

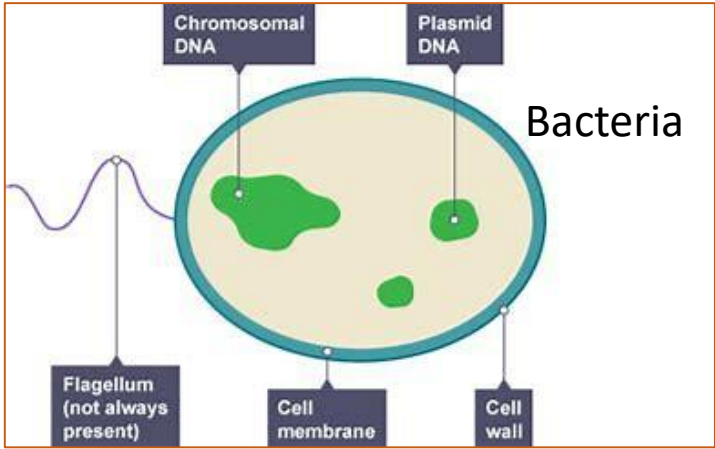
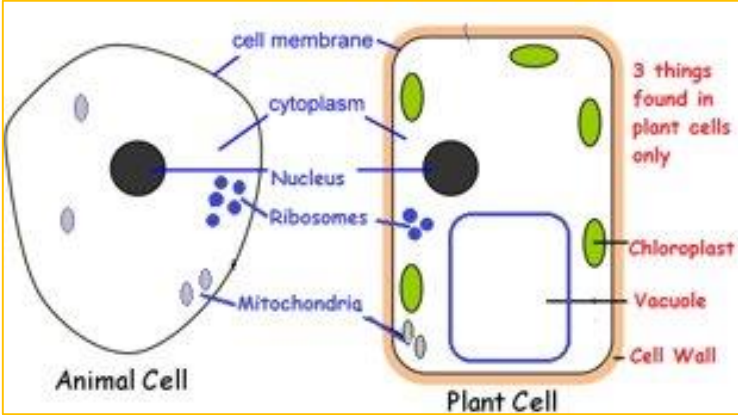
Year 9 Curriculum Overview Biology 2023-24

| | B1 – Cell Biology | B2 - Organisation |
|---------------------------------------|---|--|
| Unit Title | B1 – Cell Biology | B2- Organisation |
| Approximate Number of Lessons | 17 Lessons | 26 Lessons |
| Curriculum Content | Cells are the basic unit of life. Structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells. | The human digestive system provides the body with nutrients and the respiratory system provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis. |
| Links to prior learning | All learners will be able to: Recognise a typical animal and plant cell Some learners will be able to: Identify the differences between animal and plant cells A few learners will be able to: Explain the functions of the cell organelles. | All learners will be able to: Recall the idea of cells being the basic building blocks of living things. Some learners will be able to: Identify the relationship between cells, tissues, organs and systems A few learners will be able to: Relate systems together |
| Cultural Capital Opportunities | Trip suggestion: - Electron Microscope University of Cambridge Article on cells going through a maze, great video too free sign up to New Scientist website needed: https://www.newscientist.com/article/2253161-watch-cells-sniff-their-way-around-the-maze-from-hampton-court-palace/ | Visit to Botanical garden Cambridge https://www.botanic.cam.ac.uk/ (Children under 16 free Adult tickets £6.50) Visit to Kew Gardens (London) https://www.kew.org/ For ticket price details: https://www.kew.org/kew-gardens/visit-kew-gardens/tickets |

