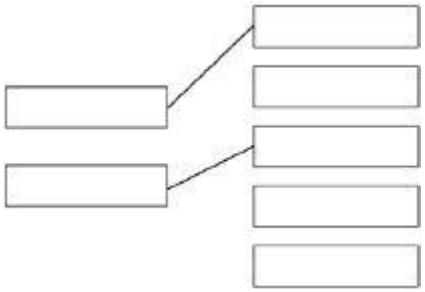
Q1.

(a)



additional line from a level of organisation negates the mark for that level of organisation

2

(b) palisade mesophyll

1

(c) $\frac{50}{8}$

1

6 / 6.25 / 6.3 (micrometres)

1

*an answer of 6 / 6.25 / 6.3 scores **2** marks*

(d) they have no chloroplasts / chlorophyll

allow they are underground

allow they don't get (access to) light

allow (because) photosynthesis needs light

allow they can't absorb light
ignore 'sun'
ignore 'it is dark'

1

(e) differentiation

1

(f) to protect endangered plants from extinction

1

(g) plants can be produced quickly

1

(h) any **one** from:

- glucose / sugars / starch
- amino acids / protein
- hormones

  allow named hormones e.g. auxin
- ions / minerals

  allow magnesium / nitrate
- vitamins

  allow named vitamins e.g. vitamin B
- water

allow H_2O / H2O

ignore oxygen / carbon dioxide / agar / nutrients / fertiliser

1

[10]

Q2.

(a) phloem

1

(b) translocation

1

(c) either:

less (sugars for) respiration

1

(so) less energy released

1

or

less amino acids made (1)

(so) less protein produced **or** less protein synthesis (1)

or

less cellulose made (1)

(so) weaker cell walls (1)

(d) (aphids) can fly to another plant **or** part of the plant

ignore to fly unqualified

1

to get (more) food

allow to find a mate
allow idea of less competition for food
allow to escape predators
*do **not** accept escape prey*

1

(e) (oil) prevents aphids from attaching to leaf **or** causes aphids to slide off leaf

ignore 'the leaf is slippery'

or
idea that oil may harm / kill the aphid

allow oil may be unpleasant to the aphid

1

(f) (plant / stem has) thorns

allow spines / spikes / prickles
ignore stings
*do **not** accept thorns protect (the plant) from*

predators

1

(g) C

if any other letter given then no marks for the question

1

(fungi / spores) blown by / in direction of the wind

allow black spot / disease is blown by / in direction of the wind

or

it's the closest plant (to A)

*do **not** accept reference to bacteria / viruses / pollen being blown*

1

(h) any **one** from:

- spread rose bushes out more

  allow isolate the infected plant
  allow idea of barrier around infected plant
  ignore separate unless qualified

- remove any infected parts of the plant

  allow remove infected plant / A

- use a fungicide

  ignore pesticide
  *do **not** accept insecticides / herbicide*

1

[11]

Q3.

(a) (mouthpiece) has pierced / entered the phloem

or

(the aphid) has been feeding from the phloem

1

(b) yellow leaves due to lack of chlorophyll

ignore 'chloroplasts'
ignore magnesium is needed to make chlorophyll

1

(therefore) less / no light absorbed (by chlorophyll)

1

(therefore) lower rate of / no photosynthesis

*do **not** allow 'energy is produced by photosynthesis'*

1

(therefore) plant makes less / no sugar / glucose

1

(therefore) plant converts less / no sugar / glucose into protein (for growth, so growth is stunted)

allow less glucose / sugar converted into cellulose (cell wall)
allow less energy for protein synthesis

1

(c) inject the protein / it into a mouse

1

combine lymphocytes with tumour / cancer cells to make hybridoma (cells)

ignore white blood cells
allow T or B lymphocytes
ignore tumour unqualified

1

find a hybridoma which makes a monoclonal antibody specific to PVY

1

(the scientist) clones (the hybridoma) to produce many cells (to make the antibody)

*do **not** allow cloning of original stem cells*
allow many rounds of cloning / mitosis

1

[10]

Q4.

