

1	(a) carbon dioxide / CO ₂ ; (aerobic) respiration ; (simple) diffusion ;	[3]	A excretion I gas exchange
	(b) water enters by <u>osmosis</u> ; down a <u>water potential</u> gradient / high(er) to low(er) <u>water potential</u> ; through partially permeable membrane ; needs to remove water to prevent bursting ;	[max 3]	R water concentration A semi- / selectively / differentially
	(c) as concentration of sea water increases the removal of water decreases ; as concentration of sea water increases the water potential gradient decreases ; therefore less water enters at higher concentrations of sea water ; less excess water ;	[max 3]	A 0% to 12%
	(d) cell walls, inelastic / do not stretch / rigid / inflexible / keep shape of cell ; cells, are turgid / have high turgor pressure ; resist any increase in, volume / pressure ; these cells do not absorb excess water ; the cells will not burst ;	[max 3]	I strong / tough / don't break A (very) little water enters
		[Total: 12]	

2	(a)	<p>root hairs ; water moves, from high water <u>potential</u> to low water <u>potential</u> / down water <u>potential</u> gradient ; by osmosis ; through partially permeable membrane ; through protein pores (in membrane) ;</p>	max [4]	
	(b) (i)	<p>movement of gas / oxygen / carbon dioxide, into and out of leaf ; for, photosynthesis / respiration ; allows transpiration ; enables water to be pulled up the plant / AW ;</p>	max [2]	<p>ignore air</p> <p>A transpiration pull</p>
	(ii)	<p>greater density / more stomata, in variety A ; four times more ;</p>	[2]	
	(iii)	<p>more stomata / AW, in variety A ; more transpiration in variety A ; ora greater opportunity for loss of water vapour through stomata in variety A ; ora by evaporation, from surfaces of (mesophyll) cells / into air spaces (in leaf) ; loss of water from leaf (cells) lowers water potential ; (this) pulls on / creates tension (in water column in xylem) ; cohesion of water molecules / AW ;</p>	max [3]	<p>A transpiration pull</p> <p>A 'stick together' / ref to polar</p>

2 (c)	sunken stomata ; hairs ; fleshy/succulent, leaves ; thick cuticle ; small surface area ; few/shedding of, leaves ; AVP ; e.g. rolling of leaves/reflective surfaces	max [2]	ignore ref to stems / roots
(d)	water vapour <u>condenses</u> to form, clouds/fog/dew ; precipitation ; rainwater drains into rivers ; seeps / AW, into soil/forms ground water ;	max [2]	
		[Total: 15]	

Question		Marks	Additional Guidance
3 (a) (i)	xylem;	1	
(ii)	<p>thick/lignified, cell walls; for support;</p> <p>lignin; cell walls are waterproof/no water leaks out;</p> <p>long/hollow/no cytoplasm/no organelles/no end walls; water passes through easily/low resistance (to flow);</p> <p>pits; for lateral movement;</p> <p>AVP;;</p>	max 2	one feature linked to a reason max 1 for feature
(b)	<p>1 transpiration/transpiration pull;</p> <p>2 creates a, tension/negative pressure;</p> <p>3 water potential gradient;</p> <p>4 osmosis into leaf cells;</p> <p>5 continuous column of water;</p> <p>6 cohesion of water molecules/described;</p> <p>7 adhesion of water to, cell wall/xylem;</p> <p>8 water evaporates, into airspaces (in mesophyll);</p> <p>9 water (vapour), diffuses/passes, out through stomata;</p> <p>10 root pressure;</p>	max 4	<p>I water into roots I water concentration</p> <p>A evaporates</p>

Question		Marks	Additional Guidance
3 (c) (i)	<p>1 two peaks; 2 at 10h, and 14/15h; 3 no water conduction before 4h; 4 slow/gradual, increase from 4h to 6h/7h; 5 maximum water conduction rate of 2.4 dm³ per hour; 6 steep increase in rate of water conduction at 7h/7.5h; 7 decrease in rate of water conduction after 14.5 – 15h; 8 any other data quote;</p>	max 3	<p>Correct units (dm³ per hour) for water conduction must be stated at least once. If no units at all, only penalise once.</p> <p>A at 15h</p>
	(ii) add the volume (of water conducted) for each hour / calculate area under curve / AW;	1	A half hour
	<p>(iii) possible reasons: different rates of transpiration; different numbers of leaves / different surface areas; different rates of evaporation;</p> <p>factors affecting transpiration: (sun)light / shade; temperature / heat; humidity; wind speed;</p> <p>different species; different diameters of xylem / AW; any feature of leaf structure; e.g. thickness of cuticle / stomatal density / hairs length of roots; different ages; AVP;</p>	max 3	

