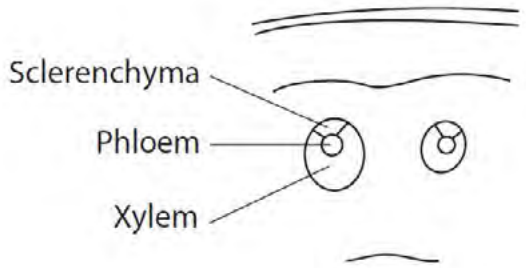
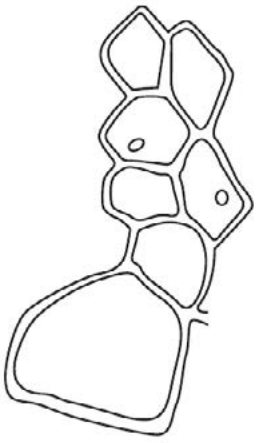
Unit 3 - Mark scheme

Question number	Answer	Mark
1(a)(i)	A drawing showing the following features: • neat lines and no cells drawn (1) • two vascular bundles drawn and three or four layers of tissue (1) • two tissues labelled (1) Example of labelled drawing: 	(3)

Question number	Answer	Mark
1(a)(ii)	A drawing showing the following features: • cells in the box drawn to the correct proportions (1) • nuclei drawn in the two cells (1) • cell walls shown correctly (1) Example of drawing: 	(3)

Question number	Answer	Mark
1(b)(i)	A calculation showing the following steps: • equivalent micrometer units and graticule units given (1) • 1 graticule unit calculated (1) Example of calculation: 6 stage micrometer units = 20 graticule units so 1 graticule unit = 60 ÷ 20 μm = 3 μm	(2)

Question number	Answer	Mark
1(b)(ii)	An answer showing the following steps: • reading diameter of A using scale (1) • actual diameter calculated (1) Example of calculation: A is 24 units wide so actual diameter is 24 × 3 = 72 μm	(2)

Question number	Answer	Mark
2(a)(i)	• concentration of sodium hydroxide solution	(1)

Question number	Answer	Mark
2(a)(ii)	An answer that includes any one of the following pairs: • temperature of solution (1) • carry out in a thermostatically controlled water bath (1) or • length of time in solution (1) • start them all at same time / stopwatch (1)	(2)

Question number	Answer	Mark
2(a)(iii)	An answer that includes any five of the following points: • a source material variable taken into account, e.g. length, width, age, mass, hydration level, part of plant extracted from (1) • environmental variable controlled, e.g. temperature, humidity (1) • named procedural variable controlled, e.g. size of masses used (1) • idea of adding masses until fibre breaks / measure the mass {that breaks the fibre / that the fibre can hold before breaking} (1) • repeat and find the {mean / average} (1) • reference to safety procedure (1)	(5)

Question number	Answer	Mark
2(b)(i)	An answer that includes the following points: • for {Baobab, Okra and Kenaf / three of the plants} concentration should be 10% (1) • for Roselle it should be 25% (1)	(2)

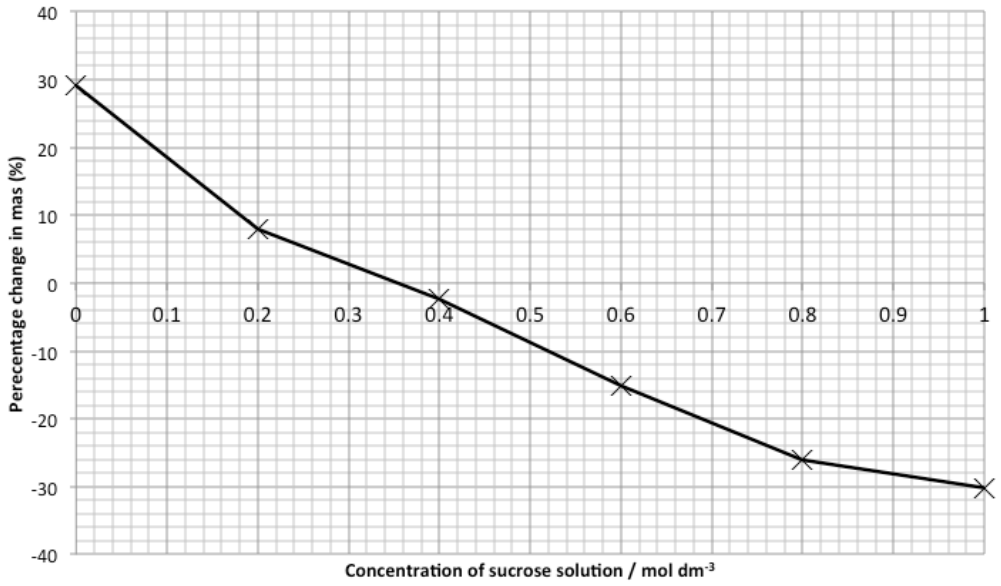
Question number	Answer	Mark
2(b)(ii)	A table, drawn showing: • suitable table drawn (1) • headings of sodium hydroxide concentration with units, tensile strength with units and the two species (1) • data correctly entered into it (1) Example of table drawn:	(3)

Sodium hydroxide concentration/%	Tensile strength/a.u.	
	Roselle	Baobab
10	0.40	1.00
15	0.30	0.63
20	0.59	0.65
25	0.65	0.60

