



Plant tissues, fibres and mineral nutrition: practice questions

8 questions · 31 marks · mark scheme at the back

For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 31

1 UNIT 2 STYLE [1 mark]

Which statement correctly describes the cells of xylem vessels and phloem sieve tubes when mature?

- A. ☐ Xylem vessels are dead and sieve tubes are living
- B. ☐ Xylem vessels are living and sieve tubes are dead
- C. ☐ Both are dead
- D. ☐ Both are living but have no nucleus

2 UNIT 2 STYLE [5 marks]

Compare and contrast the structure and functions of xylem vessels and phloem sieve tubes.

[5 marks]

[illegible]

[3 marks]

[illegible]

[3 marks]

[illegible]

6 UNIT 2 STYLE

[4 marks]

Explain how the use of plant fibres and starch-based plastics could contribute to sustainability, and give one limitation.

7 UNIT 3 STYLE

[6 marks]

Describe how you could compare the tensile strength of fibres from two different plants. Include the measurements you would make and how you would control other variables.

8 UNIT 3 STYLE

[4 marks]

In an investigation, the masses at which five fibres from the same plant broke were: 4.4 kg, 4.6 kg, 4.5 kg, 4.4 kg and 4.6 kg. The fibres had a mean diameter of 0.30 mm. Calculate the tensile strength of the fibre in N mm^{-2} . Use $g = 9.81 \text{ N kg}^{-1}$. Show your working.

Answer = ...

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

A A: xylem vessels are dead, lignified tubes; sieve tube elements are living (they lose their nucleus but are supported by companion cells)

2. [5]

- similarity: both are elongated cells / joined end to end forming tubes / found in vascular bundles / involved in transport (any one)
- xylem vessels are dead / sieve tube elements are living
- xylem has thick lignified walls; phloem walls are thin / not lignified
- xylem has no end walls between cells; sieve tubes have sieve plates (perforated end walls)
- xylem transports water and mineral ions; phloem transports organic solutes / sucrose / amino acids
- xylem transports upwards only / phloem transports in both directions; xylem also gives support (any one of these)
- Max 5. Differences must refer to both xylem vessels and sieve tubes; at least one similarity is needed for full marks.

3. [5]

- (a) use a sharp pencil / single clear continuous lines / no shading or colouring
- (a) draw the outline of the section and the boundaries between tissues
- (a) do not draw individual cells
- (a) draw large / in proportion / use most of the space available
- (a) labels drawn with ruled lines that do not cross, touching the structure
- (a) give a title / state the magnification or include a scale
- (a) Max 4
- (b) sclerenchyma fibres (do not accept xylem or phloem)

4. [3]

- magnification = size of image ÷ size of real object (1)
- $84 \div 2.4$ (1)
- $\times 35$ (1); allow 35 without $\times$, but do not accept an answer with a unit

5. [3]

- magnesium ions are needed to make chlorophyll / are the central atom of chlorophyll
- less chlorophyll is made, so the leaves are yellow (chlorosis)
- so less light is absorbed, less photosynthesis, less growth

6. [4]

- renewable: crops can be regrown / not a finite resource unlike oil
- biodegradable / broken down by microorganisms, so less waste accumulates
- carbon dioxide absorbed in photosynthesis, so lower net carbon dioxide release / fewer fossil fuels used
- limitation: needs land / water / fertiliser, may compete with food crops or reduce biodiversity (any one)
- Max 4

7. [6]

- cut fibres of the same length from each plant / same age and moisture content
- measure the diameter at several points with a micrometer (or microscope and graticule) and calculate cross-sectional area (πr^2)
- clamp one end of the fibre and hang a mass holder from the other end
- add masses in equal increments until the fibre breaks
- record the total mass at which it breaks and convert to force (mass $\times$ 9.81)
- calculate tensile strength = breaking force $\div$ cross-sectional area
- repeat with several fibres of each plant and calculate a mean
- safety: soft box to catch masses / eye protection
- Max 6

8. [4]

- mean mass = 4.5 kg (1)
- force = $4.5 \times 9.81 = 44.1$ N (1)
- radius = 0.15 mm, so area = $\pi \times 0.15^2 = 0.0707$ mm² (1)
- $44.1 \div 0.0707 = 620$ N mm⁻² (1); accept 620 to 625; ecf from earlier steps; unit required; do not accept use of the diameter instead of the radius (about 156 N mm⁻²)