PHOTOSYNTHETIC ORGANSIMS

- Organisms that contain chlorophyll are capable of carrying out photosynthesis
- Chlorophyll molecules contain a porphyrin ring (a magnesium centre surrounded by a hydrocarbon ring) and a long hydrocarbon tail (see Fig.2 pg. 139)
- **Cyanobacteria** (blue-green algae) are prokaryotic autotrophs that live in oceans, freshwater lakes and rivers, rocks and soil.
- **Algae, photosynthetic protists, and plants** are eukaryotic autotrophs that contain chlorophyll in chloroplasts

Leaves

- Maximizes the surface area to absorb sunlight, while limiting the distance that the gases need to travel
- The upper and lower surface tissue is **cuticle-covered epidermis**
- The cuticle contains water-insoluble lipids with long fatty-acid tails (wax) that have been secreted from the epidermal cells and helps to prevent water loss
- The layer in the middle is the **mesophyll layer: palisade mesophyll** are long rectangular cells and **spongy mesophyll** are various shaped cells with more air spaces between them
- The air spaces allow for the diffusion of carbon dioxide into the cells and carries oxygen away from the cells
- The veins are **vascular bundles** that contain **xylem** and **phloem**; tissues that distribute substances through the plant
- The xylem carries soil water and dissolved minerals and it acts as support for the plant
- The phloem carries sugars and other solutes
- The lower epidermis contains **guard cells** that control the openings (**stomata**) where water leaves the plant (**transpiration**) and carbon dioxide enters (see Fig.9 on p.142)

Transpiration and Photosynthesis

- Transpiration is important for pulling water, minerals and other substances from the roots to the leaves, and for providing a cooling effect (protecting proteins from being denatured)

Opening and Closing Stomata

- When water leaves the cell the guard cells collapse and the stomata closes; usually occurs during the night
- When water enters the cell, the guard cells swell up with turgor pressure forcing them apart forming the stoma (opening); usually occurs during the day (see Fig.11 on p.143)
- Photosynthesis begins when the sun rises, and as the day goes on carbon dioxide levels decrease, and when the sun goes down carbon dioxide levels rise
- Pollutants may clog the stomata openings

Chloroplast

- Organelle where photosynthesis occurs

- Has two outer membranes that wrap around the interior; **stroma** (mainly fluid)
- The inner membrane (**thylakoid**) looks like flattened channels and disks arranged in stacks called **grana**
- The first stage (ATP production) occurs in the thylakoid membrane system
- The second stage (glucose production) occurs in the stroma (see Fig.13 on p. 144)