**B2 CELLS**

**2.1 Cell Structure**

1. **State that living organisms are made of cells.**

All living things are made of cells - microscopic units that act as building blocks. Some organisms are unicellular (one-celled), some are multicellular - made up of many cells.

1. **Identify and describe the structure of a plant cell (palisade cell) and an animal cell (liver cell) as seen under a light microscope.**

**4. Relate the structures seen under the light microscope in the plant cell and animal cell to their functions.**

****

 **Plant cell (palisade cell) Animal Cell (liver cell)**

PARTS OF A CELL

|  |  |  |  |
| --- | --- | --- | --- |
|  | **PART** | **DESCRIPTION** | **FUNCTION** |
| **Animal & plant cells** | Cytoplasm | Jelly-like, 70% is water | Contains cell organellesChemical reactions take place here |
| Membrane | Surrounds the cell; partially permeable  | Controls what substances enter & leave the cell. |
| Nucleus | Contains DNA in the form of chromosomes | Controls cell division;Controls cell development;Controls cell activities. |
| **Plant cells only** | Cell wall | Tough layer made of cellulose, surrounds the cell membrane | Freely permeable (allows water and salts to pass through);Protects and supports the cell;Prevents plant cells from bursting |
| Sap vacuole | Fluid-filled space surrounded by a membrane | Contains salts and sugars (cell sap);Helps keep plant cells turgid (firm) |
| Chloroplast | Organelle containing chlorophyll | Chlorophyll taps light energy for photosynthesis |

1. **Describe the differences in structure between typical animal and plant cells.**

|  |  |
| --- | --- |
| **PLANT CELLS** | **ANIMAL CELLS** |
| Have a cellulose cell wall outside the membrane | No cell wall |
| Often have chloroplasts containing chlorophyll | No chloroplasts |
| Often have one large vacuoles containing cell sap | Have only small vacuoles (vesicles) |
| Often have starch grains | Never have starch grains; sometimes have glycogen granules |
| Often regular in shape | Often irregular in shape |

1. **Relate the structure of the following to their functions: red blood cells (transport), root hair cells (absorption).**

|  |  |  |
| --- | --- | --- |
| **Structure** | **Special features** | **Functions** |
| **P:\imagesCAJF4Z5T.jpg** | The ‘hair’ gives a large surface area due to its elongated shape | Absorbs water and mineral ions;Anchor the plant firmly in the soil |
| **P:\imagesCAGJA1S3.jpg** | Have no nucleus;contain hemoglobin;biconcave shape (for greater surface area);flexible (so they fit through small capillaries). | Transport oxygen around the body. No nucleus so more room for oxygen bound to hemoglobin.  |

1. **Calculate magnification and size of biological specimens using millimeters as units.**

Magnification (X) = Measured length (mm) ÷ Actual length (mm)

**2.2 Movement into & out of Cells**

1. **Define Diffusion.**

Diffusion is the net movement of molecules from a region of their higher concentration to a region of their lower concentration down a concentration gradient, as a result of their random movement.

1. **Describe the importance of diffusion of gases and solutes and of water as a solvent.**

Factors that help diffusion are as follows:

* Distance (the shorter the better) e.g. thin walls of alveoli and the capillaries.
* Concentration gradient (the bigger the better). This can be maintained by removing the substance as it passes across the diffusion surface.
* Size of the molecules (the smaller the better).
* Surface area for diffusion (the larger the better) e.g. there is millions of alveoli in a lung, giving a huge surface area for diffusion of oxygen.
* Temperature (molecules have more kinetic energy at higher temperatures).

 Importance of diffusion of gases and solutes:

|  |  |
| --- | --- |
| **Substance diffused** | **Site of diffusion** |
| Oxygen | From the alveoli into blood capillaries |
| Carbon dioxide | From blood capillaries into the alveoli.From air, through stomata & into the leaf for photosynthesis. |
| Soluble products of digestion | From small intestine to the blood capillaries. |
| Scent made of tiny molecules | From flowers into the bee’s body. |

Importance of water as a solvent:

* Most cells contain about 75% of water;
* Many important metabolic reactions take place in aqueous solution;
* Many substances move around a cell dissolved in water (and also around organisms, e.g. in blood, xylem & phloem).
1. **Define Osmosis**

Osmosis is the diffusion of water molecules from a dilute solution to a more concentrated solution through a partially permeable membrane.

1. **Describe the importance of osmosis in the uptake of water by plants, and its effect on plant and animal tissues.**

*Importance of osmosis in the uptake of water by plants:*

* Usually, the water in the soil is more dilute than that in root hair cells
* So water enters root hair cells by osmosis (a passive process – requiring no energy)

*Effects of osmosis on plant and animal tissues:*

* When placed in pure water, plant and animal cells will take in the water by osmosis;
* This is because there is a higher concentration of water molecules outside the cell than inside it;
* Plants become **turgid**, but do not burst because of their tough cell wall;
* Animal cells will **burst**, because they have no cell wall;
* The reverse happens when plant and animal cells are placed in a concentrated sugar or salt solutions. This is because there is a higher concentration of water molecules inside the cell than outside it;
* Plant cells become **flaccid** and the cytoplasm is no longer pressed against the cell wall;



 Turgid plant cell Flaccid plant cell

* Animal cells also become flaccid and their shape changes- they can become **crenated**.

 

RBC burst Crenated RBC

1. **Describe and explain the importance of a water potential gradient in the uptake of water by plants.**

* Water potential is the correct term for saying ”water concentration” a high water potential is equivalent to a low solute concentration and vice versa;
* For plants to take in water through their roots they must have a high solute concentration or low water potential in the roots and low solute concentration or high water potential outside the roots.
* In osmosis, water molecules diffuse down a water potential gradient.