

# GCSE Knowledge Organiser

## Unit 1 – Cells

SCIENCE

### ONE

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

### TWO

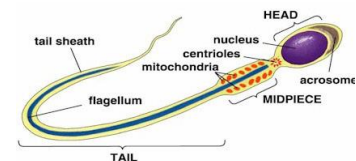
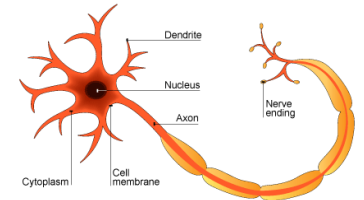
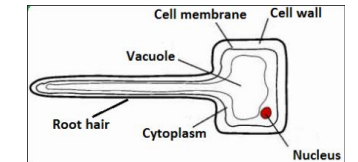
| SPECIALISED CELLS |                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------|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

### THREE

| MICROSCOPY          |                                                                                                                                                                               |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Magnification       | The degree by which an object is enlarged.<br>Magnification = $\frac{\text{size of image}}{\text{size of real object}}$                                                       |
| Resolution          | The ability of a microscope to distinguish detail.                                                                                                                            |
| Light microscope    | Basic microscope with a maximum magnification of 1500x. Low resolution.                                                                                                       |
| 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. |

### FOUR

| ORDERS OF MAGNITUDE          |                |                   |
|------------------------------|----------------|-------------------|
| Unit Prefix                  | Size in metres | Standard Form     |
| Centimetre (cm)              | 0.01m          | $10^{-2}\text{m}$ |
| Millimetre (mm)              | 0.001m         | $10^{-3}\text{m}$ |
| Micrometre ( $\mu\text{m}$ ) | 0.000001m      | $10^{-6}\text{m}$ |
| Nanometre (nm)               | 0.000000001m   | $10^{-9}\text{m}$ |



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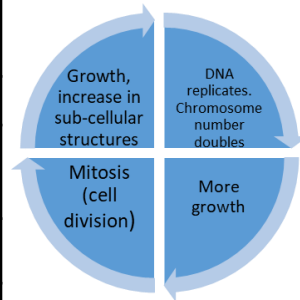
## Unit 1 – Cells

### SCIENCE

## FIVE

### MITOSIS AND CELL CYCLE

|        |                                                                               |
|--------|-------------------------------------------------------------------------------|
| Step 1 | Number of sub-cellular structures (e.g. ribosomes and mitochondria) increase. |
| Step 2 | Number of chromosomes double.                                                 |
| Step 3 | One set of chromosomes is pulled to each end of the cell.                     |
| Step 4 | The nucleus divides.                                                          |
| Step 5 | Cytoplasm and cell membranes divide to form two identical cells               |



## SIX

### TRANSPORT ACROSS MEMBRANES

| Cell Structure   | Definition                                                                                                                                                   | Uses                                                                                                                                                                                                 |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                   |
| 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.                                                                                                                                                             |
| 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. |

## SEVEN

### STEM CELLS

| Stem Cell                         | Properties                                                                                          | Uses                                                                                          |
|-----------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Embryonic stem cell               | Can divide into most types of cell.                                                                 | Therapeutic cloning – embryonic stem cells produced with same genes as patient. No rejection. |
| Adult stem cell                   | Can divide into a limited number of cells e.g. bone marrow stem cells can form various blood cells. |                                                                                               |
| 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 |                                                                                                     |                                                                                               |
| Pros                              | Treatment of diseases such as diabetes, dementia and paralysis.                                     |                                                                                               |
| Cons                              | Ethical and religious objections. Can transfer viruses held within cells.                           |                                                                                               |

## EIGHT

### FACTORS AFFECTING DIFFUSION

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

### ADAPTATIONS OF EXCHANGE SURFACES (4 FEATURES)

|   |                                                                                |
|---|--------------------------------------------------------------------------------|
| 1 | Large surface area                                                             |
| 2 | Thin membrane to provide a short diffusion path                                |
| 3 | Ventilation (in animals for gas exchange – maintains a concentration gradient) |
| 4 | Efficient blood supply (in animals – maintains a concentration gradient)       |