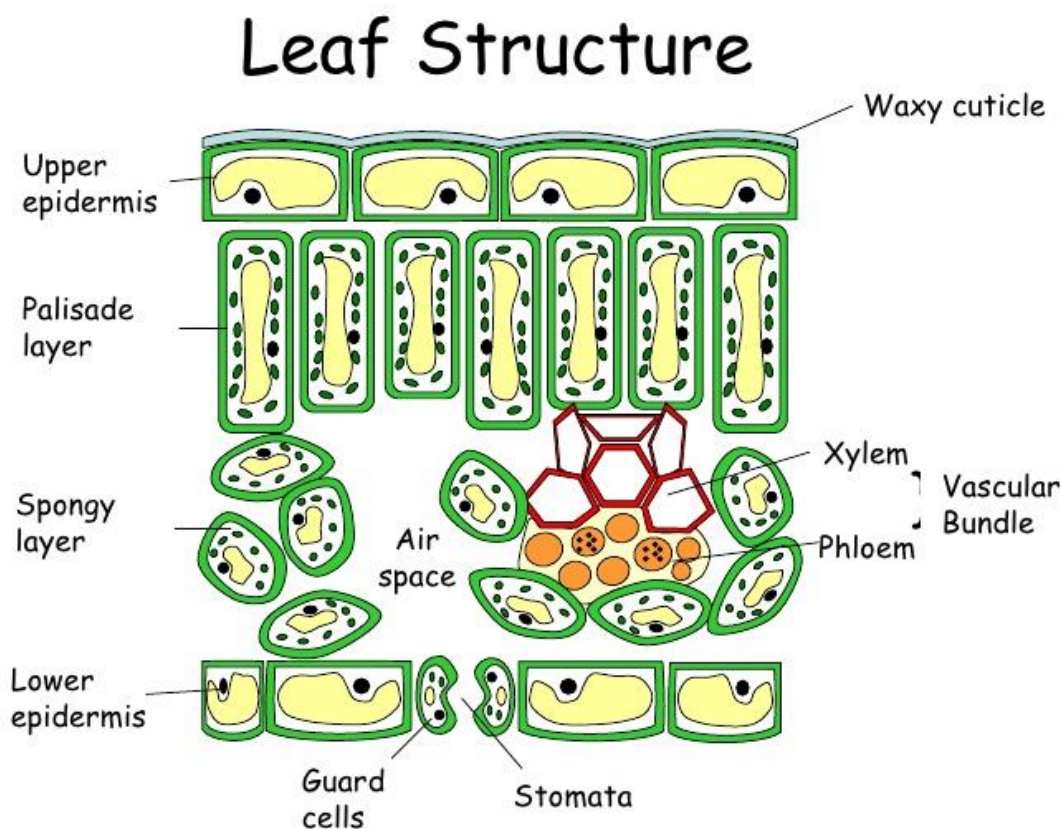


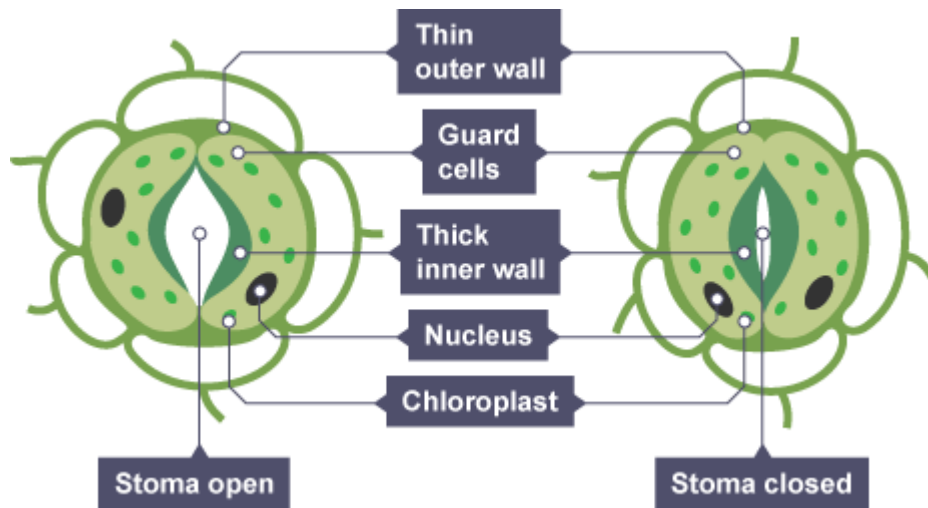
### Plant Gas Exchange

Plants carry out both photosynthesis and respiration. The stomata located on the underside of the leaf in the lower epidermis are the site of gas exchange in plants. During the day, plants photosynthesise more than they respire. This means there is a net intake of carbon dioxide through the stomata and net outflow of oxygen. This reverses during the night when there is no photosynthesis but respiration continues. Therefore during the night, there is a net outflow of carbon dioxide and a net intake of oxygen via the stomata. The size and opening of the stomata is carefully controlled by the pair of guard cells adjacent to it. When the guard cells are turgid, the stomata are more open. When the guard cells are flaccid, the stomata are more shut. Therefore, osmosis and the water potential of the guard cells regulates the opening and closing of the stomata. A light stimulus will also cause the stomata to open. The guard cells are specialised cells with a thick inner wall and a thin outer wall. They are kidney bean shaped and have many chloroplasts for photosynthesis.



The gases are exchanged by diffusion. When carbon dioxide enters through the stomata during the day, it diffuses across the open spaces of the spongy mesophyll layer to the palisade cells at the top. Here, the carbon dioxide can be used for photosynthesis in the numerous chloroplasts.

During the night, the guard cells lose  $K^+$  ions causing the water potential inside the cell to be higher than outside. Water is lost by osmosis and the guard cells become flaccid, reducing the size of the stomata. The opposite happens during the daytime with the accumulation of  $K^+$  ions.



[Image from BBC Bitesize].