

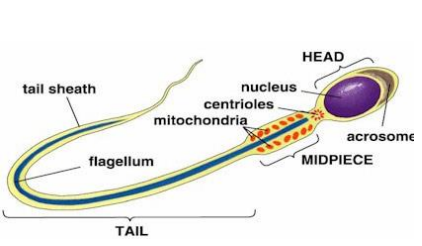
Biology 1: Cell Biology

Section 1: Cell Structure

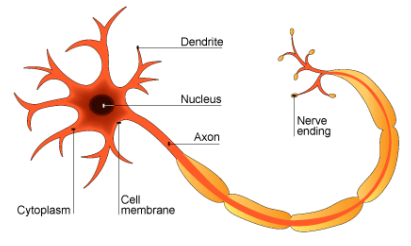
| Cell Structure | Function | Eukaryotic | | Prokaryotic |
|---------------------|--|--------------|-------------|-----------------|
| | | Animal Cells | Plant Cells | Bacterial Cells |
| 1 Nucleus | Contains genetic information that controls the functions of the cell. | Y | Y | |
| 2 Cell membrane | Controls what enters and leaves the cell. | Y | Y | Y |
| 3 Cytoplasm | Where many cell activities and chemical reactions within the cell occur. | Y | Y | Y |
| 4 Mitochondria | Provides energy from aerobic respiration . | Y | Y | |
| 5 Ribosome | Synthesises (makes) proteins . | Y | Y | Y |
| 6 Chloroplast | Where photosynthesis occurs. | | Y | |
| 7 Permanent vacuole | Used to store water and other chemicals as cell sap . | | Y | |
| 8 Cell wall | Strengthens and supports the cell. (Made of cellulose in plants.) | | Y | Y |
| 9 DNA loop | A loop of DNA , not enclosed within a nucleus. | | | Y |
| 10 Plasmid | A small circle of DNA , may contain genes associated with antibiotic resistance. | | | Y |

Section 2: Specialised Cells

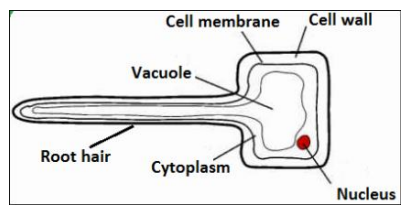
| Specialised Cell | How structure relates to function |
|-------------------|---|
| 13 Sperm cell | Acrosome contains enzyme to break into egg; tail to swim; many mitochondria to provide energy to swim. |
| 14 Nerve cell | Long to transmit electrical impulses over a distance. |
| 15 Muscle cell | Contain protein fibres that can contract when energy is available, making the cells shorter. |
| 16 Root hair cell | Long extension to increase surface area for water and mineral uptake; thin cell wall . |
| 17 Xylem cell | Waterproofed cell wall; cells are hollow to allow water to move through. |
| 18 Phloem cell | Some cells have lots of mitochondria for active transport ; some cells have very little cytoplasm for sugars to move through easily. |