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|------------------------------------|--|---|
| | <p>Article on Children who sleep less may age faster at the cellular level: https://www.newscientist.com/article/mg23531333-200-children-who-sleep-less-show-signs-of-ageing-in-their-cells/</p> <p>Light Microscope Simulation: https://www.ncbionetwork.org/iet/microscope/ Best to do this following lesson on how to use a light microscope in class. Students can use skills learned in class and expand their knowledge of the light microscope looking at different cells. Also available on Apple IPADs (No android equivalent unfortunately) Scroll down on the website for the link for this.</p> | <p>Website: - British Heart Foundation Website and Heart Matters Magazine https://www.bhf.org.uk/information-support/heart-matters-magazine</p> <p>Article on Does sleeping too little or too much raise your risk of heart disease? https://www.bhf.org.uk/information-support/heart-matters-magazine/news/behind-the-headlines/sleep-and-heart-disease</p> <p>Website: - Guts UK https://gutscharity.org.uk/ Information on different disorders and research on the gastric system (digestive system)</p> <p>Website – British Lung Foundation Stories and Videos https://www.blf.org.uk/support-for-you/copd/stories-and-videos</p> <p>Website – NHS A-Z conditions https://www.nhs.uk/conditions/</p> |
| Assessment Focus | End of topic test on cell biology | End of topic test on cell biology and organisation |
| Name of Knowledge Organiser | | |

Cells are the building blocks of all living things.



Stem cells are cells which can differentiate into any type of cell. In adult cells there is limited ability to do this but embryonic stem cells can change into any type of cell. These could be used in medical treatments but some people have concerns about this. Plants also have their own version of stem cells called meristem cells.

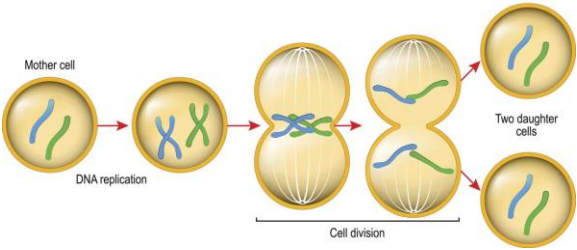
Cells knowledge organiser

Calculating magnification

Magnification = image size / actual size

$$1\text{mm} = 1000\mu\text{m}$$

MITOSIS



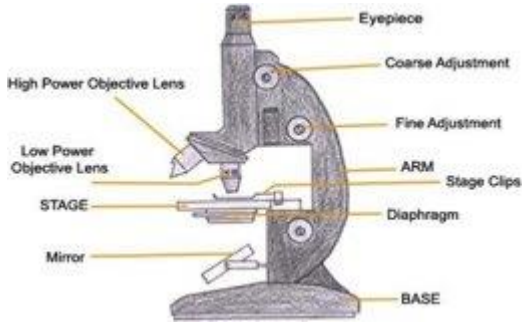
Transport

Diffusion is the process where molecules move from high to low concentration.

Osmosis is the movement of water from a dilute solution to a more concentrated one. It involves movement across the partially permeable membrane of a cell.

Active transport involves moving substances against a concentration gradient. This requires energy.

Microscopes are used to examine cells in more detail. Light microscopes are less powerful than electron microscopes



| | |
|-------------------|---|
| Eukaryotic cells | Cells that contain a nucleus |
| Prokaryotic cells | Single-celled organisms that do not contain a nucleus |
| DNA | Deoxyribonucleic acid – the genetic information found in all living organisms |
| Ribosome | A cell organelle that makes proteins |
| Respiration | The release of energy from glucose |
| Diffusion | The net movement of particles from an area of high concentration to an area of lower concentration |
| Organelle | A part of a cell with a specific function |
| Mitochondrion | A cell organelle where respiration occurs |
| Chloroplast | A cell organelle in which photosynthesis occurs - plants only |
| Cytoplasm | Jelly like substance in cells where chemical reactions occur |
| Nucleus | A cell organelle found in eukaryotes containing their genetic material |
| Cell membrane | Structure surrounding the cell that controls what moves in and out of the cell |
| Vacuole | Found in plant cells, filled with cell sap, keeps the cell turgid - plants |
| Cell wall | Made from cellulose and provides support – plants and bacteria |
| Photosynthesis | Chemical reaction that happens in chloroplasts that stores energy in glucose |
| Turgid | Describes a swollen cell |
| Resolution | The ability to distinguish between two very close points |
| Specialised cells | Cells such as sperm, red blood cells and nerve cells have features which allow them to carry out their functions effectively. |

