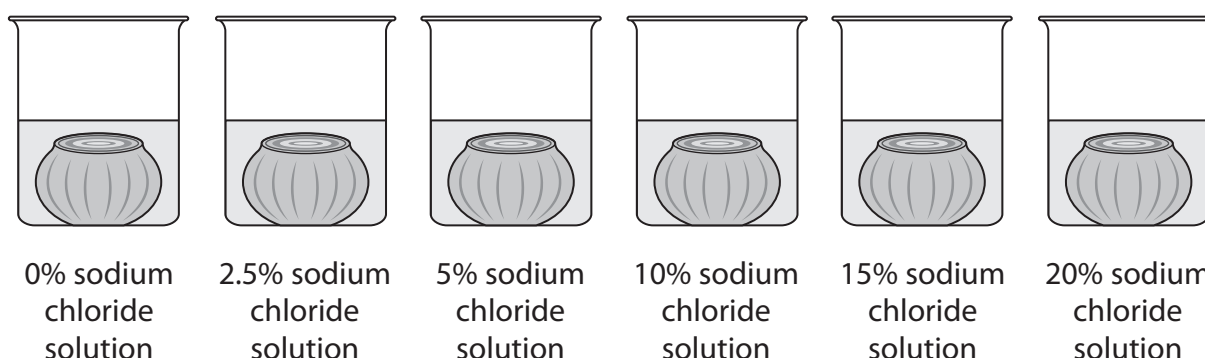


- 5 Pickling is a technique used to preserve food. Onions can be pickled by immersing them in a solution of sodium chloride.

A student investigated the effects of changing the concentration of sodium chloride solution on the mass of onion tissue. Small onions were peeled, had their tops and bottoms cut off and were weighed. The onions were then placed into covered beakers containing different concentrations of sodium chloride solution.

Six beakers were set up as shown in the diagram.



The beakers were left for two days. The onions were removed, blotted dry and reweighed. The investigation was repeated two more times.

The mean percentage change in mass was calculated.

The results of the investigation are shown in the table.

Sodium chloride solution (%)	Percentage change in mass (%)				SD
	1	2	3	Mean	
0.0	7.3	7.1	7.9	7.4	0.4
2.5	3.2	4.7	5.8	4.6	
5.0	-1.3	-0.9	-1.2	-1.1	0.2
10.0	0.6	-0.8	-1.9	-0.7	1.3
15.0	-2.1	-1.8	-2.9	-2.3	0.6
20.0	-2.2	-2.4	-1.9	-2.2	0.3

- (a) (i) Explain **one** way in which this investigation could be improved.

(2)

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(ii) Standard deviation can be calculated using the formula shown.

$$S = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Calculate the standard deviation for the 2.5% sodium chloride solution.

(2)

Answer

(iii) Deduce the effect of increasing the concentration of sodium chloride on the change in mass of the onion tissue.

(3)

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(b) A method for pickling red onions is to immerse them in wine vinegar. This vinegar contains ethanoic acid. The vinegar causes anthocyanin pigments to leave the onion cells, entering the solution.

Explain why pickling in vinegar would result in anthocyanin pigments leaving the onion cells.

(3)

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(Total for Question 5 = 10 marks)

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