

**Science: Cell Biology**

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| 1. Key Words | | |
|  | Organelle | Function |
| 1 | Nucleus | Controls the cell  Contains genetic material |
| 2 | Cell membrane | Controls the exchange of substances in and out of the cell |
| 3 | Ribosomes | Protein synthesis |
| 4 | Cytoplasm | Where chemical reactions occur |
| 5 | Mitochondria | Releases energy from aerobic respiration |
| 6 | Cell wall | Supports the cell |
| 7 | Chloroplasts | Where photosynthesis occurs |
| 8 | Vacuole | Contains cell sap |
| 9 | Plasmid | Circular ring of DNA |
| 10 | flagella | Provides movement for single celled organisms |
| Eukaryotes (complex cells)  6    1  2  7  3  8  4  Plant Cell  Animal Cell  5 | | |
| Prokaryotes (simple cells – bacteria)  9  6  10    2  3  4  DNA (genetic material | | |

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| 1. Specialised Cells | | |
| Cell | Function | Adaptation |
| Sperm cell | Fertilised the egg cell | * Tail to swim to egg * Many mitochondria to release energy |
| Nerve cell | Carry electrical impulses around the body | * Long to reduce the number of synapses * Lots of branches to connect to many cells |
| Muscle cell | Contracts and relaxes to cause movement | * Many mitochondria to release energy * Contains protein fibres that can contract |
| Root hair cell | Absorbs water and minerals from the soil | * Large surface area to increase absorption * No chloroplasts to allow a larger vacuole |
| Palisade cell | Where most photosynthesis occurs | * Many chloroplasts, so more photosynthesis * Rectangular shape to fit more cells along the upper surface of the leaf |
| Phloem cell | Transports sugars, ions and other minerals around the plant | * Many mitochondria to release energy for active transport * Perforated ends so cytoplasm of adjacent cells connect speeding up exchange |
| Xylem cell | Transports water from the root to the leaves. | * Contains lignin to prevent water loss * Hollow so water and minerals can travel through |

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| 1. Comparing microscopes | | |
| Type | Advantages | Disadvantages |
| Light Microscope | * Can see colours * Cheaper * Can see live specimens | * Lower magnification * Lower resolution |
| Electron Microscope | * Higher resolution * Higher magnification | * Cannot see colour * Only see dead specimens |
| Conversions: | | |



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| 1. Calculating magnification |
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| 1. Cell differentiation and stem cells | |
| Differentiation | When a stem cell changes into a specialised cell |
| Stem cells | Cells that have not differentiated yet |
| Adult stem cells | Stem cells found in body tissues such as skin and bone marrow |
| Embryonic stem cells | Stem cells from the embryo that have the potential to turn in to any type of specialised cells |
| Meristems | Tips of the roots and shoot where the plant stem cells are found |
| Chromosomes | Condensed strand of DNA containing the genes for characteristics (23 pairs in humans) |
| Cell cycle | The process where the cell divides |
| Mitosis | A type of cell division that produced 2 identical diploid daughter cells |
| Therapeutic cloning | Creating a cloned embryo to have the same genetics as the patient to treat genetic diseases. |

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| 1. Stages of the cell cycle (mitosis in lilac) | | |
| 1 | Organelles are copied and DNA condenses into chromosomes | 4  3  2  1 |
| 2 | Chromosome number doubles and nuclear membrane dissolves |
| 3 | Chromosomes line up along the centre and duplicate chromosomes are pulled apart |
| 4 | Cell membrane closes around each set of chromosomes (cytokinesis) and 2 identical cells are formed |

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| 1. Types of exchange | | |
| Key Word | Definition | Example |
| Diffusion | Movement of solutes from a high to a low concentration across a semi-permeable membrane | Oxygen and carbon dioxide exchanged in the lungs |
| Osmosis | Movement of water from a low to high concentration across a semi-permeable membrane | Water moving into the blood in the large intestine or into the roots of a plant |
| Active transport | Movement of solutes from a low to a high concentration against a concentration, requiring energy | Minerals moving into the root hair cells and sugars moving in to the blood in the small intestines |

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| Challenge Questions | |
| 1 | Why do prokaryotes not contain mitochondria? |
| 2 | Compare and contrast plant, animal and prokaryotic cells. |
| 3 | Using a Venn diagram, compare and contrast diffusion, osmosis and active transport. |
| 4 | Evaluate the use of adult stem cells and embryonic stem cells to treat patients |