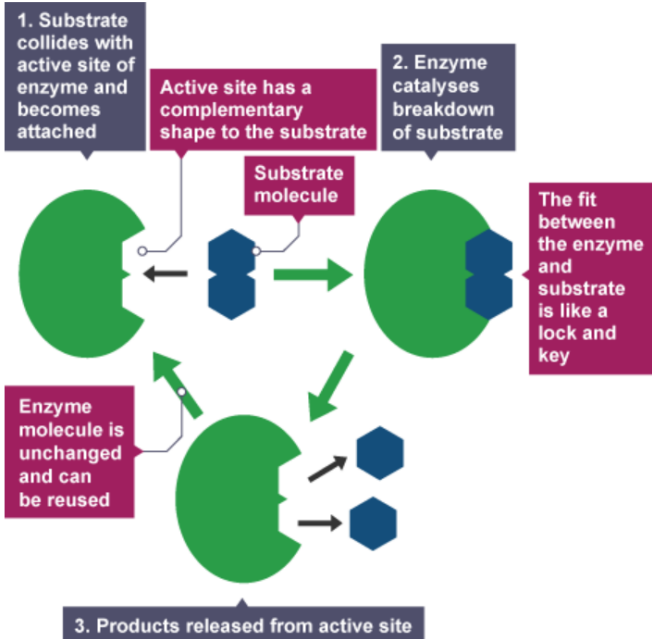
Cells → Tissue → Organ → system → organism

| Key term | Definition |
|------------------------|---|
| Artery | Blood vessel that carries blood from the heart to the body under high pressure. |
| Capillary | Carries blood from arteries into organs and tissues and passes blood back to veins. Exchange happens across capillary walls because they are one cell thick. |
| Vein | Blood vessel that brings blood back towards the heart. Pressure is lower than in the arteries. Veins have valves to prevent blood from flowing backwards. |
| Double circulation | On one journey around the body, the blood passes through the heart twice. Once to be pumped to the lungs and then again to be pumped around the body. One side of the heart receives oxygenated blood and the other deoxygenated blood. |
| Pacemaker | The heart rhythm is controlled by a group of cells in the heart called the SAN. |
| Coronary heart disease | A condition where the coronary blood vessels which supply the heart muscle with oxygen become blocked by fatty deposits. |
| Lifestyle factors | These are factors which can increase someone's risk of getting coronary heart disease such as smoking, a diet high in fat, stress and alcohol. |

Blood is pumped around the body by the heart. It is made up of a liquid called plasma, red blood cells, white blood cells and platelets. Hormones, nutrients and carbon dioxide are transported in the plasma. Red blood cells contain haemoglobin which carries oxygen. White blood cells are involved in our immune response.

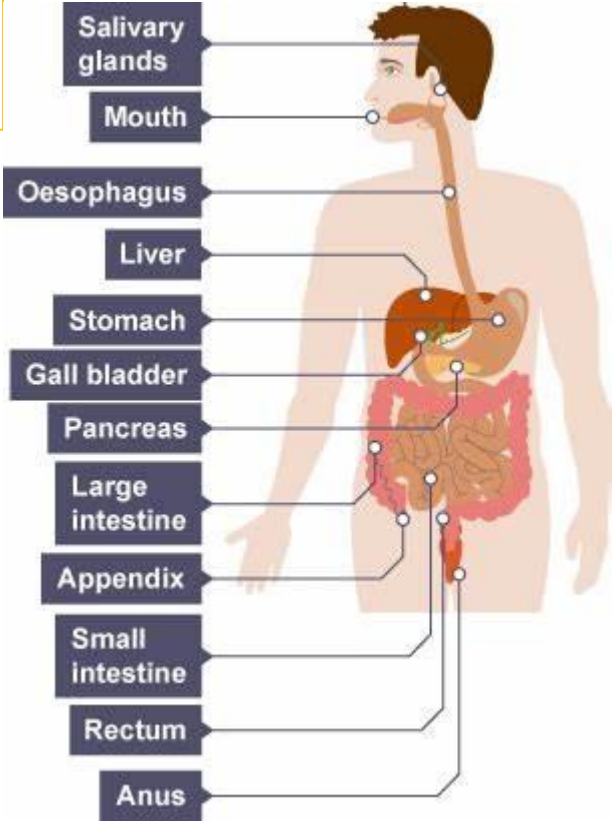
Enzymes are biological catalysts. They speed up reactions such as digestion.

