

NAME:



Shrewsbury School

SHREWSBURY SCHOOL

SCHOLARSHIP EXAMINATION 2015

BIOLOGY

(30 minutes)

Instructions to candidates:

- Write your name on the top of this sheet
- Answer all questions in the spaces provided
- There are 20 marks available for this paper

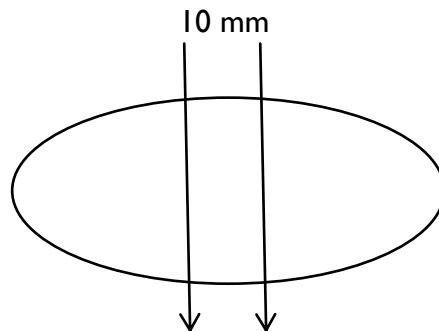
This biology question consists of two parts, an experiment and an observation exercise. You will need to set up the experiment and then leave it while you do the Chemistry and the Physics questions. Then you can get the results of the experiment.

Experiment

Crassula is a plant that lives in very dry habitats. It has a thick layer of wax on both the lower and upper surfaces of the leaf.

You have been given two *Crassula* leaves. Put one of them on the white tile. Make sure you know which the upper and lower surfaces of the leaf are. The leaf curves downwards at the left and right edges.

Use a ruler and scalpel to cut a 10 mm wide strip of the leaf. The arrows show the position of the cuts.



Measure the maximum thickness of the leaf strip from the upper to the lower surface. Put the result in the table (two pages on).

Do a quick drawing of one of the cut sides of the strip to show the shape as accurately as you can. (Take no more than two minutes to do this.) Add labels to record which the upper and lower surfaces are. [2 marks]

Examine the cut sides of the strip with a hand lens to find where most of the green colour (chlorophyll) is located.

Where is most of the leaf's chlorophyll located, and what is the advantage to the plant of this distribution? [2 marks]

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Mark the upper leaf surface of the strip with the letter U and the lower surface with the letter L, using the marker pen. Allow the ink to dry. The next step requires skill! (You should practise with spare ends of the leaves before you do the cuts on the actual leaf strip.) Use the scalpel to cut both strips of leaf into an upper half and a lower half. The easiest way to do this is to lay the strip on the white tile and cut horizontally from one end to the other, with a gentle sawing motion. **Be very careful not to cut your finger.**

You have a spare leaf that can be used if you aren't happy with how you cut the first strip, for example if one of the halves is too thin.

When you have finished cutting the strip into two halves, gently dry their cut surfaces on the paper towel and then take them to one of the electronic balances set up around the hall. Zero the balance if necessary and then find the combined mass of the upper and lower halves of the strip. Record the mass in the results table.

Without delay, put both halves of the strip into the beaker of water. Leave them there until you have finished the Chemistry and Physics questions, which will be after at least 30 minutes but not more than an hour.

Now do the Chemistry and Physics questions.

Method for collecting the results of the experiment

Remove the upper and lower halves of leaf strip leaf from the water and dry them gently using the paper towel. Dry them in the same way as you did at the start of the experiment. They may be quite brittle so try not to snap them!

Find the combined mass of the upper and lower halves of the strip using the same electronic balance that you used before. Record the mass in the results table.

Try to put the two halves of each strip back together again. This will reveal any changes of shape that have occurred during the experiment.

Draw the two halves to show their shapes after being in the water. On your drawing label the upper and lower surfaces (of the original leaf). [2 marks]

What did you find when you tried to put the halves of the leaf strip back together? [2 marks]

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Observation exercise

You have been given two tubes, with three dandelion fruits in each. The fruits have been fixed by pushing their seeds into plasticine. One of the tubes contains some crystals of silica gel, which absorb water vapour. The other contains some wet filter paper, from which water evaporates. The dandelion fruits have been in these tubes for 24 hours.

What difference do you observe between the dandelion fruits in the two tubes? Include a drawing in your answer if you wish. [3 marks]

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What are the advantages to dandelions of the changes in the fruits that you have observed? [2 marks]

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