When photosynthesis is taking place, (although some CO_2 comes from respiration of cells) most of it is obtained from the external air. In the same way, some oxygen from photosynthesis is used in respiration but most of it diffuses out of the plant.

When plant isn't photosynthesising (in the dark) oxygen diffuses into the leaf because it is constantly being used by cells during respiration.

Gas exchange in the leaf of a plant

Structure of a plant leaf and gas exchange:

- No living cell is far from the external air = a source of oxygen and CO_2.
- Diffusion takes place in the air = more rapid than water.

So there is a short, fast diffusion pathway. Air spaces inside the leaf have a very large surface area compared with the volume of living tissue. Most gaseous exchange occurs in leaves which show these adaptations for rapid diffusion:

- Many **small pores called stomata** = no cell is far from a stoma and therefore diffusion pathway is short
- **Numerous interconnecting air-spaces that occur throughout the mesophyll so that gases can readily come in contact with mesophyll cells**
- Large surface area of mesophyll cells for rapid diffusion

Stomata:

Minute pores that occur mainly, but not exclusively on the leaves (especially underneath). **Each stoma** (singular) is **surrounded by a pair of special cells (guard cells) that can open and close the stomatal pore. They can therefore control the rate of gaseous exchange**. Important because terrestrial organisms lose water by evaporation. **Plants have evolved to balance the conflicting needs of gas exchange and control water loss. They do this by closing stomata at times when water loss would be excessive.**