B2 organisation



| Enzyme | Substrate | Products |
|----------|-----------|--------------------------|
| Amylase | Starch | Sugars (glucose) |
| Protease | Proteins | Amino acids |
| Lipase | Lipids | Fatty acids and glycerol |

Bile is produced by the liver and it is alkaline. It is released from the gall bladder and neutralises the stomach acid. It also breaks lipids into droplets to increase the surface area.



Food tests

Sugars – test with Benedict’s reagent and warm in a water bath.
 Starch – test with iodine
 Protein – test with Biuret reagent
 Lipids – test with Sudan III

Sugar turns Benedict’s from blue to brick red
 Starch turns iodine from brown to blue/black

Protein turns Biuret from blue to lilac

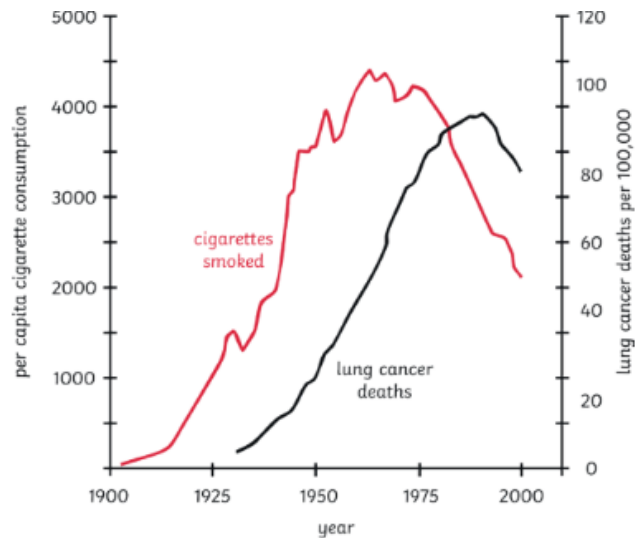
Lipids turn Sudan III red

Cancer

The uncontrolled growth and division of cells leads to a tumour.

Tumours can be benign which means they do not normally spread in the body.

Malignant tumours usually grow more quickly and can spread to other parts of the body via the blood.



Health and disease

Lung cancer can be caused by smoking.

Liver conditions are linked to alcohol consumption and diet.

Obesity and diabetes are linked with poor diet.

Anxiety and depression are linked with stress and prolonged excessive alcohol consumption.

| Plant cell or tissue | Features and role |
|----------------------|--|
| Xylem | Dead cells which form a tube to transport water and minerals from the roots |
| Phloem | Cells which transport sugars from the leaves to all parts of the plant. |
| Root hair cell | Cells which absorb water and nutrients from the soil. Their shape provides a large surface area. |
| Guard cells | Cells which control the opening of tiny pores under the leaf. The pores are called stomata |
| Epidermis | The top and bottom layer of cells on the leaf |
| Spongy mesophyll | Tissue inside the leaf which has lots of air spaces to allow gases to move around |
| Palisade cells | Have many chloroplasts to absorb light for photosynthesis |

Transpiration is the loss of water from the leaves by evaporation and diffusion. Water evaporates from the stomata. As water leaves from the leaf it pulls more water up the stem to replace it. The transpiration rate increases when there is high light intensity, it is windy, dry and hot.

Translocation involves the movement of sugars from the leaves to other parts of the plant.