Stomata Experiment

Aim: To find out where stomata is mostly found in a leaf; in the lower epidermis or the upper epidermis.

Stomata: Each stomata is a tiny opening in the leaf that can be opened and closed by two guard cells. Stomata allow gases to pass in and out of a leaf. When stomata are open carbon dioxide for photosynthesis can enter and oxygen can leave however water vapour can also diffuse out of the leaf.

Hypothesis: I predict their will be more stomata at the lower epidermis because from previous knowledge I know water transpiration occurs fastest at hot, dry, windy conditions. Therefore at the lower epidermis there will be more protection against these conditions so less water will be lost.

However for more carbon dioxide diffusion the stomata may be on both sides to gain more in order for the plant to photosynthesise to make more glucose. Although, carbon dioxide diffusion won't be affected if the majority of stomata are on the lower epidermis of the leaf and therefore I predict there will be a lot more stomata on the lower epidermis of the leaf.

Apparatus

- Microscope
- Nail Varnish
- Leaf
- Cover Slip

Method of looking at stomata:

1) Paint the leaf with nail varnish
2) The liquid nail varnish will soak into the stomata
3) It will then harden and when you peel it off you can see the stomata under the microscope.

Results:

	Stomata	Stomata per mm^2
Lower Epidermis	24	17.15
Upper Epidermis	1	0.714

I calculated these stomata in a $14mm^2$ area through a microscope with 10x magnification. Therefore in $1mm^2$ there is

$24 \div (14 \div 10) = 17.15$ stomata per mm^2 for lower epidermis
$1 \div (14 \div 10) = 0.714$ stomata per mm^2 for upper epidermis
Risk Assessment:

Nail Varnish
Wash any spillages with water
Use small drops and don't overflow

Conclusion:
The results show that the stomata count is significantly high in the lower epidermis with 17.15 stomata per mm^2 unlike in the upper epidermis which I only found 0.714 stomata per mm^2. This shows me that my prediction was correct however I expected at least more stomata in the upper epidermis.

A leaf loses water via transpiration in order to do this the guard cells are turgid which means the stomata is open. To be effective and also photosynthesise the plant would rely on a good supply of soil water. Therefore it needs to minimise this and the leaf does this by having most stomata on the lower epidermis.

As the temperature rises the faster the rate of transpiration as water molecules move faster and are able to move quickly out of the leaf. On the upper epidermis the sun will beam down directly on it therefore transpiration will be high. However on the lower epidermis the leaf will be at a lower temperature as it is not directly facing sunlight and therefore will be cooler. This explains why there are more stomata found on the lower epidermis.

As the more windy it is the faster the rate of transpiration the more water molecules can be blown away from the leaf lowering the humidity near the stomata, therefore the water molecules will move quickly out of the leaf. The wind will be more effective upon the upper epidermis and therefore if more stomata were to be on the lower epidermis it will have more protection from the wind and therefore transpiration will be less.

Therefore the results support my conclusion that at the lower epidermis there will be more protection against conditions that would increase transpiration therefore less water will be lost.

Evaluation
The limitations were

- Didn't know the conditions of the leaf therefore couldn't give a detailed conclusion.

Difficulties:

- was hard to count up the stomata through a microscope therefore may not be accurate

Improvements:

- I would improve the experiment using more than one leaf for a stomata count
- The stomata count was not a mean average so I need to repeat the experiment at least 3 times so results are reliable.