Aim: To observe the transpiration pathway in plants.

Hypotheses:
I think the water will enter the plant from the xylem and travel up the shoot to the leaves of the plant.

Method:

1. Pick a celery stalk that has leaves. Cut off the base of the stalk.
2. Fill a glass/jar with 200 ml of water. Make sure it's not filled to the brim.
3. Add 8 drops of food colouring. Choose a colour that is stronger and different from the original leaf colour.
4. Place the celery stalk into the water.
5. Lean the celery stalk against the wall so that it stays upright. It is crucial for it to stay upright.
6. Leave the celery in that position in the jar for 24 hours, but keep checking on it to observe changes.

Results:
After 4 hours I didn't really notice any change in the leaves or the stalk. However, in the evening there was a change in the colour of the leaves. The celery stalk in the blue dye was turning blue and the leaves were much more greener and slightly blue. The same with the celery stalk in the red dye, yet it wasn't as strong as the blue.

The next day when I cut the celery open, there were blue stains around the corner of the celery stalk. These stains were circular. The stains were showing the xylem vessels. This is because the xylem is composed of long, hollow tubes formed by overlapping dead cells creating a hollow cavity that is interconnected to form one long tube. This tube is used to carry water by the plants.

Conclusion:
The water entered the plant through the xylem and travelled up the shoot to the leaves of the plant. This is a continuous flow known as the transpiration stream. This is because when the plant is photosynthesizing, it opens holes in the underside of the leaf called stomata. The plant does this so that carbon dioxide can flow in, but it also has a downside: water also diffuses out of the stomata at the same time, drying out the inside of the leaf ever so slightly. As the plant dries out from the leaves, it brings more water in from the xylem. Water is a polar molecule, meaning that it's slightly "sticky"—it forms temporary hydrogen bonds with itself. This creates cohesion; small quantities of water will tend to stick together rather than scattering and spreading everywhere. Water also sticks to the inside of small tubes due to a property called capillary action. These two properties allow the water to travel in one unbroken column through

the xylem from the roots to the leaves. This proves my hypothesis. This process called *transpiration*. There are 4 factors that affect the rate of transpiration:

1) Temperature: With the increase in atmospheric temperature, the rate of transpiration also increases. This is not only because evaporation occurs quickly in warmer air but also because warm air is capable of holding more water vapours than the cold air.
2) Humidity: Humidity is the concentration of water vapour in the air. At low humidity, there is a lower concentration of water molecules in the air around the leaves. This concentration gradient helps the transport of water molecules from the leaves by diffusion. High humidity means the air around the leaves is already saturated and has a higher concentration of water molecules than inside the leaves, that is why transpiration is slower.
3) Light intensity: Transpiration increases in bright light because the stomata open wider to allow more carbon dioxide into the leaf for photosynthesis. More water is, therefore, able to evaporate.
4) Wind speed: Transpiration is faster in windy conditions. This is because moving air removes any water vapour which might remain near the stomata, increasing the rate of diffusion of water vapour from the leaf.