(a) (**A**) bronchus

allow bronchi
allow bronchiole

1

(**B**) trachea

allow windpipe

1

(**C**) alveolus

allow alveoli
ignore air sac

1

(b) circulatory system

1

(c) **Q**

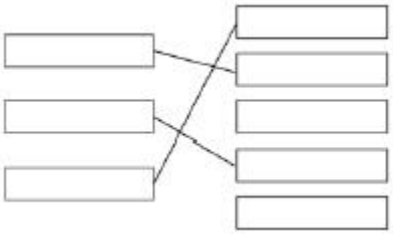
1

(d) guard cell

1

(e) a group of cells with a similar structure / function

1

(f) 

1 *mark for each correct line*

extra line from a tissue negates the mark for that tissue

3

[10]

Q5.

(a) electron (microscope)

1

(b) $\frac{30000}{200}$

*an answer of 150 (μm) scores **2** marks*

1

150 (μm)

*if answer is incorrect allow for **1** mark sight of 0.015 / 0.15 / 1.5 / 15*

*allow ecf for incorrect measurement of line **X** for max **1** mark*

1

(c) **either**

large surface area

allow (vacuole contains) cell sap that is more concentrated than soil water (1)

1

for more / faster osmosis

create / maintain concentration / water potential gradient (1)

or

allow thin (cell) walls

for short(er) diffusion distance

1

(d) (on hot day) more water lost

allow converse for a cold day if clearly indicated

1

more transpiration

or

more evaporation

1

so more water taken up (by roots) to replace (water) loss (from leaves)

1

(e) (aerobic) respiration occurs in mitochondria

*do **not** accept anaerobic respiration*

1

(mitochondria / respiration) release energy

*do **not** accept energy produced / made / created*

1

(energy used for) active transport

1

to transport ions, against the concentration gradient
or
from a low concentration to a high concentration

1

[12]

Q6.

(a) 86

allow this answer only

*do **not** accept 85.7*

if no answer given, check for answer in the table

1

(b) as salt concentration increases, percentage of open stomata (in field of view) decreases (above 0.1 mol / dm^3)
or
allow percentage of open stomata stays the same between 0.0 and 0.1 (mol / dm^3 then decreases as salt concentration increases)

ignore references to number of open stomata

allow converse

allow idea that mean concentration (of salt) in guard cells is between 0.3 and 0.4 mol per dm^3

1

(c) use concentrations between 0.3 (mol / dm^3) and 0.4 (mol / dm^3)
or
draw a graph of the data and read off the value at 50% (open stomata)

allow a list of appropriate concentrations i.e. 0.32 mol / dm^3), 0.34 (mol / dm^3), 0.36 (mol / dm^3) etc.

1

(d) ($\pi \times 0.1875^2$) = 0.11 (mm^2)

*an answer of 36 scores **3** marks*

1

$$\frac{4}{0.11}$$

1

36 (per mm^2)

*allow 36.22 / 36.23 **or** 36.2*

*if answer is incorrect allow for **2** marks for sight of number of*

open stomata = 9 per mm²

(diameter used instead of radius)

*if no other marks awarded allow for **1** mark any **one** from:*

- *sight of area = 0.44(mm²) (diameter used instead of radius)*
- *sight of number of open stomata = 9.1 / 9.05 / 9.06 per mm² (diameter used instead of radius and no rounding)*

1

(e) (potassium) ions increase the concentration of the solution (inside guard cells)
or
(potassium) ions make cell more concentrated / less dilute

allow (potassium) ions decrease concentration of water / water potential (of guard cells)

1

water moves into the (guard) cell by osmosis

1

cell swells unevenly (so stoma opens)

1

as inner wall is less flexible than outer wall **or** thick part of the wall is less flexible than the thin part (of the wall)

1

[10]

Q7.

(a) active transport

1

(b) by transpiration stream / pull

1

in xylem

1

(c) any **three** in the correct order from:

- mount epidermis on a slide
- count stomata in one area
- repeat in four more areas
- repeat method on other surface of leaf
- calculate mean

allow nail varnish film

3

(d) 1

allow numbers written out in a line with middle number circled

1

(e) (44 + 41 + 40 + 42 + 39) / 5 = 41.2

1

41

*allow 41 with no working shown for **2** marks*

1

*allow 41.2 for **1** mark*

(f) less water lost

1

so it does not wilt

1

[11]

Q8.