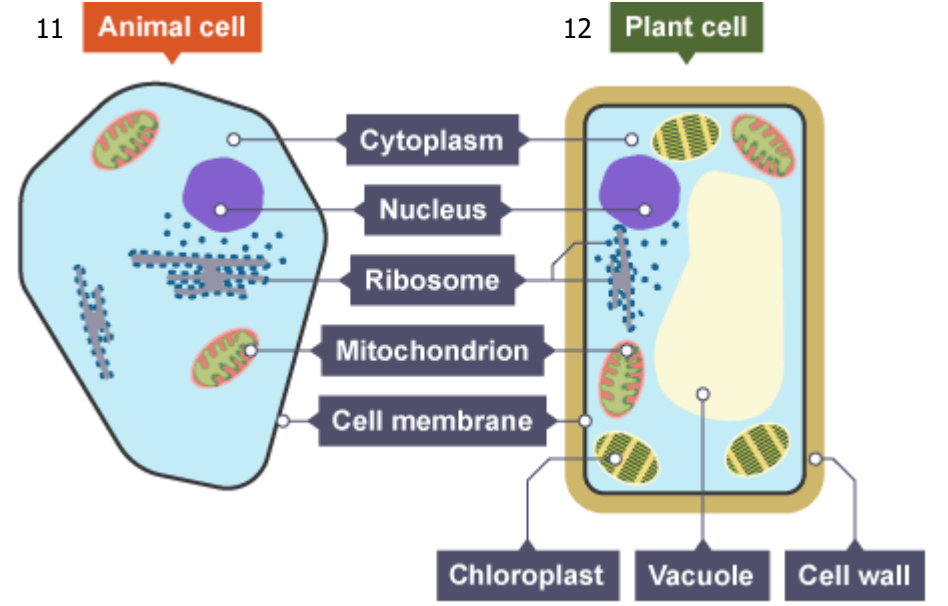
19 – Sperm cell



20 – Nerve cell



21 – Root hair cell

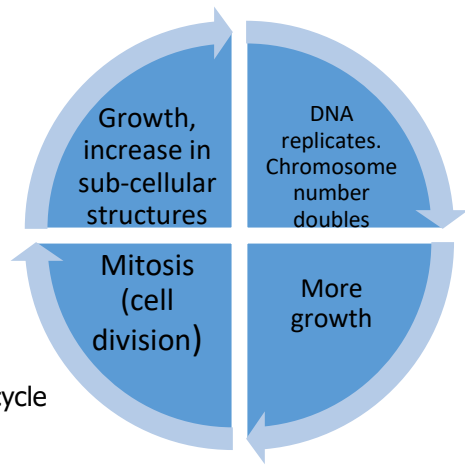


Section 3: Microscopy

| | |
|------------------------|--|
| 22 Magnification | The degree by which an object is enlarged . Magnification = $\frac{\text{size of image}}{\text{size of real object}}$ |
| 23 Resolution | The ability of a microscope to distinguish detail . |
| 24 Light microscope | Basic microscope with a maximum magnification of 1500x. Low resolution. |
| 25 Electron microscope | Microscope with a much higher magnification (up to 500 000x) and resolving power than a light microscope. This means that it can be used to study cells in much finer detail. |

Section 4: Orders of Magnitude

| Unit Prefix | Size in metres | Standard Form |
|--------------------------|----------------|---------------|
| 26 Centimetre (cm) | 0.01m | 10^{-2} m |
| 27 Millimetre (mm) | 0.001m | 10^{-3} m |
| 28 Micrometre (μ m) | 0.000001m | 10^{-6} m |
| 29 Nanometre (nm) | 0.000000001m | 10^{-9} m |



30 – Cell cycle

Section 5: Mitosis and the Cell Cycle

| | |
|----|---|
| 31 | Number of sub-cellular structures (e.g. ribosomes and mitochondria) increase . |
| 32 | Number of chromosomes double . |
| 33 | One set of chromosomes is pulled to each end of the cell. |
| 34 | The nucleus divides . |
| 35 | Cytoplasm and cell membranes divide to form two identical cells |

Section 7: Transport Across Membranes

| Cell Structure | Definition | Uses |
|---------------------|--|---|
| 41 Diffusion | Spreading out of the particles (gas/solution) resulting in a net movement from an area of higher concentration to an area of lower concentration . | Oxygen and carbon dioxide in gas exchange (leaves and alveoli). Urea from cells into the blood plasma for excretion in the kidney. |
| 42 Osmosis | The diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane. | Movement of water into and out of cells. |
| 43 Active Transport | The movement of substances from a more dilute solution to a more concentrated solution (against a concentration gradient). Requires energy from respiration. | Absorption of mineral ions (low concentration) from soil into plant roots . Absorption of sugar molecules from lower concentrations in the gut into the blood which has a higher sugar concentration. |

Section 6: Stem Cells

| Stem Cell | Properties | Uses |
|------------------------|--|---|
| 36 Embryonic stem cell | Can divide into most types of cell. | Therapeutic cloning – embryonic stem cells produced with same genes as patient. No rejection . |
| 37 Adult stem cell | Can divide into a limited number of cells e.g. bone marrow stem cells can form various blood cells. | |
| 38 Meristem | Found in plants. Can differentiate (divide) into any type of plant cell. | Clone rare species to prevent extinction . Crops with special features can be clones |

Pros and Cons of Using Stem Cells

| | |
|---------|--|
| 39 Pros | Treatment of diseases such as diabetes, dementia and paralysis. |
| 40 Cons | Ethical and religious objections. Can transfer viruses held within cells. |

Section 8: Factors Affecting Diffusion

| Factor | Explanation |
|---|---|
| 44 Difference in concentrations (concentration gradient) | The greater the difference in concentrations, the faster the rate of diffusion. |
| 45 Temperature | Particles move more quickly at higher temperatures, so rate of diffusion increases. |
| 46 Surface area of membrane | The greater the surface area the quicker the rate of diffusion. |

Section 9: Adaptations of Exchange Surfaces

| | |
|----|---|
| 47 | Large surface area |
| 48 | Thin membrane to provide a short diffusion path |
| 49 | Ventilation (in animals for gas exchange – maintains a concentration gradient) |
| 50 | Efficient blood supply (in animals – maintains a concentration gradient) |