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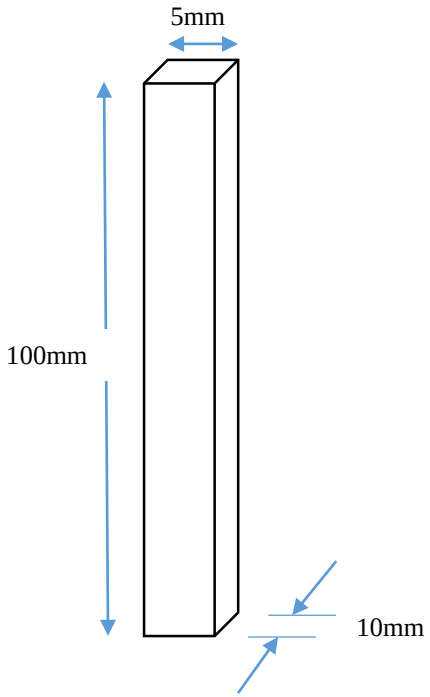
Answers to 2015 O level Biology 5108 Paper 3

In the 2015 Pure Biology practical examination, there were 4 parts. The first two experiments were on water potential, the third part on leaf structure and the last experiment was on variation. In the first question the aim was to determine the salt concentration of eggplant. Candidates were given a slice of eggplant (brinjal) and asked to cut 12 strips with the dimensions shown below.



They were then asked to prepare 6 NaCl solutions of various concentrations from a stock solution (60 g/dm^3) using values from a table as shown below. Students were also provided with measuring cylinders.

Concentration of salt solution (g/dm^3)	Volume of stock solution (cm^3)	Volume of water (cm^3)
60	100	0
45	75	25
30	50	50
15	25	75
7	12	88
0	0	100

Then 50cm^3 of each NaCl solution was poured into 6 different petri dishes and candidates were asked to fully submerge two eggplant strips into each petri dish for 10 minutes.

Questions:

1. Explain how you obtained the 7 g/dm^3 salt solution.
   The small measuring cylinder was used to measure 10 cm^3 of stock solution and this was poured into an empty beaker. Then the small measuring cylinder was used to measure 2 cm^3 of stock solution and this was poured into the beaker containing the 10 cm^3 of stock solution. The small measuring cylinder was then used to measure 8 cm^3 of water and this was added to the same beaker. Finally 80 cm^3 of water was measured using the large measuring cylinder and this was added to the same beaker and stirred.

2. Describe any changes in the texture or appearance of the strips after being placed in the solutions/water.

   <u>Teacher's comment</u>

   Although the water potential of different varieties of eggplant varies, there should've been no change in the eggplant strip placed in the 7 g/dm^3 salt solution. However this is only an assumption and under experimental conditions this assumption may not be true.

   For salt solutions with concentrations greater than 7 g/dm^3, students can use terms such as wrinkled / smooth / thin / shorter or shiny to describe the appearance of the eggplant strip and terms such as slippery / flexible or flaccid should be used to describe texture.

   For the eggplant strip placed in the distilled water, students can use terms such as rough or thicker to describe the appearance of the eggplant strip and terms such as solid / turgid / smooth / firm / hard should be used to describe texture.

3. Describe any changes in the length of the strips after being placed in the solutions/water.

   Eggplant strips placed in salt solutions with concentrations greater than 7 g/dm3 should be shorter; strips in salt solution with a concentration of 7 g/dm^3 should be unchanged and the strips placed in distilled water should be longer.

4. Suggest how this experiment could be improved

   Using a wider range of salt solutions at different concentrations/ repeating the experiment more times and using the average value.

The question for the second experiment was as follows:

A student obtains the following data after placing various onion tissues in different salt solutions. Calculate the change in percentage mass, X, in an onion tissue placed in 100 cm^3 of a salt solution with a concentration of 60 g/dm^3.

Volume of 60 g/dm^3 salt solution/ cm^3	Volume of water/ cm^3	Mass of onion tissue before being placed in salt solution/ g	Mass of onion tissue after being placed in salt solution/ g	% change in mass
0	200	147	173	+18
25	175	Various values	Various values	+8
50	150	Various values	Various values	-2
100	100	Various values	Various values	X
150	50	Various values	Various values	-5
200	0	Various values	Various values	-6