(a) to kill virus
or
to prevent virus spreading

1

(b) take (stem) cells from meristem
or
tissue culture

allow take cuttings

1

(c) use Benedict's solution

1

glucoses turns solution blue to orange

1

(d) **Level 2 (3–4 marks):**
A detailed and coherent explanation is provided. The student makes logical links between clearly identified, relevant points that explain why plants with TMV have stunted growth.

Level 1 (1–2 marks):
Simple statements are made, but not precisely. The logic is unclear.

0 marks:
No relevant content.

Indicative content

- less photosynthesis because of lack of chlorophyll
- therefore less glucose made
  so
- less energy released for growth
- because glucose is needed for respiration
  and / or
- therefore less amino acids / proteins / cellulose for growth
- because glucose is needed for making amino acids / proteins / cellulose

4

[8]

Q9.

(a) guard (cells)

allow phonetic spelling

1

(b) (i) as carbon dioxide (concentration) increases, the (mean) number of stomata decreases

allow there is a negative correlation

1

(there is a) rapid drop initially

allow use of any number between 1.5 and 3.0 to indicate "initially"

1

(ii) (there is) more carbon dioxide so plant doesn't need as many stomata (to obtain the amount needed)

or

(there is) less carbon dioxide so the plant needs more stomata (to obtain enough)

1

(c) (i) may lose too much water

allow plant may wilt

ignore references to oxygen / carbon dioxide

plants lose a lot of water is insufficient

ignore flaccid

1

(ii) any **one** from:

- hot
- dry
- windy

ignore environments unqualified eg desert

1

[6]

Q10.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

Level 3 (5–6 marks):
Processes used for obtaining specified materials are given.
and
correctly linked to the vessels that the materials are transported in
or
correctly linked to a description of the direction of movement of the materials.
For full credit, in addition to the above descriptors at least **one** of the processes must be linked to the vessel that the material is transported in **and** the direction of the movement of the material.

Level 2 (3–4 marks):
At least **one** process for obtaining a specified material is given
and
is correctly linked to the vessel that the material is transported in
or
correctly linked to a description of the direction of movement of the material

Level 1 (1–2 marks):
At least **one** process (P) for obtaining a material is given
or
at least **one** vessel (V) and the material it carries is given
or
there is a description of the direction of movement (M) for at least **one** material

0 marks:
No relevant points are made

examples of points made in the response Ions:
(P) taken up by diffusion or active transport
- from an area of high to low concentration (diffusion) **or** an area of low to high concentration (active transport)
  (V) travels in the xylem
  (M) to the leaves **or** from the roots / soil

Water:
(P) taken up by osmosis
- from an area of low to high concentration
  allow high concentration of water to low concentration of water
  allow from high water potential to low water potential
  ignore along a concentration gradient
  (V) travels in the xylem
  (M) to the leaves **or** from the roots / soil
  (P) transpiration stream
- movement replaces water as it evaporates from leaves
  (V) in the xylem

Sugar:
(P) made during photosynthesis
(V) travels in the phloem
(M) to other parts of the plant **or** to storage organs **or** travels up and down

[6]

Q11.

(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 <u>wilt</u>

1

because plants lose too much water (by evaporation)

1

through the <u>stomata</u>
or
because cells become <u>plamolysed</u>
or
<u>stomata</u> close
controlled by <u>guard cells</u>
to prevent <u>wilting</u>

1

[13]

Q12.

(a) (i) water / H_2O

accept oxygen

allow H_2O

*do **not** allow H^2O 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) <u>hairs</u>

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]

Q13.

