

Question 1 (Answer: D)

- Actual size = image size $\div$ magnification.
- $25 \text{ mm} \div 5000 = 0.005 \text{ mm}$.
- 0.005 mm is $5 \mu\text{m}$.

Question 1 (Answer: C)

- Calibrate the eyepiece graticule first, using the stage micrometer.
- Work out how many micrometres one graticule division represents.
- Then multiply by the number of divisions the cell covers.

Question 1 (Answer: B)

- Calibrate the graticule first: line it up against the 0.1 mm stage micrometer divisions.
- Here 40 graticule divisions span $0.1 \text{ mm} = 100 \mu\text{m}$, so one division is $2.5 \mu\text{m}$.
- A $10 \mu\text{m}$ lymphocyte therefore covers $10/2.5 = 4$ divisions.

Question 1 (Answer: D)

- A light microscope at $\times 400$ resolves down to about $0.2 \mu\text{m}$.
- Starch grains and mitochondria are large enough to be seen when stained.
- Centrioles are far too small, and higher plants do not have them anyway.

Question 2 (Answer: C)

- Calibrate the graticule against the stage micrometer, whose divisions are $0.01 \text{ mm} = 10 \mu\text{m}$.
- Work out the size of one graticule division in micrometres.
- Then multiply by the number of divisions the structure spans – the magnification is unchanged between the two images.

2(a)(i)	1 uses most of the available space and the correct number of tissues ; 2 draws half the root <u>and</u> no cells ; 3 draws the outer region of the vascular tissue as 2 lines drawn close together ; 4 draws the correct proportion of the vascular tissue ; 5 label line to the tissue involved in transport of substances throughout the plant <u>and</u> the label T ;															
2(a)(ii)	1 lines continuous, thin and sharp <u>and</u> no shading ; 2 draws only four cells <u>and</u> each cell touching at least one of the other cells ; 3 cell wall drawn as two lines ; 4 correct shapes of the cells ;															
2(b)(i)	1 states only observable differences ; (differences) 2, 3 and 4 ; Any three from : <table><tr><th>feature</th><th>Fig. 2.2</th><th>K1</th></tr><tr><td>area of vascular tissue</td><td>larger</td><td>smaller ;</td></tr><tr><td>presence of trichomes</td><td>absent</td><td>present ;</td></tr><tr><td>number of xylem vessels</td><td>more</td><td>less ;</td></tr><tr><td>presence of endodermis</td><td>absent</td><td>present ;</td></tr></table>	feature	Fig. 2.2	K1	area of vascular tissue	larger	smaller ;	presence of trichomes	absent	present ;	number of xylem vessels	more	less ;	presence of endodermis	absent	present ;
feature	Fig. 2.2	K1														
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2(c)(i)	1 records a value for the length of the line A – B ; 2 shows the length of line A – B divided by 35 to calculate actual length of line A – B ; 3 shows $\frac{1}{2}$ actual length of line A – B squared and multiplied by π ; 4 correct answer ;
2(c)(ii)	1 take sections of the root from plants at different ages ; 2 keep the species of the plants the same ; 3 keep the variables for growing the plants the same ;

2(a)(i)	1 appropriate size <u>and</u> no shading ; 2 draws correct section of the organ ; 3 draws the correct pattern of vascular bundles and the correct proportions of large vascular bundles <u>and</u> no cells drawn ; 4 draws two lines for the epidermis <u>and</u> trichomes ; 5 label line <u>and</u> label to vascular bundle ;															
2(a)(ii)	1 appropriate size <u>and</u> lines are sharp and continuous ; 2 draws only four xylem vessel elements <u>and</u> each xylem vessel element touches at least one other xylem vessel element ; 3 two lines around each xylem vessel element <u>and</u> three lines where xylem vessel elements touch ; 4 draws correct shape of xylem vessel elements ; 5 label line <u>and</u> label to the wall of one xylem vessel element ;															
2(a)(iii)	1 stem <u>and</u> reason ;															
2(b)	1 collects differences using only observable differences ; 2, 3 two observable differences ;; <i>any two (correct differences) from:</i> <table><tr><th>feature</th><th>M1</th><th>Fig. 2.2</th></tr><tr><td>shape</td><td>square</td><td>circular ;</td></tr><tr><td>vascular bundles</td><td>at corners and between bulges</td><td>in a ring ;</td></tr><tr><td>vascular bundles</td><td>large and small</td><td>same size ;</td></tr><tr><td>central tissue</td><td>cells</td><td>no cells ;</td></tr></table>	feature	M1	Fig. 2.2	shape	square	circular ;	vascular bundles	at corners and between bulges	in a ring ;	vascular bundles	large and small	same size ;	central tissue	cells	no cells ;
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shape	square	circular ;														
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2(c)(i)	1 correct number of eyepiece graticule units ; 2 shows division of eyepiece graticule units by one <u>and</u> multiplies by 1000 ;															
2(c)(ii)	1 correct measurement using eyepiece graticule units ; 2 shows the answer from 2(c)(i) multiplied by the number of eyepiece graticule units ;															
2(c)(iii)	1 3 measurements <u>and</u> calculate the mean ;															