Oxford Cambridge and RSA

A Level Biology A

H420/02 Biological Diversity

Question Set 14

1 Water moves by osmosis in living organisms.

(i) Define osmosis. **[2]**

(ii) Plants rely on osmosis for support.

Explain the importance of osmosis in plant support.

[3]

1 (b) The apparatus shown in Fig. 16 can be used to demonstrate osmosis.

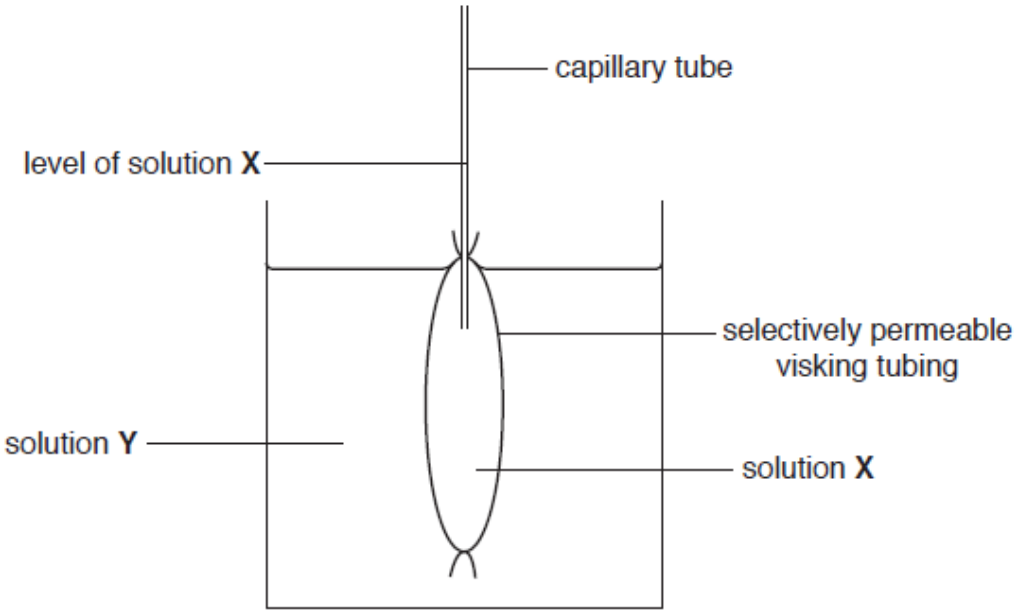

Fig. 16

When the capillary tube with visking tubing bag was placed in solution **Y**, the level of solution **X** inside the capillary tube rose from 10.5 mm to 26.5 mm.

(i) The ruler used to measure the distance along the capillary tube was accurate to thenearest 0.5 mm.

Calculate the percentage uncertainty of the measurement.

uncertainty = ... %

[2]

(ii) What conclusions can be drawn about the composition of solutions **X** and **Y**?

[2]

(c) A group of students used the following method to investigate osmosis in plant cells.

Cut pieces of plant material of equal surface area ensuring no skin is present.

- Rinse to remove cell debris.
- Gently pat the plant pieces dry with a paper towel.
- Weigh each piece and record mass.
- Put the plant piece in a 200 cm^3 beaker.
- Cover plant piece with 50 cm^3 of sucrose solution.
- Use sucrose solutions of 0, 0.1, 0.3, 0.5, 0.7 mol dm^{-3}.
- Leave for 24 h.
- Remove the piece of plant material.
- Dry carefully using a paper towel.
- Weigh the plant piece and record the mass.
- Calculate the percentage change in mass for each piece.
- Repeat twice for each sucrose concentration.

The students investigated material from three different plants: carrot, courgette and potato.Their results are shown in Table 16.

Plant	Sucrose concentration / mol dm^{-3}	Percentage change in mass			
		Replicate 1	Replicate 2	Replicate 3	Mean
Carrot	0	+ 6.0	+ 5.8	+ 5.8	+ 5.87
	0.1	+ 4.2	+ 4.1	+ 4.3	+ 4.20
	0.3	+1.5	+1.5	+1.3	+ 1.43
	0.5	– 2.4	– 2.3	– 2.1	– 2.27
	0.7	– 6.3	– 6.1	– 6.3	– 6.23
Courgette	0	+ 7.9	+ 7.8	+ 7.6	+ 7.77
	0.1	+ 5.5	+ 5.5	+ 5.5	+ 5.50
	0.3	+ 1.9	+ 1.8	+ 2.0	+ 1.90
	0.5	– 1.2	– 1.4	– 1.1	– 1.23
	0.7	– 4.3	– 4.4	– 4.1	– 4.27
Potato	0	+ 5.7	+ 5.8	+ 5.7	+ 5.77
	0.1	+ 3.1	+ 2.9	+ 3.0	+ 3.00
	0.3	– 0.3	– 0.4	– 0.6	– 0.43
	0.5	– 2.4	– 2.2	– 2.5	– 2.37
	0.7	– 6.1	– 5.9	– 5.1	– 5.70

Table 16

(i) Explain why it was necessary to calculate **percentage** change in mass. **[2]**

(ii) The students identified replicate 3 of the potato in 0.7 mol dm^{-3} sucrose as anomalous.

Suggest a practical error by the students that might have caused this result to beanomalous and explain the likely effect of this error.

[2]

(iii) Use Table 16 to identify which plant cells contained the highest concentration of sucrose.

Justify your conclusion.

[3]

(d) Water has many properties that are essential for living organisms.

Explain how properties relating to the **density** of water contribute to the survival of organisms.

[3]

Total Marks for Question Set 14: 16