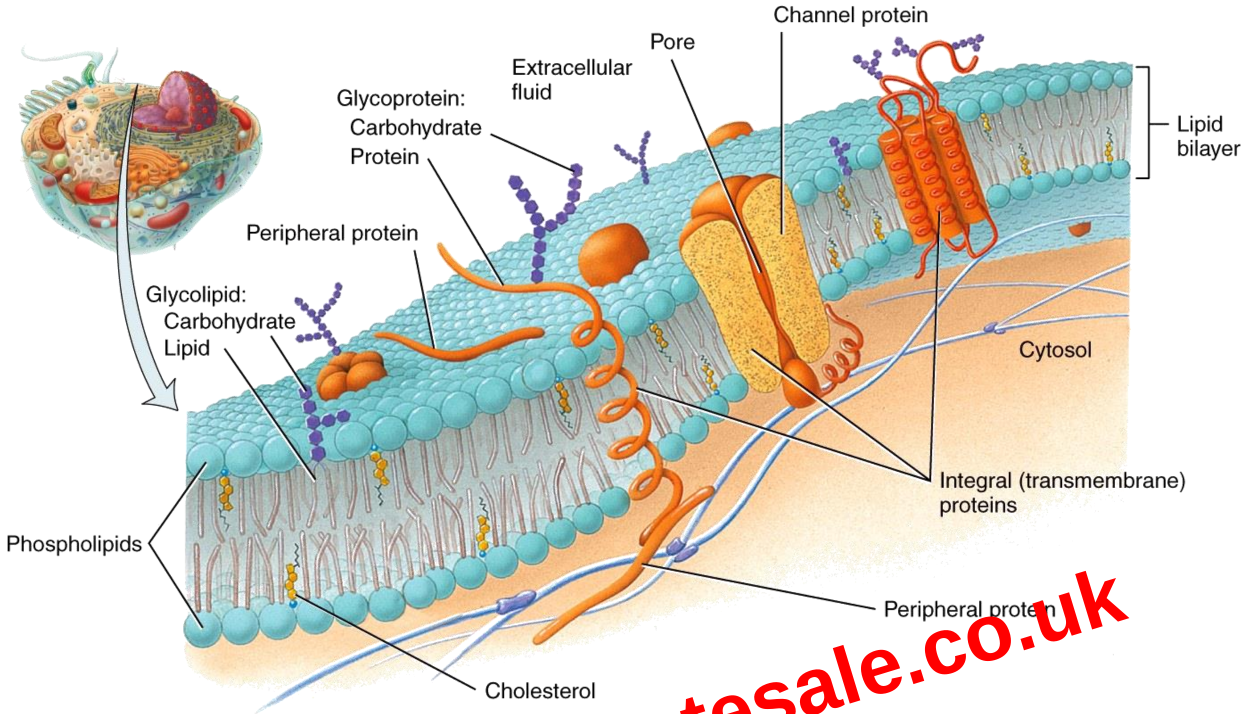
The plasma membrane



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It is a **flexibly** yet **sturdy** barrier which surrounds and contains the cytoplasm of the cell.

It is best described as the **fluid-mosaic** model. This is because the molecular arrangement of the membrane resembles a continually moving sea of fluid lipids which contains a mosaic of many different proteins.

The membrane lipids allow passage of several types of **lipid soluble** molecules. But act as a barrier to the entry or exit of **charged or polar substances.**

Transmembrane (integral) proteins allow passage of specific molecules or ions.

Other proteins act as **signal receptors** (telling other cells what type of cells that they are) or as molecules which link the plasma membrane to intracellular or extracellular proteins.

