B1 Cell Structure and Transport

Lessons TBAT	Key Knowledge	Practical	Assessment
TBAT: Describe how a microscope works TBAT: Compare animal and plant cells TBAT: Compare prokaryotic and eukaryotic cells TBAT: Describe adaptations in specialised animal cells	Plant and animal cells (eukaryotic cells) have a cell membrane, cytoplasm and genetic material enclosed in a nucleus. Bacterial cells (prokaryotic cells) are much smaller in comparison. They have cytoplasm and a cell membrane surrounded by a cell wall. The genetic material is not enclosed in a nucleus. It is a single DNA loop and there may be one or more small rings of DNA called plasmids. Students should be able to demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, including the use of standard form. Students should be able to explain how the main sub-cellular structures, including the nucleus, cell membranes, mitochondria, chloroplasts in plant cells and plasmids in bacterial cells are related to their functions. Most animal cells have the following parts: • a nucleus • cytoplasm • a cell membrane • mitochondria • ribosomes. In addition to the parts found in animal cells, plant cells often have: • chloroplasts • a permanent vacuole filled with cell	Required practical activity 1: use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included. Required practical activity 2: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.	Osmosis prac write up Maths focus Use prefixes centi, milli, micro and nano.

TBAT: Describe adaptations in specialised plant cells TBAT: Explain how diffusion takes place TBAT: Compare osmosis and diffusion TBAT: Investigate osmosis in plant tissues TBAT: Explain how active transport works TBAT: Calculate surface area and volume ratio	sap. Plant and algal cells also have a cell wall made of cellulose, which strengthens the cell. Students should be able to use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures. Students should be able to, when provided with appropriate information, explain how the structure of different types of cell relate to their function in a tissue, an organ or organ system, or the whole organism. Cells may be specialised to carry out a particular function: • sperm cells, nerve cells and muscle cells in animals • root hair cells, xylem and phloem cells in plants. Students should be able to: • understand how microscopy techniques have developed over time • explain how electron microscopy has increased understanding of sub-cellular structures. Limited to the differences in magnification and resolution. An electron microscope has much higher magnification and resolving power than a light microscope. This means that it can be used to study cells in much finer detail. This has enabled biologists to see and understand many more sub-cellular structures. Students should be able to carry out calculations involving magnification, real size and image size using the formula: magnification = size of image size of real object Students should be able to express answers in standard form if appropriate. Substances may move into and out of cells across the cell membranes via diffusion. Diffusion is the spreading out of the particles of any substance in solution, or particles of a gas, resulting	Key stage 3 Cells and organisation ♣ cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope ♣ the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts ♣ the similarities and differences between plant and animal cells ♣ the role of diffusion in the movement of materials in and between cells ♣ the structural adaptations of some unicellular organisms ♣ the hierarchical organisation

	in a net movement from an area of higher concentration to an area of lower concentration. Some of the substances transported in and out of cells by diffusion are oxygen and carbon dioxide in gas exchange, and of the waste product urea from cells into the blood plasma for excretion in the kidney. Students should be able to explain how different factors affect the rate of diffusion. Factors which affect the rate of diffusion are: • the difference in concentrations (concentration gradient) • the temperature • the surface area of the membrane. A single-celled organism has a relatively large surface area to volume ratio. This allows sufficient transport of molecules into and out of the cell to meet the needs of the organism. Water may move across cell membranes via osmosis. Osmosis is the diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane. WS 1.2 Recognise, draw and interpret diagrams that model osmosis. Students should be able to: • use simple compound measures of rate of water uptake • use percentages • calculate percentage gain and loss of mass of plant tissue Students should be able to calculate and compare surface area to volume ratios. Students should be able to explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area to volume ratio. Students should be able to explain how the small intestine and lungs in mammals, gills in fish, and the roots and leaves in plants, are adapted for exchanging materials. In multicellular organisms, surfaces and organ systems are specialised for exchanging materials. This is to allow sufficient molecules to be transported into and out of cells for the organism's needs. The effectiveness of	

	an exchange surface is increased by: • having a large surface area • a membrane that is thin, to provide a short diffusion path • (in animals) having an efficient blood supply • (in animals, for gaseous exchange) being ventilated.	

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