science biology

Year 9 – Transport in cells

1. Principles of organisation

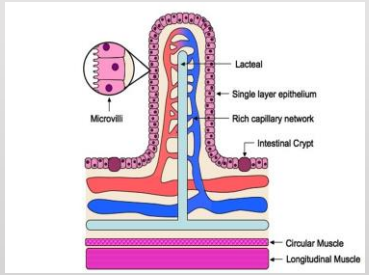
- **Cells** are the basic building blocks of all living organisms.
- A **tissue** is a group of cells with a similar structure and function.
- **Organs** are a collection of different tissues performing specific functions.
- Organs are organised into **organ systems**, which work together to form **organisms**.

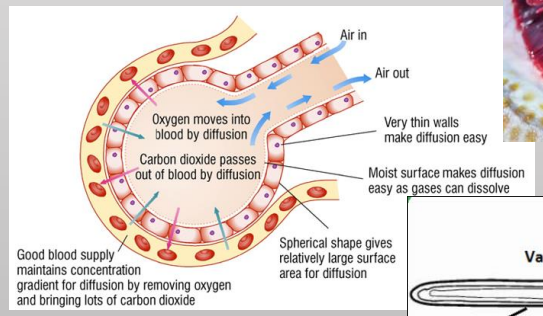
2. Exchanging materials

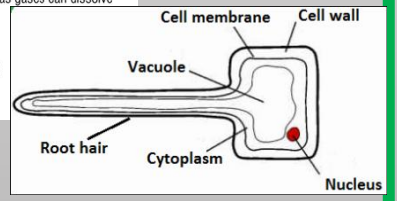
In **multicellular** organisms, surfaces and body organs are specialised for exchanging materials. Some example of specialised exchange surfaces are the villi in the small intestine, the alveoli sacs in the lungs, the gills in fish and leaves in plants.

The effectiveness of exchange surfaces in plants and animals 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





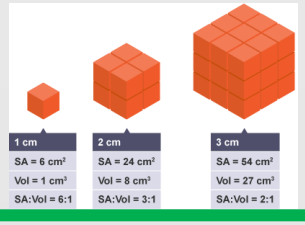


4. Calculating surface area: volume ratio

Large organisms have a small SA:vol so need specialised exchange surfaces (eg. alveoli, villi, gills) with large SA so diffusion is faster.

Surface area= length x width x 6

Volume= length x width x height



5. Active transport- *energy is used to move particles against a concentration gradient*

Examples

- Mineral ions are absorbed into plant root hairs from very dilute solutions in the soil. Plants require ions for healthy growth.
- Sugar molecules are absorbed from the gut to the blood stream

6. Osmosis *the movement of water from a high concentration of water (dilute solution) to a low concentration of water (concentrated solution) across a partially permeable membrane*

Osmosis Required Practical

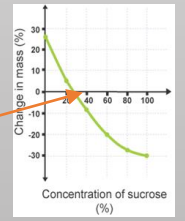
IV= Conc of solution. DV = % change in mass

CVs = time, same length potato, solution volume, amount of blotting

1. Cut sections of plant (potato) tissue to 2cm and weigh them
2. Put into different concentrations of sucrose solution
3. Leave for 1 hr, remove from solutions
4. Blot dry using and paper towel and re-weigh the potato
5. Calculate the % change in mass

% change in mass= (change in mass/ starting mass) x 100

x intercept = zero change in mass = solution must = concentration of cytoplasm



7. Diffusion *the movement of particles of a gas or a liquid from a high concentration to a low concentration.*

Rate of diffusion is increased by:

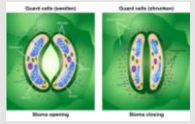
- ▲ temperature
- ▲ surface area
- ▲ concentration gradient
- ▼ diffusion distance

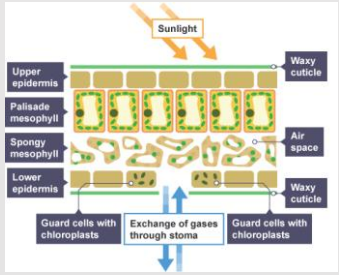
Example

- Oxygen diffusing into the bloodstream and carbon dioxide diffusing into the alveoli sac.

8. Plant Tissues

Leaves are adapted for **photosynthesis**, and the exchange of gases required for the process.





Tissue	Features	Function
Epidermal tissue	Covered with a **waxy cuticle.**	Reduces water loss by **evaporation**
Palisade mesophyll tissue	Has lots of **chloroplasts**	**Photosynthesis**
Spongy mesophyll tissue	Has lots of **air spaces.**	**Diffusion** in and out of cells.
Xylem	Dead cells joined together to make a continuous tube	**Transpiration**
Phloem	Elongated and living cells	**Translocation**
Meristem tissue (at the tips of shoots and roots)	**Differentiate** into different types of plant cell.	This allows the plant to grow.

Guard cells surround the stomata. They control the opening and closing of stomata depending on water loss.

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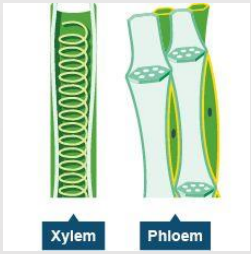
9. Plant Transport Systems

Translocation- movement of dissolved sugars through the **phloem** from the leaves (made) to the roots (store)

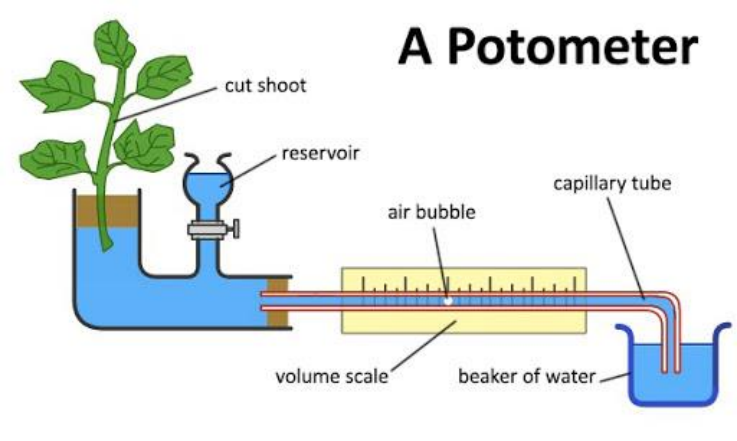
Transpiration- the evaporation of water through the stomata. This causes the movement of water and minerals from the roots to the leaves through the **xylem**.



The rate of transpiration is increased by:

- Warm Temperature
- Wind
- Dry air
- Sunlight

Transpiration can be measured using a **potometer**. As the shoot takes up the water the air bubble moves and this can be timed to give a volume of water per minute.



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