Transport across the plasma membrane

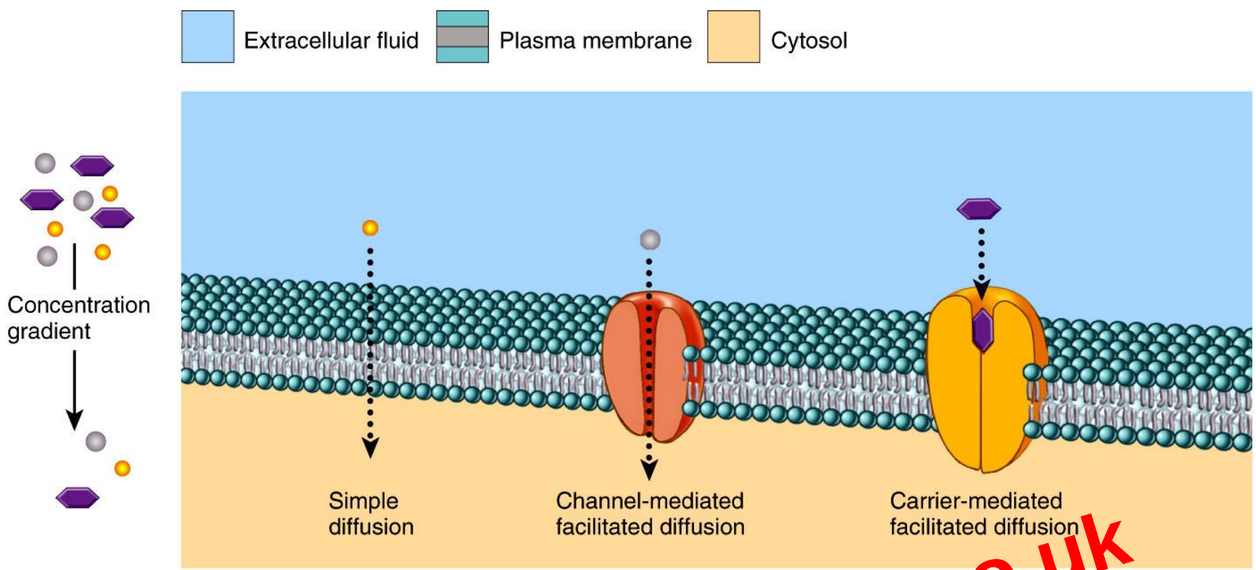

Figure 03.05 Tortora - PAP 12/e

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Passive processes – No cellular energy is required.

Simple diffusion: Substance move freely through the lipid bilayer **without** the help of membrane transport proteins. Non-polar, hydrophobic molecules move through this way. (O_2, CO_2, nitrogen gases, fatty acids, steroids and fat-soluble vitamins (A, D, E and K). Water, urea and small alcohols also pass via simple diffusion.

Simple diffusion depends upon: **Amount of substance, concentration gradient, temperature, surface area and diffusion distance.**

Facilitated diffusion: An integral membrane protein assists a specific substance across the membrane (these proteins can be **membrane channel or** carrier).

Channel mediated: A solute moves down its **concentration gradient** across the lipid bilayer through a membrane channel. Most membrane channels are **ion channels**. Each ion can diffuse across the membrane at specific sites. The most numerous are K^+.

