Science—Cells Transport Systems (Biology)

Year 9 Term 4

(1) Transport Processes

Diffusion- Net movement of particles from an area of high concentration to an area of low concentration (down a concentration gradient). This process is **passive,** requiring no energy. E.g. gas exchange in both plants and animals.

Factors affecting rate of diffusion:

- Decreasing the diffusion distance.
- Increasing the concentration gradient.
- Increasing the surface area.

Active Transport—Net movement of substances from an area of low concentration to high concentration (against the concentration gradient). It is an **active** process (energy (ATP) is required), which happens through a cell membrane. E.g. mineral movement into the roots of plants.

Osmosis—The movement of water molecules from an area of high water potential to a lower water potential (down a water potential gradient) across a selectively permeable membrane.

(2) Osmosis

Partially permeable membrane—A partially permeable membrane allows certain types of molecules to pass through the membrane but blocks others.

Water potential—The concentration of free water molecules is known as water potential.

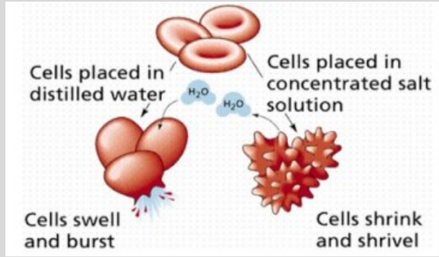
Flaccid— Plant cell containing a low volume of water.

Turgid—Plant cell containing a high volume of water.

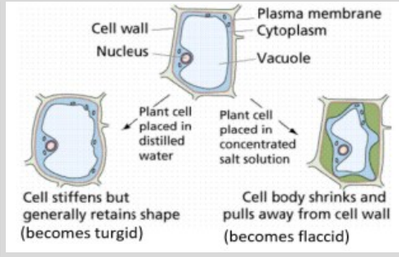
Plasmolysis– the bursting of an animal cell due to osmosis.

Crenation– the shrinking of an animal cell due to osmosis.

Osmosis in animal cells



Osmosis in plant cells



(3) Cell division

Stem Cell—An undifferentiated cell.

Embryonic Stem Cell	Found in embryos. Can differentiate into any type of cell (multipotent).
Adults Stem Cell	Found in various body tissue (bone marrow, skin, brain). Can only differentiate into one type of cell e.g. stems cells in the skin can only form new skin cells.
Plant Stem Cells	Found in the meristem, located in shoots and roots.

Mitosis—Each cell divides to produce 2 genetically identical cells (clones). Used to replace worn out cells, repair damaged tissue and enables organisms to grow.

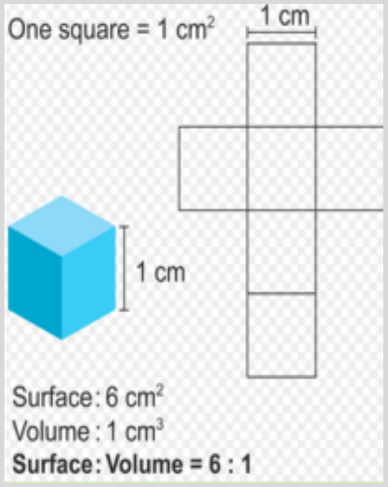
Cell differentiation—When cells become specialised to perform a job.

(4) Surface area: Volume

Volume of a cube = length x width x height

Surface area of a cube = Area of one side (width x height) multiplied by number of faces (e.g. 6 faces on a cube).

Surface area to volume ratio: a ratio of the surface area compared to the volume.



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(5) Transport in Plants

Transpiration—The loss of water from a plant's leaves via evaporation through the stomata.
Translocation– The movement of dissolved sugars in plants from the leaves to other parts of the plant.
Potometer—A device used for measuring the rate of transpiration from a leafy plant shoot.

Plant Vessels:

Xylem	Phloem
Movement of water and dissolved minerals (transpiration)	Movement of sugars (translocation)
Movement only occurs upwards	Movement occurs both upwards and downwards
Made of dead cells	Made of living cells.
Supported by thick layer of lignin	Cells have sieve plates between them to allow substances to pass through

(6) The Circulatory System

Double Circulatory System—This means we have two loops in our body in which blood circulates. One loop to the lungs, one loop to the body.

Red Blood Cell— Transports oxygen. Biconcave shape, no nucleus, flexible and contains haemoglobin.

White Blood Cell- Defence against pathogens. Large cell, multi-lobed nucleus.

Platelet—responsible for blood clotting.

Plasma—liquid that carries dissolved substances.

Artery—Carries blood away from heart at high pressure. Has a thick muscular wall and narrow lumen.

Vein—Carries blood towards the heart at low pressure. Large lumen, thin walls, has valves.

Capillary—Connects arteries and veins. Allows transport of substances out of the blood. One cell thick.