

- M1. (a) (i) guard (cells)  
*allow phonetic spelling* 1
- (ii) any **one** from:  
*ignore reference to cells*
- allow carbon dioxide to enter  
*allow control loss / evaporation of water or control transpiration rate*
  - allow oxygen to leave.  
*allow 'gaseous exchange'* 1
- (b) (i) 200  
*correct answer gains 2 marks with or without working*  
*allow 1 mark for  $0.1 \times 0.1 = 0.01$  (mm<sup>2</sup>)* 2
- (ii) more / a lot of / increased water loss  
*allow plant more likely to wilt (in hot / dry conditions)* 1
- (c) (i) 0.12 1
- (ii) the lower surface has most stomata 1
- stomata are now covered / blocked (by grease) 1
- so water cannot escape / evaporate from the stomata  
*ignore waterproof*  
*to gain credit stomata must be mentioned at least once* 1

[9]

M2. (a) guard cell  
*ignore stoma / stomata* 1

(b) Species A :  
*allow converse points for species B*  
stomata open in dark / at night **or** close in light / in day 1

stomata closed during warm(est) period **or** open when cool(er) 1

heat (energy) /warmth increases evaporation / transpiration  
*must give explicit link between heat and transpiration* 1

reduces water loss / evaporation / transpiration  
*ignore photosynthesis* 1

[5]

**M3.** (a) guard (cell)

*ignore stoma / stomata*

1

(b) Species A:

- stomata open in dark / at night **or** close in light / in day

1

- stomata closed during warm(est) period **or** open when cool(er)

1

- heat (energy) / warmth increases evaporation / transpiration  
*must give explicit link between heat and transpiration*

1

- reduces water loss / evaporation / transpiration  
*ignore photosynthesis*  
*allow converse points for species B*

1

**[5]**

**M4.** (a) solution in soil is more dilute (than in root cells)  
*concentration of water higher in the soil (than in root cells)* 1

so water moves from the dilute to the more concentrated region  
*so water moves down (its) concentration gradient or water moves from a high concentration of water to a lower concentration* 1

concentration of ions in soil less (than that in root cells) 1

so energy needed to move ions

**or**

ions are moved against concentration gradient  
*the direction of the concentration gradient must be expressed clearly*  
*accept correct reference to water potential or to concentrations of water* 1

(b) any **three** from:

- movement of water from roots / root hairs (up stem)
- via xylem
- to the leaves
- (water) evaporates
- via stomata

3

(c) (i) 0.67/0.7  
*accept 0.66, 0.666666... or  $\frac{2}{3}$  or 0.6*

correct answer gains 2 marks with or without working

100

if answer incorrect allow evidence of 150 for 1 mark  
do **not** accept 0.6 or 0.70

2

(ii) during the first 30 minutes

any **one** from:

- it was warmer
- it was windier
- it was less humid
- there was more water (vapour) in the leaves

1

so there was more evaporation

*ignore 'water loss'*

**or**

stomata open during first 30 minutes **or** closed after 30 minutes (1)

so faster (rate of) evaporation in first 30 min **or** reducing (rate of) evaporation after 30 min (1)

1

[11]