(a) A - atrium

ignore references to right / left

1

B - ventricle

1

(b) (i) muscular

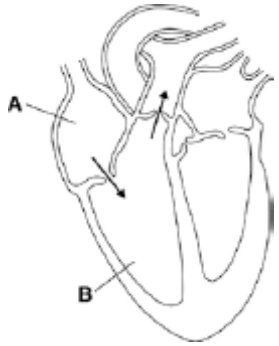
1

(ii) push blood

accept pump / force

1

(c)



arrows approx as indicated

1

arrow(s) showing flow from A to B
from B out / up / to artery

1

(d) (i) male

1

65 and over

1

(ii) fatty deposits / material in (coronary) arteries

allow correct points made about heart attacks

1

narrows / blocks / reduces flow

1

decreases oxygen supply (to heart muscle)

1

[11]

Q14.

(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 $\frac{1.6 - 1.28}{1.6} \times 100$

or $\frac{0.32}{1.6} \times 100$

*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]

Q15.

(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]

Q16.

(a) (i) traps light (energy)

allow uses light / converts light energy to chemical energy

1

for photosynthesis / for making sugar / starch / carbohydrates

ignore food

allow organic molecules

1

(ii) dodder takes sugar / glucose / sucrose from phloem / dodder cannot make its own glucose / carbohydrate

or

phloem has sugar / glucose / sucrose

accept amino acids / fatty acids / other small organic molecule

ignore takes food / minerals / water / nutrients

1

(iii) any **one** from:

- not enough sugar / nutrients to grow / respire
  accept not enough food to grow / respire
- might strangle / restrict growth by squeezing stem tightly
- may damage stem tissues by growing into it
- may smother leaves / block light **so** less photosynthesis / less growth

1

(b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
Description and explanation of an adaptation which only involves hooks **and / or** suckers.

Level 2 (3 – 4 marks)
Description and explanation of adaptations including hooks **and / or** suckers with any other adaptation **or** explanation.

Level 3 (5 – 6 marks)
Description of most correct adaptations **and** explanations.

Examples of biology points made in the response:

- hooks – for holding on / not being detached
- suckers – for holding on / not being detached
- flattened / large surface area – absorption of (large amounts of) food
- no gut – not needed as host digests food
- thick cuticle – protection from host's enzymes / so not digested
- large number of eggs – increased chance of infecting new host
  allow hermaphrodite and self-fertilising – likely to be just one worm per host
  internal fertilisation – gametes not digested

6

[10]

Q17.

(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]

Q18.

(a) any **three** from:

- (water through a) partially permeable

  accept 'semi permeable' / selectively permeable
- membrane
- from dilute to (more) concentrated solution

  allow 'from a high concentration of water to a lower concentration (of water)'
  allow 'from high water potential to low water potential'
  allow 'down a concentration gradient of water'

  *do **not** accept 'along a concentration gradient of water'*
- (it's a) passive (process)

  allow requires no energy

(b) (there are) many hairs **or** thin hairs **or** hairs are one cell thick

1

(which gives) large / increased surface area **or** short diffusion pathway

1

(so there is) more diffusion / osmosis (of water into the root)

ignore absorption

1

[6]

Q19.

(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]

Q20.

(a) any **one** from:

ignore 'check temperature'

- add a water bath
- heat screen
- use LED
- low energy bulb / described

1

(b) (i) rate / number of bubbles decreases

*accept converse with reference to increasing light **or** shorter distance*

or

less oxygen / gas released

ignore reference to rate of photosynthesis

1

(ii) temperature / CO_2 (concentration)

*accept 'it was too cool' **or** not enough CO_2*

accept number of chloroplasts / amount of chlorophyll

allow heat

allow CO2

*do **not** allow CO^2*

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1-2 marks)
There is a brief description of at least 1 tissue **or** at least 1 function of an indicated part of the leaf.

The account lacks clarity or detail.

Level 2 (3-4 marks)
There is a clear description which includes at least 1 named tissue and at least 1 correct function described for an indicated part of the leaf.

Level 3 (5-6 marks)
There is a detailed description of most of the structures and their functions.

Examples of responses:

- epidermis
- cover the plant

- mesophyll / palisade
- photosynthesises
- phloem
- xylem
- transport.

