**M1.**(a)     (i)      water / H2O

*accept oxygen*

*allow H2O*

*do* ***not*** *allow H2O or H2O*

**1**

(ii)     the mineral ions are absorbed by active transport

**1**

the absorption of mineral ions needs energy

**1**

(iii)    have (many root) hairs

**1**

(which) give a large surface area (for absorption)

**1**

(b)     carbon dioxide in

**or**

oxygen out

**or**

control water loss

*accept gas exchange*

*ignore gases in and out*

*ignore gain / lose water*

**1**

(c)     (i)      guard cells

**1**

(ii)     (stomata are) closed

*allow there is no gap / space*

**1**

(iii)    plant will wilt / droop

*ignore die*

**1**

**[9]**

**M2.**(a)     (i)      wind

*answers in either order*

**1**

temperature

*ignore weather*

**1**

(ii)     different plants have different sizes

*ignore reference to validity*

/ different numbers of leaves  
/ different sizes of leaves  
/ different plants take up different amounts of water  
/ different number of stomata  
/ different surface area

*allow different plants need different amounts of water*

**1**

(b)     in table, in sequence:

C  
B  
A

*all 3 correct =* ***2*** *marks*

*2 correct =* ***1*** *mark*

*0 or 1 correct =* ***0*** *marks*

**max 2**

(c)     transpiration

**1**

**[6]**

**M3.**(a)     (i)      xylem

**1**

(ii)     phloem

**1**

(iii)    transpiration

**1**

(iv)    stomata

**1**

(b)     (i)      any **one** from:

•        reduce / prevent evaporation of water from flask

•        holds plant shoot in place

•        prevent damage to the plant

**1**

(ii)     same surface area **or** number of leaves

*(because if they used larger / smaller size shoots) there would be a larger / smaller surface area* ***or*** *a larger/ smaller number of leaves*

*allow same number of stomata*

**1**

from which (the same amount of) water evaporates

*(and therefore) more / less water would escape*

*allow from which water escapes*

**1**

(iii)    4.5

*look for answer written in table*

**1**

(iv)    increasing temperature / heat increases (rate of) water loss / evaporation

**1**

(v)     having moving air / a fan increases (rate of) water loss / evaporation

**1**

(c)     (i)      0.3 g

**1**

(ii)     plastic bag reduces air flow across leaves  
**or**air is humid around the leaves

*allow plastic bag stops water (vapour) leaving  
allow air (in plastic bag) becomes saturated (with water)*

**1**

**[12]**

**M4.**         (a)      (i)     root hair

**1**

(ii)     any **two** from:

*ignore food*

•        water

•        ions / minerals / nutrients / salts / correct named eg nitrates

*ignore N,P,K*

•         oxygen

**2**

(b)     (i)      stomata

**1**

(ii)     diffusion

**1**

**[5]**

**M5.**(a)    xylem **and** phloem

*either order*

*allow words ringed in box*

*allow mis-spelling if unambiguous*

**1**

(b)    (i)      movement / spreading out of particles / molecules / ions / atoms

*ignore names of substances / ‘gases’*

**1**

from high to low concentration

*accept down concentration gradient*

*ignore ‘along’ / ‘across’ gradient*

*ignore ‘with’ gradient*

**1**

(ii)     oxygen / water (vapour)

*allow O2 / O2*

*ignore O2/ O*

*allow H2O / H2O*

*ignore H2O*

**1**

**[4]**

**M6.**(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 (mm2)*

**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]**

**M7.**(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, 0.6666666... or ⅔ or 0.6*

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

*if answer incorrect allow evidence of  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]**

**M8.**(a)     (i)      xylem

**1**

(ii)     water

**1**

minerals / ions / named example(s)

*ignore nutrients*

**1**

(b)     (i)      movement of (dissolved) sugar

*allow additional substances, eg amino acids / correct named sugar (allow sucrose / glucose)*

*allow nutrients / substances / food molecules if sufficiently qualified*

*ignore food alone*

**1**

(ii)     sugars are made in the leaves

**1**

so they need to be moved to other parts of the plant for respiration / growth / storage

**1**

(c)     (i)      mitochondria

**1**

(ii)     for movement of minerals / ions

*Do not accept ‘water’*

**1**

against their concentration gradient

**1**

**[9]**

**M9.**(a)     (i)      5.0

**1**

(5 × 0.8) **or** 4

*allow ecf from distance*

**1**

0.4

*allow ecf from 10-min volume*

**1**

(ii)     increased (rate of uptake)

**1**

more transpiration / evaporation

**1**

(b)     correct scales

*allow reversed axes*

**1**

correctly labelled axes with units

**1**

correct points

*one plot error = max* ***1*** *mark*

**2**

curved line of best fit

*allow correct straight line*

**1**

(c)     leaves wilt

**1**

because plants lose too much water (by evaporation)

**1**

through the stomata

**or**

because cells become plamolysed

**or**

stomata close

controlled by guard cells

to prevent wilting

**1**

**[13]**

**M10.**(a)     guard cells

**1**

(b)     (i)      any **one** from:

•        species / plant

•        length of time

*ignore temperature and size of leaves*

**1**

(ii)     20

*correct answer =* ***2*** *marks*

*accept *

*or          *

*for* ***1*** *mark*

**2**

(c)     less water loss / transpiration / evaporation

**1**

(d)     hot

**1**

*ignore bright / sunny conditions*

dry / low humidity

**1**

wind(y)

**1**

**[8]**