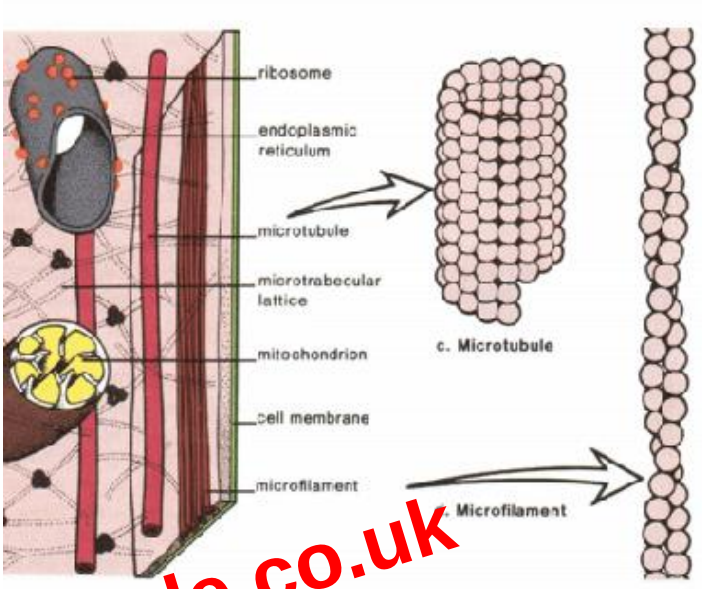
membrane is convoluted into shelf like structures within called cristae.

- **Cytoskeletons** are formed from multiple types of protein structures. Thse structures help maintain the cells shape, anchor organelles, and allows movement as appropriate. Includes **microfilaments and microtubules.**
- **Microfilaments** are long and very thin fibres that occur in bundles or groupings. Similar structure to the proteins responsible for muscle contraction.
- **Microtubules** are shaped like cylinders and are several times larger than microfilaments. Can be found in cilia, flagella, and centrioles.
- When both these structures are disassembled, the cell is able to change shape into something else.
- **Centrioles** are shorter cylinders with a 9+0 pattern of microtubule triplets. They help in the movement of material throughout the cell.



- Cells that have a **cilia or flagella** are able to move around. Cilia are hair like projections able to move cells around. Flagella use a tail like structure to move around, like sperm. Cilia are formed from a 9+2 arrangement of microtubules.

Each cilium and flagellum has a basal body (fig. 2.16c) lying in the cy-toplasm at its base. **Basal bodies,** which are short cylinders with a circular arrangement of nine microtubule triplets called the 9 + 0 pattern, are believed to organize the structure of cilia and flagella.

Ch. 3 Cell Membrane and Cell wall

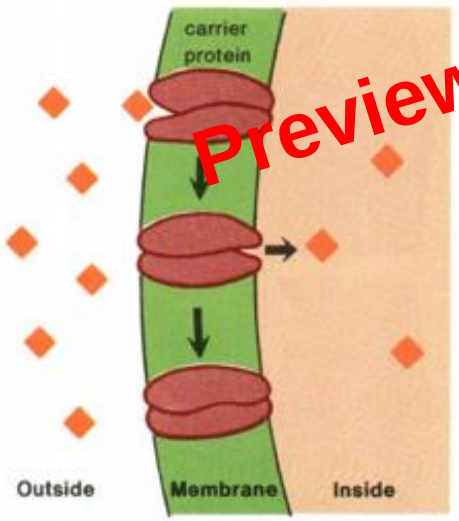
- Proteins can be found within the cell membrane, some are carriers that promote movements of molecules in and out of the cell, and some are receptors for molecules that influence the metabolic activity of the cell
- On the cell membrane there are also chains of simple sugars attached to the proteins and fats (**glycoproteins and glycolipids)** these help the body to identify the cell.
- In addition to a membrane, plants are also surrounded by a cell wall.
- Plant cell walls are easily permeable, however the cell membrane in both are not and regulate entrance and exit of molecules in and out of the cell.
- The animal cell is semipermeable or more like selectively permeable because it chooses what can and cannot enter, and not all large particles are able to enter.
- The three general means of entering a cell are: **diffusion, transport by carriers, and endocytosis and exocytosis.**

- **Diffusion** is the movement of particles from a higher concentration to an area of lesser concentration until equally distributed.
- **Rate of Diffusion** is determined by three things, the size and shape of the molecules diffusing, temperature, and the **concentration gradient** (difference in concentration of diffusing molecules between the two regions involved.)
- Chemical and physical properties of the cel membrane don't allow many molecules to diffuse easily. Lipids soluble molecules are able to diffuse through the membrane because the membrane is composed of phospholipids.

Table 3.2 Effect of Osmosis on Cell

Tonicity of Solution	Concentrations Solute	Water	Net Movement of Water	Effect on
Isotonic	Same as cell	Same as cell	———	———
Hypotonic	Less than cell	More than cell	Cell gains water	Swells, tu pressur
Hypertonic	More than cell	Less than cell	Cell loses water	Shrinks, plasmol

- **Osmosis** is the diffusion of water across a selectively permeable membrane.
- **Osmotic Pressure** is the pressure caused by the flow of water from areas of greater concentration to lesser concentration.
- **Solutes** are the dissolved substance within the **solvent,** which is usually water.
- If a cell is in an **isotonic** solution, the concentration of solute in the cell and around the cell are equal so movement of water is at equilibrium.
- If a cell is placed in a **hypotonic** solution, the amount of solute within the cell is greater than around the cell and will cause water to enter the cell (causing swelling or **turgor pressure in plants or lysis in animals**)
- If a cell is placed in a **hypertonic** solution, the cell has less amount of solute within it compared to its surroundings, and water will leave the cell (causing shrinking or **plasmolysis in plants or crenation in animals)**



- **Facilitated Transport** explains molecules that are non lipid soluble passing through the cell membrane anyway, like glucose and amino acids.
- They get through the membrane via proteins called **carriers.** They are highly specific and only combine with on type of molecule.
- During facilitated diffusion or transport, there is no expenditure of energy by the cell, because the molecules are moving across the concentration gradient from an area of greater concentration to an area of lesser concentration.
- **Active Transport** is similar to facilitated transport, however it requires energy in the form of ATP in order to move molecules against the concentration gradient. Meaning the molecules are moving from an area of lesser concentration to an area of greater concentration.
- Active transport occurs often in the kidneys, thus the high amount of mitochondria, because lots of ATP