The following points are all acceptable but beyond the scope of the specification:

- (waxy) cuticle – reduce water loss
- epidermis – no chloroplasts so allows light to penetrate
- stomata / guard cells – allow CO_2 in (and O_2 out) **or** controls water loss
- palisade (mesophyll) – <u>many</u> chloroplasts to trap light

  – near top of leaf for receiving more light
- spongy (mesophyll) – air spaces for rapid movement of gases

6

[9]

Q21.

(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]

Q22.

(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]

Q23.

(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 O_2 / O2
ignore O^2/ O

allow H_2O / H2O

ignore H^2O

1

[4]

Q24.

(a) (i) root hairs

if clear which word then allow

1

(ii) xylem

if clear which word then allow

1

(iii) stomata

if clear which word then allow

1

(iv) storage organs

in this order

1

phloem

1

(b) (i) 23.2

1

(ii) loss of water (from flask with plant) from leaves / plant

1

via transpiration / via evaporation

if no other marks allow used in photosynthesis for one mark

1

[8]

Q25.

(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) 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]

Q26.

(a) transpiration

1

(b) (i) 200

correct answer with or without working

if answer incorrect:

*allow **1** mark for 8 × 25 **or***

*allow **1** mark for answer from candidate's count × 25*

2

(ii) **R**

*allow **P** or **Q** if candidate's answer to (b)(i) nearer to value for one of those*

*do **not** allow **R** if the answer to (b)(i) would give an answer of **P** or **Q***

allow R if (b)(i) is blank

1

(iii) few stomat

allow no stomata on upper surface / all stomata on lower surface

1

little / less transpiration **or** little / less water (vapour) loss / enable water to be retained

allow no water loss from upper surface

1

[6]

Q27.

(a) (i) water loss

extra substance(s) cancel

*if transpiration stream described max **1** mark*

1

as a vapour / by evaporation

ignore stomata

1

(ii) stomata / stoma / guard cells

ignore epidermis

1

(b) (i) 2.8

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

if answer incorrect:

*allow **1** mark for (8.6 - 0.2) ÷ 3 **or** 8.4 ÷ 3*

2

(ii) warmer at 16:00 / gets cooler

or *reverse argument for 19.00*

1

faster diffusion / evaporation

accept sun setting as equivalent to heat or light marking points

or

lighter at 16:00 / gets darker (1)

if no environmental factor still allow reason mark

stomata open / more open (1)

eg 'stomata close later in the day'

or

(more) windy at 16:00 / gets less windy (1)

removal of (more) water vapour / steeper gradient (1)

or

air is less humid at 16.00 (1)

allow rain at 19.00

faster diffusion or steeper gradient (1)

1

[7]

Q28.

(a) transpiration

1

(b) increase then decrease

1

maximum rate at 36 - 38 (°C) / 540 - 560 (grams per day)

any figure in these ranges

1

(c) (i) reduce water loss / prevent wilting

allow stops water loss

1

(ii) 40 - 45 °C

1

[5]

Q29.

(a) (i) wind

1

temperature

answers in either order

ignore weather

1

(ii) different plants have different sizes / different numbers of leaves / different sizes of leaves / different plants take up different amounts of water

ignore reference to validity

allow different plants need different amounts of water

1

(b) in table, in sequence:

C

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

B

A

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

*2 correct = **1** mark*

*0 **or** 1 correct = **0** mark*

2

(c) transpiration

1

[6]

Q30.

