

Crossing the Membrane

Generally obey **Fick's Law**: $\frac{\text{Surface Area} \times \text{Concentration Difference}}{\text{Distance}}$

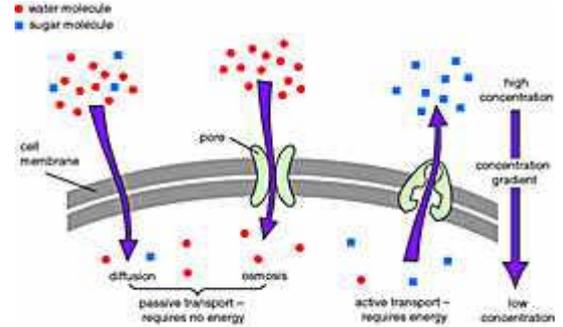
Any tissue designed for absorption has: **maximised SA** (villi/microvilli/alveoli); and will use **active transport out** (to ↑ conc. Diff.); be **thin**, (thus close to blood supply/food/air)

Passive: Molecules move **down the concentration gradient** (high → low)

Simple Diffusion: **gases** (O₂, CO₂) pass **between molecules** in membrane

Facilitated Diffusion: uses **carrier (channel) proteins** to cross membrane (glucose, amino-acids etc.)

Osmosis: **water only**. Goes **down the water potential gradient** (less -ve towards more -ve)



Active: **Against the concentration gradient**; needs ↑ energy (ATP); ↑ **respiration**; ↑ **mitos**.

Ions/small molecules: **sodium pump** (Na⁺ out, K⁺ in). Found in **all cells**

Large molecules: enter through **pinocytosis**; leave through **secretion** (vesicles, Golgi body)

Particles: Enter through **phagocytosis** (WBC's, *Amoeba*)

Tools & Techniques

Cell fractionation: Break open cells with ultrasound/homogeniser; use ice-cold osmotic buffer (to keep organelles intact); then use

Centrifuging: organelles settle in size order:

nucleus; chloroplasts; mitochondria; lysosomes; e.r./ribosomes; remaining cytoplasm = **supernatant**

Chromatography: chemicals identified by **R_f values**, which remain constant (**table of data**)

Calculation: distance to **front** of spot ÷ distance moved by **solvent** (= solvent front). Use **mm's!**

Staining: **Gram's** with bacteria (+ve = black, -ve = pink); **Heavy metals** for e-m's
all stains show up (particular) parts of cells – so **name the part**
(nucleus / DNA / chromosomes / starch grains / cell wall)

Squashing: makes cells spread out (and flat), **so easier to see**

Sectioning: Allows light through, one cell thick; easier to see cells

Food Tests: Sugars - **Benedicts**; Starch - **iodine solution**; protein – **biuret**; lipids - **ethanol/emulsion**

Light microscope: + points: easy to use, portable, colour, movement, (< x 1,000)

Transmission e.m. + points: **high resolution** (due to short wavelength) x 50,000+

Scanning e.m. + points – 3-D images of **surface** of object (with high resolution) x 200-10,000

Magnification calculations: Distance across object (mm) ÷ magnification (1000's) = real size (µm)