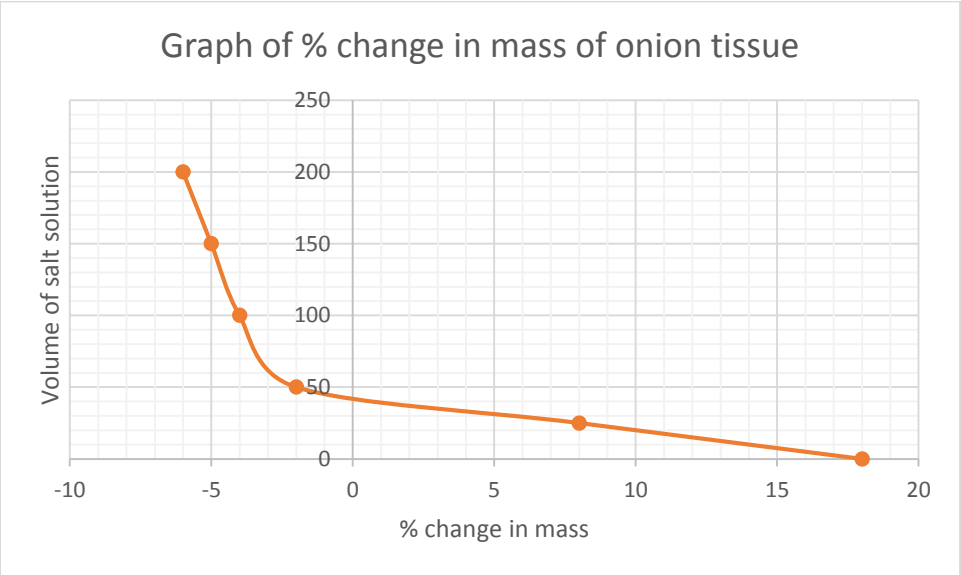
Using the formula:

$\%\ \boldsymbol{change\ in\ mass} = \frac{\boldsymbol{mass\ after - mass\ before}}{\boldsymbol{mass\ before}} \times \mathbf{100}\%$**, the value of X could be calculated. X was found to be approximately -4.**

Question: Why did the student wipe the onion tissue before weighing it?

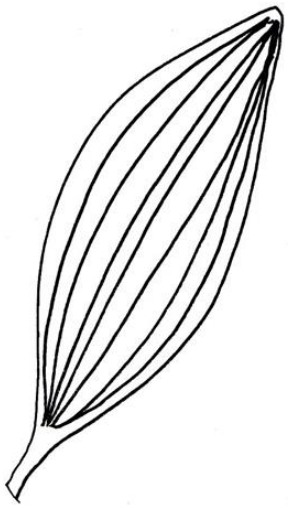
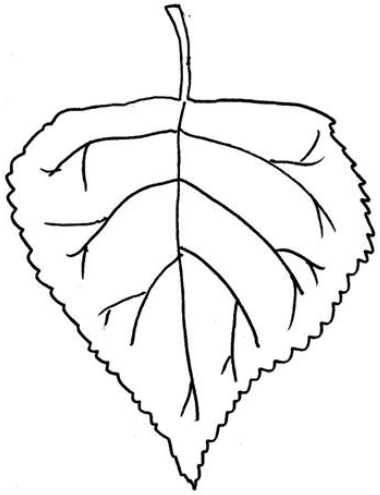
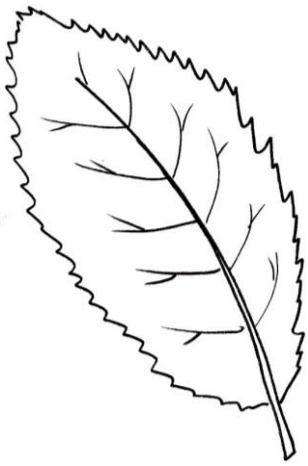
Answer: **This is because the liquid found on the outside of the onion tissue, when the tissue is removed from the salt solution, could contribute to an additional mass which will lead to erroneous change in mass.**

Lastly candidates were asked to plot a graph to determine the volume of the 60 g/dm^3 salt solution that would give no change in the mass of the onion tissue.



From the graph, 40 cm^3 of a 60 g/dm^3 salt solution mixed with 160cm^3 of water will produce no change in the % mass.

In the 3rd part, candidates had to describe the differences between four types of leaves from a drawing of the leaves as shown below.

K1 	K2 
K3 	K4 

Answer:

Candidates could describe any of the following. Serrated/smooth edge; deltoid/ovate shape; length of petiole/leaf stalk; branching/parallel veins.

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For the last experiment, candidates were given 15 bean sprouts and were asked to measure and record the lengths of each bean sprout hypocotyl to the nearest mm.

Length of hypocotyl (x) /mm	Number of bean sprouts/ Frequency (f)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Questions:

1. State the range of lengths of bean sprout hypocotyl.
   Range refers to the difference between the smallest and longest hypocotyl.

2. Calculate the mean length of the hypocotyl using $mean\ length = \frac{\sum fx}{\sum x}$.

3. Explain any evidence that is visible in the table above that shows that the length of bean sprout hypocotyl is continuous variation.
   Table shows the extremes and intermediates of hypocotyl length. A bell-shaped curve would be obtained if the values are plotted.