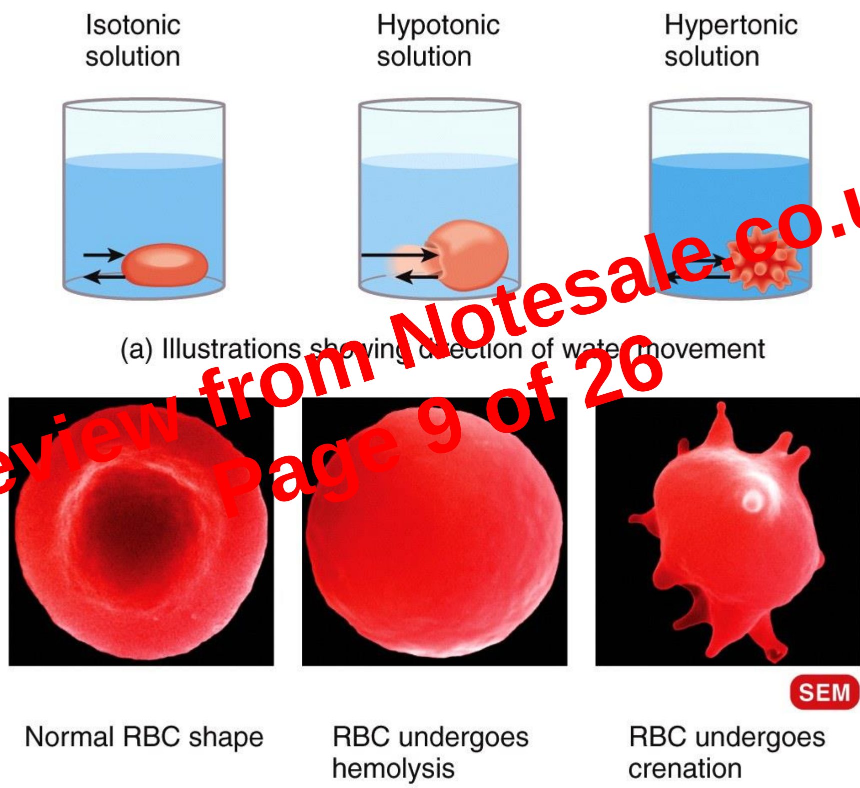
Tonicity

A solutions tonicity is the measurement of the solutions ability the change the volume of cells by altering their water content.

Any solutions in which a cell (i.e. RBC) maintains its **normal** shape and volume is called **isotonic solution**.

When a RBC is placed in a **hypotonic** solution (solution that has a lower concentration of solutes that the cytosol in the RBC) **hemolysis occurs**.

In a **hypertonic solution** RBC under **crenation** – they shrink.



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Active processes – Cellular energy is required

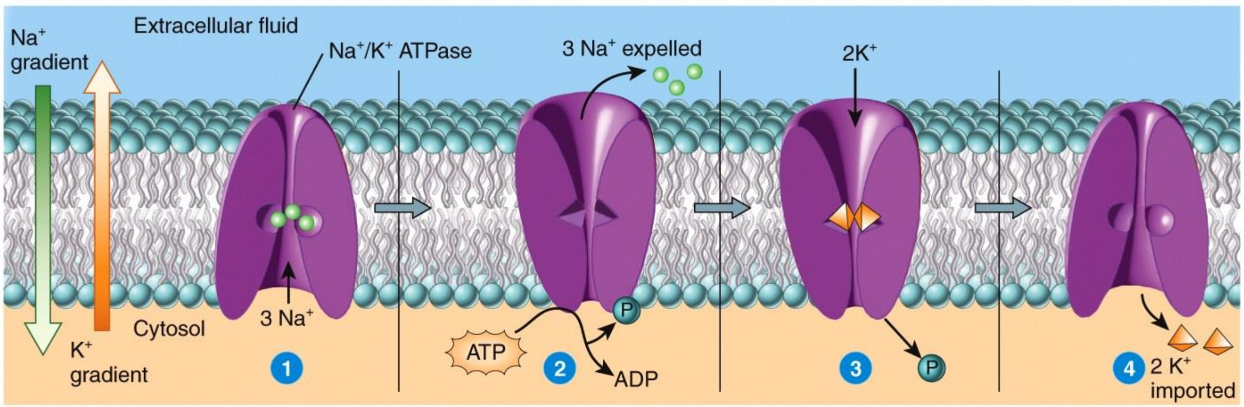
This is where molecules move **against** their concentration gradient.

There are 2 sources for cellular energy;

1. Energy from the **hydrolysis** of ATP (primary active transport)
2. Energy stored in an ionic concentration gradient (secondary active transport)

Primary and Secondary active transport

Primary Active Transport



Energy is derived from the hydrolysis of ATP. This changes the shape of the carrier protein which pumps the substance across the cell membrane **against** its concentration gradient.

An example of a “pump” is the sodium-potassium pump. This is because part of the pump acts as an ATPase (which hydrolyses ATP).

The sodium potassium pump is essential for setting membrane potentials and initiating action potentials.

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40% of the ATP produced within a cell is used on primary active transport.

It also exhibits saturation kinetics.