(a) (i) tissue

extra box ticked cancels the mark

1

(ii) organ

extra ring drawn cancels the mark

1

(b) (i) Layer B

*each extra box ticked cancels **1** mark*

1

Layer C

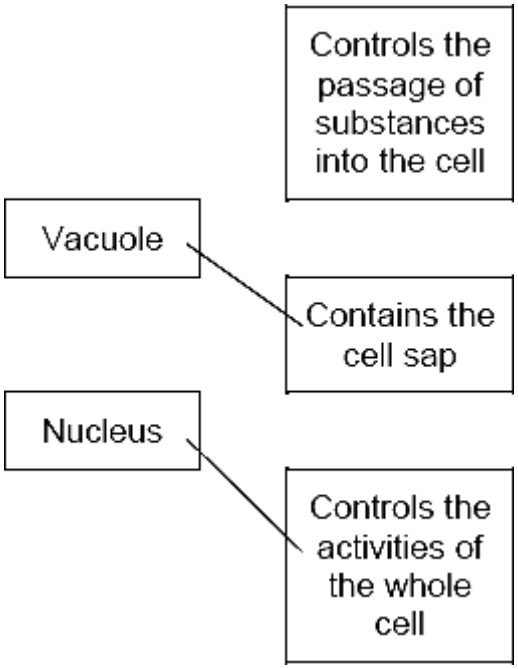
1

(ii) (contain) chloroplasts / chlorophyll

other parts disqualify

1

(c)



*two correct = **2** marks*
*one correct = **1** mark*
extra line from a part of a cell cancels the mark

2

[7]

Q31.

(a) guard cells

1

(b) (i) 2.00 / 2.0 / 2

1

(ii) 0.05 or 1/20

1

(iii) (Q has)
it = Q

large(r) surface area / more stomata / thinner cuticle / larger leaves
accept other sensible answers
1

(iv) wind 30
extra box ticked cancels the mark
1

(c) wilting
extra ring drawn cancels the mark
1

[6]

Q32.

(a) C
1

(b) (i) guard (cell)
1

(ii) temperature water movement / transpiration through stomata / pores / holes /(region) X

or

petroleum jelly blocks / covers stomata / pores / holes / X
1

stomata / pores / holes / X found on lower surface
1

[4]

Q33.

(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]

Q34.

(a) transpiration / evaporation / diffusion

ignore osmosis

1

(b) (i) D

1

(ii) any **two** from:

- <u>more / faster</u> diffusion **or** evaporation **or** transpiration
- molecules move faster
- maintains concentration gradient
  or keeps water concentration low in the air
  or brings in more dry air
  or removes damp air / water

2

[4]

Q35.

(a) guard (cell)

ignore stoma / stomata

1

(b) <u>Species A</u>:

- 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]

Q1.

(a) (i) <u>on diagram</u>:

arrow drawn from cell **X**, through air space and out through stoma above stoma

1

(ii) transpiration

1

(b) (i) 13 – 15

ignore units

1

(ii) any **two** from:

- warmest / hottest / brightest time of day
  *accept warmer / hotter **or** sun higher in sky*
- water evaporates fastest
- stomata open / more open

2

[5]

Q2.

(a) **B**

1

(**B** has) low(est) number of stomata
or no stomata on upper surface
or <u>only</u> 800 (on lower surface)

1

less transpiration / evaporation / water loss owtte
or water (vapour) is lost via stomata

only allow zero water loss if linked to no stomata on upper surface / linked to leaf B upper surface

ignore references to leaf surface area

1

(b) reduce loss / amount of water (vapour)

accept converse

or
reduced transpiration (from upper surface)

*do **not** allow <u>no</u> water is lost*

1

warmer above leaf

accept converse

or wilted leaf folds over lower surface

or lower leaf in shade

ignore reference to dust

or less light / heat / sun on lower side

1

[5]

Q3.

(a) (i) lower – **B** loses less (water / mass) than **C**
or
described in terms of petroleum jelly

*accept converse re Leaf **C***

1

(ii) yes - **B** and **C** lose less than **D or**
B and **C** lose more than **A or**
D loses the most **or**
A loses the least

*do **not** accept just 'all leaves lose some weight'*

1

(b) (i) **X** = stoma

accept stomata / stomatal pore
*do **not** accept air space*

1

Y = guard cell

1

(ii) petroleum jelly blocks stomata / pores
or petroleum jelly prevents water loss
or petroleum jelly waterproofs

*allow pores are blocked in **B***

1

water (mainly) lost via stomata / pores / **X**
or stomata on lower surface only

1

[6]

Q4.

