supports the plant.
8	Mitochondria (B)	Where aerobic respiration takes place
9	Ribosomes (B)	Make proteins by protein synthesis
10	Chloroplasts (P)	Where photosynthesis occurs. Contains chlorophyll to absorb light
11	Chlorophyll (P)	Green pigment used for photosynthesis found in chloroplasts
12	Vacuole (P)	Contains cell sap
13	Specialised cell	Cells that are modified to carry out a particular function. Found in both animals and plants
14	Magnification	How much bigger an image appears than the real object
15	Resolution	Ability to distinguish between two very small and closely spaced objects

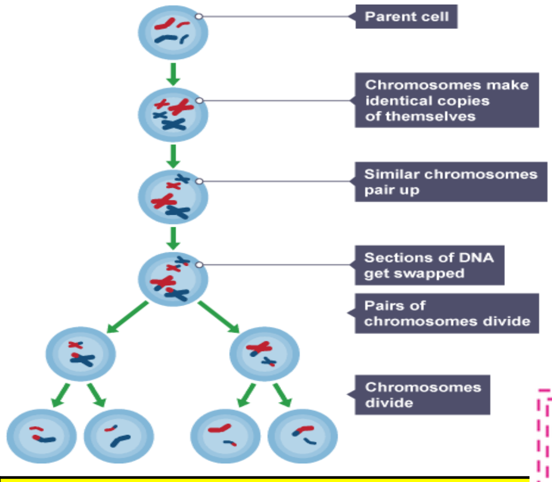
Subject: Science	Topic: Cells (2)	Year Group: 9

enjoy learn succeed



Mitosis and cell cycle

1	Stage-1: Growth- Increase number of subcellular structures eg: mitochondria
2	Stage-2: DNA synthesis- DNA replicates forming 2 copies of each chromosome
3	Stage-3: Mitosis- Cells divide in stages. Genetic material is doubled, then divided into 2 identical cells. It occurs during growth, repair and replacement of cells. Asexual reproduction occurs by mitosis in plants and simple animals.
4	One set of chromosomes is pulled to each end (pole) of the cell and nucleus divides. Cytoplasm and cell membrane divides to form 2 new cells (daughter cells) identical to the parent cell (image)



Adaptations for diffusion

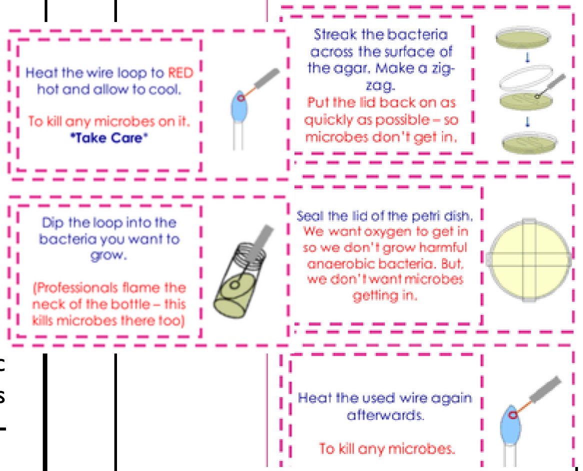
1	Small intestine (SI) and Lungs (L) in humans and Gills in fish (G)	Villi (SI), Alveoli (L), gill filaments and lamellae (G)- increase surface area Good blood supply- maintain concentration gradient Thin membranes- short diffusion pathway
2	Roots (R) and leaves (L) in plants	Root hair cells (R), flat/large (L)- increase surface area Thin (L)- short diffusion pathway Stomata on lower surface (L)- let O_2 and CO_2 in/out

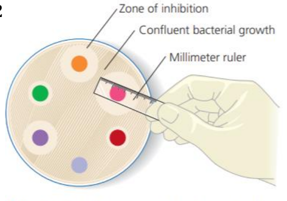
Stem cells

1	Treatment with stem cells may help conditions such as diabetes and paralysis. Uses of stem cells are rejected by some due to ethical or religious reasons.		
2	Human embryonic stem cells	Can be cloned, differentiate into most cell types	Therapeutic cloning uses same genes- no tissue rejection, infection risk
3	Adult bone marrow stem cells	Can form many types of human cells eg: blood cells	Matching tissue avoids rejection, infection risk, few types of cells can be formed
4	Meristems (plants)	Differentiate into any plant cell type anytime in plants life	Produces clones quickly and economically (rare species)

Culturing microorganisms (BIOLOGY ONLY)

1	Bacteria multiply by simple cell division (binary fission), approx 1x per 40mins. Bacteria can be grown in nutrient broth solution or as colonies on an agar plate gel.
2	Aseptic techniques to prepare an uncontaminated culture:
3	Required practical: Antibiotics and antiseptics can be used to inhibit the growth of bacteria and zones of inhibition can be calculated: Measure zone of inhibition with a ruler and use πr^2 **HT ONLY**: use standard form (see sheet 1)





Following incubation, measure the diameter of each zone of inhibition with a millimeter ruler.

Required Practical – Osmosis

- Independent variable – Conc of sugar sol
- Dependent variable – length + mass of potato cylinders
- Control variables – diameter/length of potato cylinders, vol of sol

Calculate: change in mass and change in length
AND

$$\%\text{ change in mass} = \frac{\text{new mass} - \text{original mass}}{\text{original mass}} \times 100$$

Key Vocabulary

1	Differentiation	When a cell becomes a specialised cell
2	Mitosis	The process of cell division where 1 parent cell produces 2 genetically identical daughter cells
3	Stem cell	Cells that are undifferentiated but can turn into any type of cell
4	Diffusion	The movement of particles from a HIGH concentration to a LOW concentration down a concentration gradient (gases or liquids). No energy required. Oxygen and carbon dioxide in gas exchange in lungs. Rate affected by concentration, temperature and surface area.
5	Osmosis	The movement of WATER particles from a high concentration (DILUTE solution) to a low concentration (MORE CONCENTRATED solution) through a partially permeable membrane. (liquids only). No energy required. Eg: water absorption by roots from soil.
6	Active transport	The movement of particles, e.g. mineral ions, from a LOW concentration to a HIGH concentration, AGAINST the concentration gradient. Requires ENERGY. Eg: movement of mineral ion into plant roots and glucose into small intestine.