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 × 0.1 = 0.01 (mm^2)

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 <u>down</u> (its) concentration gradient **or** water moves from a high concentration <u>of water</u> 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, 0.6666666... or ⅔ or 0.6

*correct answer gains **2** marks with or without working*

if answer incorrect allow evidence of $\frac{100}{150}$ *for **1** mark*
*do **not** accept 0.6 or 0.70*

2

(ii) <u>during the first 30 minutes</u>

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]