7. Transport in Plants

7.1 Structure of Transport Tissues

Paper 2

Marking Scheme

Q1.

(c)(ii)	plasmodesmata present ; **A** movement is down the, concentration / diffusion, gradient **A** because there is a high(er) concentration in the companion cell **ora** for phloem sieve tube (sap)	**1**

Q2.

(c)	(phloem) sieve tube element ; (*question asks for type of cell)* **A** sieve element	**1**

Q3.

(b)(i)	sieve plate ;	**1**

Q4.

(a)	xylem vessel elements ; **A** singular **A** vessel elements **A** xylem elements	**1**
(c)(i)	*any **two** from*: 1 (lignified wall / lignin) prevents, (inward) collapse / compression / AW (from tensions created) ; **R** bursting 2 (lignified wall / lignin) rigid / strong / secondary thickening, for support (of xylem vessels) ; **R** support, stem / plant 3 adhesion of water to hydrophilic groups in lignin, to maintain column of water / for water pathway / for transpiration stream / AW ; 4 waterproofing properties (of lignin) / AW / water prevented from leaving xylem vessels (supports idea of continuous columns) ; 5 lignification, associated with cell death / allows formation of hollow cells / allows formation of hollow tubes (for minimum resistance to flow) ; 6 AVP ; cell walls rigid to allow tension to develop	**2**
(c)(ii)	*any **one** from:* cell death / apoptosis ; loss of cell contents / become hollow ; **A** loss of (all) organelles **R** *idea that* some organelles remain loss of cytoplasm ; **A** loss of protoplasm loss of nucleus ; AVP ; e.g. formation of pits	**1**

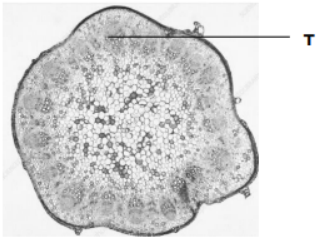
Q5.

(a)	(cell type **A**) phloem sieve tube element ; *plus any* ***two*** *from:* connect the cytoplasm of the two cells / *ref. to* the symplast pathway ; *idea of* allow (rapid) diffusion of, sucrose / named molecules, from one cell to an adjacent cell / AW ; *idea of* efficiency of, loading into / unloading from, sieve tubes ;	**3**

Q6.

(b)	sieve, plates / pores ; **A** perforated end plates / end plates with pores **I** plasmodesmata periphery / edge / AW ; companion ; **A** transfer	**3**

Q7.

(b)	label line labelled **T** to any area of xylem tissue ; e.g.  	**1**

Q8.

(b)	*one mark each correct row* ;;; *column mark can be used instead of row mark (if higher mark achieved)*	**4**

feature	companion cells	phloem sieve tube element	xylem vessel element
cytoplasm	✓	✓	x
cell surface membrane	✓	✓	x
lignified cell wall	x	x	✓
nucleus	✓	x	x

Q9.

(c)	*two from* *idea that* reduces resistance to flow through sieve tube ; *idea that* less space taken up so increased volume of sap / AW, can pass through (per unit time) ; pressure flow / mass flow, does not need energy from the cell / AW; AVP ; (organelles not needed as) metabolic reactions / AW, carried out by the companion cell ;	2

Q10.

(a)	label line to phloem in one vascular bundle ;	1

(c)(i)	epidermis / epidermal ; **I** upper / lower	1

Q11.

(b) *one mark per row* — 3

stages	description
F and **G**	cell, elongates / enlarges / grows **and**, a vacuole forms / makes a tonoplast ;
G and **H**	cell divides (longitudinally) **and** one of the cells has a vacuole ;
H and **J**	developing sieve tube cell, elongates / enlarges / grows **and** loses its nucleus **or** one (developing companion) cell divides (transversely) to form (two) companion cells ; **A** companion cell divides

(c) *any four from:* — 4

1 elongated cells to form, long tubes / AW ;

2 little, cytoplasm / cell contents / fewer organelles, to reduce resistance to flow ;
A peripheral cytoplasm / no nucleus, to allow transport of maximum volume of, (named) assimilates / sap / nutrients
A 'more space for .....'
R no organelles **R** 'no cell contents'

3 sieve (plates have) pores, so little barrier to flow from cell to cell / easy (for phloem sap) to pass from cell to cell / allows mass flow ;

4 sieve plates, support / stop collapse of / stop bulging of, sieve tube elements ;
A become plugged with, P-protein / callose, to prevent losses / after damage
A maintain hydrostatic pressure (in sieve tubes)

5 plasmodesmata between sieve tube and companion cell for ease of, loading / unloading / AW ;

6 AVP ; e.g. membrane around sieve tube for osmosis to occur / prevent loss of (named) assimilates

Q12.

(a)	stem / not a root, because, transport tissue / vascular bundles / vascular tissue(s) / xylem and phloem / xylem / phloem, around the edges / not in the centre / AW ; **A** stem because, pith / parenchyma tissue, is in the centre	1
(b)	*any two from:* (hydrostatic) support / described ; **R** *if incorrect context e.g. support because of thick cell walls* **A** packing tissue (cells), turgid / store <u>water</u> ; storage ; *in context of substances other than water e.g. sucrose / starch / waste*	2
(c)(i)	vascular bundle ;	1
(c)(ii)	0.65 (<u>mm</u>) ;	1

(d)	*mp1-3 must have statements for both xylem and phloem* *mp4-7 need statements for either xylem or phloem* *three from:*			3
	xylem		*phloem*	
	1 no cytoplasm / hollow / no contents		(peripheral / little / some) cytoplasm ; **I** protoplasm **R** full of cytoplasm / AW	
	2 no organelles / hollow / no contents		(a few) organelles ; **A** examples of organelles mitochondria or ER **I** has SER / RER / ribosomes **R** has nucleus	
	3 lignified **R** idea of lignin within element		no lignin / (only) cellulose ;	
	4 no end wall(s) / no sieve plate(s) **A** end walls have broken down	**or**	sieve plate(s) / perforated end wall(s) ; **A** (end walls) have sieve pores	
	5 (side walls) contain pits	**or**	no pits (in side walls) ;	
	6 no plasmodesmata	**or**	plasmodesmata (to companion cells) ;	
	7 thick(er), cell wall / walled	**or**	thin(ner), cell wall / walled ;	

Q13.

(b)(i)	phloem ;	**A** sieve tube(s) **A** sieve tube elements	**R** phloem sieve / phloem tube **R** phloem companion cell	1