Question number	Answer	Mark
2(c)(i)	An answer that includes the following comparative points: • both {peak at 8% (sodium hydroxide) / go down above 8% (sodium hydroxide) / rise at 25% (sodium hydroxide)} (1) • 0 °C peaks at 30% (sodium hydroxide) but at 20 °C {reaches a plateau / flattens off at 30% (sodium hydroxide)} (1)	(2)

Question number	Answer	Additional guidance	Mark
2(c)(ii)	A description that includes the following points: • an increase in temperature leads to a reduction in degree of swelling (1) • this effect is not linear (1)	Accept reverse argument	(2)

Question number	Answer	Mark
3(a)(i)	An answer showing the following steps: • change in mass calculated (1) • percentage change calculated (1) Example of calculation: 2.75 − 1.92 = -0.83 g (-0.83 ÷ 2.75) × 100 = -30.18%	(2)

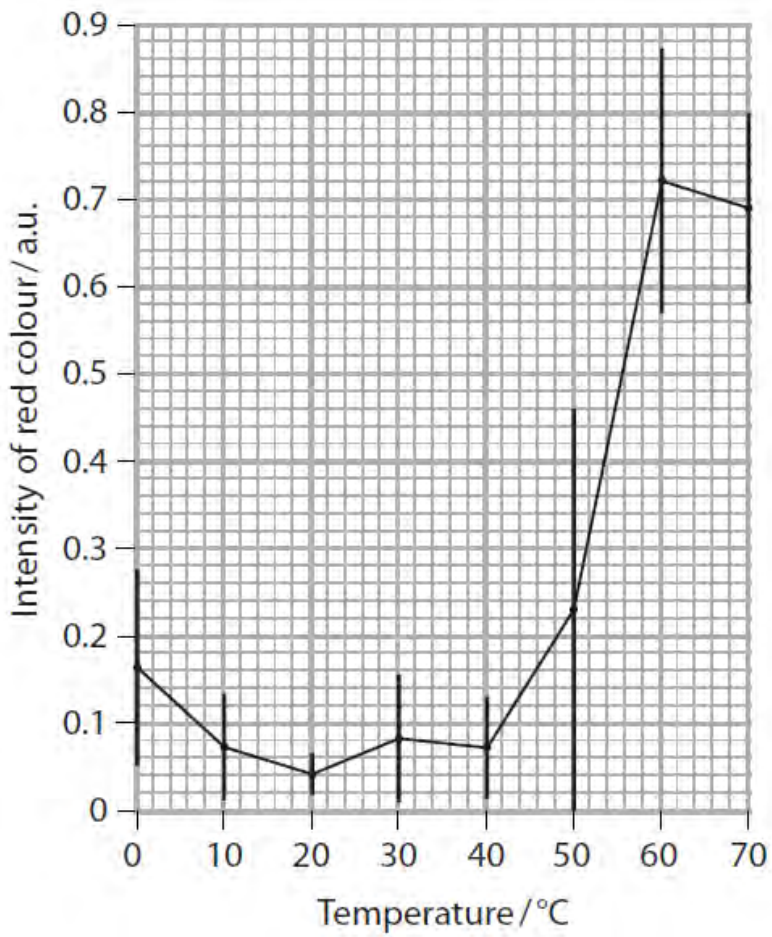
Question number	Answer	Mark
3(a)(ii)	A graph showing the following features: • A axes correct (x – concentration of sucrose solution, y - percentage change in mass) (1) • L axes correctly labelled, and with units mol dm^{-3} and % (1) • P correct plotting (1) • S points joined with straight lines (1) Example of graph:  	(4)

Question number	Answer	Additional guidance	Mark
3(a)(iii)	An answer showing the following steps: • 0.35 (1) • mol dm^{-3} (1)	 Allow ecf from graph	(2)

Question number	Answer	Mark
3(a)(iv)	An explanation that includes the following points: • there is no (net) change in the quantity of water in the carrot tissue / the water potential in the carrot equals the water potential of the solution (1) • {because / therefore} the rate of water gain is equal to its loss (1)	(2)

Question number	Answer	Mark
3(b)(i)	Any two from the following: • surface area / volume / age / variety / storage conditions / source (of beetroot) / same {wavelength / filter} (1)	(2)

Question number	Answer	Mark
3(b)(ii)	• intensity of the red colour	(1)

Question number	Answer	Mark
3(b)(iii)	A graph showing the following features: • axes correctly labelled with units (x temperature/ °C and y intensity of the red colour/a.u.) (1) • scales correctly labelled (1) • standard deviations (SDs) all correctly plotted (1) Example graph:  	(3)

Question number	Answer	Additional guidance	Mark
3(b)(iv)	An answer that includes the following points: • {cells / membranes / eq} damaged (by cutting up of pieces) (1) • so pigment could leak out of {vacuoles / cells} (1)	Accept reference to condensation on cuvette at low temperature, leads to absorption of some of the light	(2)

Question number	Answer	Mark
3(b)(v)	An answer that includes any five of the following points: • (overall) the intensity of the red colour increases as temperature increases (1) • but from 0 °C to 40 °C, the SDs overlap so no significant effect (1) • at 50 °C the mean is higher than that at 40 °C but SDs overlap so there is no case for saying the difference is significant (1) • at 60 °C the mean is higher than that at 50 °C and the SDs do not overlap so this difference can be regarded as significant (1) • at 70 °C the mean degree of redness falls from that at 60 °C but the SDs overlap so temperatures above 60 °C appear to have no further effect (1) • there are no data above 70 °C so cannot say what any further rise in temperature would cause (1)	(5)