Quality of written communication

for ideas given in a sensible order;
comparison made for geranium and cactus for each feature
(ie not just list for geranium followed by list for cactus)
+ linking of feature & explanation

1

any **four** features + explanations from:

cactus has:

accept converse points for geranium plant

Feature	Explanation
thicker cuticle	waterproof / keeps water in
smaller surface area	less water loss / less heat absorbed
fewer stomata	less water loss
stomata open at night / closed in day	(closed when warmest) – so less water loss
more widespread roots	quickly absorbs water (after rain) / access to bigger area for absorbing water / absorb more water
more water <u>storage tissue</u>	little water available in environment / can survive drought / avoids dehydration

4

[5]

Q5.

(a) water [1]

oxygen [1]

(sun) light or solar [1]

*do **not** accept sun's*

chlorophyll [1]

*do **not** accept chloroplasts*

4

(b) any **two** from:

stored as fructose
stored as sucrose
stored as starch
stored as oil **or** lipid
moved or transported away <u>in the phloem</u>

*do **not** accept "stored" by itself*

respired or burnt up for energy or
fuel changed to protein

changed to cellulose
changed to fructose
changed to starch
changed to oil or lipid

*do **not** accept "food for plant"*
*do **not** accept "used up" by itself*

2

(c) (i) roots or root hair (cells)

1

(ii) the mineral salts are (dissolved) in water [1]

water transports salts throughout the plant
or water enables osmosis or diffusion to take place [1]

2

(d) (i) plants grow better with some nutrients than none
or
plants grow better with nitrates than without

comparison is needed
accept "faster" as equivalent to "better"
accept don't grow well with only water

1

(ii) 0.14(g)

*units **not** needed*

1

(iii) making protein **or** amino acids

*do **not** accept help them grow*
*accept named protein **or** DNA **or** chlorophyll*

1

any **two** from:

(iv) type **or** variety **or** starting weight **or**

2

(iii) size of seedlings

keep the environment the same
*only if light **or** temperature **or** day length not already credited*

light
temperature not heat
time of growth

*do **not** accept the same equipment*
*do **not** accept help them grow*

1

day length
amount of culture solution **or/**size of

accept named protein, DNA chlorophyll

boiling tube

number of seedlings per tube
pH
CO_2
humidity

[15]

Q6.

(a) capillaries

1

(b) (oxygen) in red blood cells **or** haemoglobin

*the candidate **must** make clear which substance is which for **2** marks*

1

(carbon dioxide dissolved in) the plasma

accept in haemoglobin in regions of high carbon dioxide concentration

*accept for **1** mark oxygen + CO_2 is transported by red blood cells **or** haemoglobin*

*do **not** credit red + white blood cells **or** combinations of right + wrong answers*

1

(c) **one** mark for each up to a maximum of **three**

red blood cells

*award **1** mark for blood cells if no red or white*

white blood cells (or named white blood cell up to **2**)

platelets

urea

accept nitrogenous waste

*do **not** credit waste substances **or** products*

minerals (**or** one named mineral)

*accept ions **or** salts*

vitamins

water

hormones (named hormone up to 3)

protein (named blood proteins up to 2)

glucose

accept other named soluble sugar

*do **not** credit sugar(s) **or** blood sugar **or** sucrose*

fatty acids **or** glycerol

amino acids

digested food **or** nutrients (if individual foods not credited)

*do **not** credit starch **or** carbohydrates*
*do **not** credit nutrition **or** food*
*do **not** credit oxygen*
*do **not** credit haemoglobin*

carbon dioxide

accept nitrogen

antibodies

antitoxins

drugs **or** toxins (named up to 2)

bacteria **or** viruses

cholesterol

3

[6]

Q7.

(a) (i) light **or** solar

*do **not** credit sun's energy*
*do **not** credit radiant*

1

(ii) chlorophyll

1

(iii) chloroplast

1

(iv) CO_2 **+** H_2O

reactants identified (accept words)

1

$C_6H_{12}O_6 + O_2$

products identified (accept words)

1

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

balanced equation

1

(b) any **two** from:

increased CO_2 concentration

increased water supply

increased temperature (up to a point)
increased light intensity
*do **not** accept heat or warmth*

altered light quality by less green **or** increasing other colours

2

(c) any **four** points

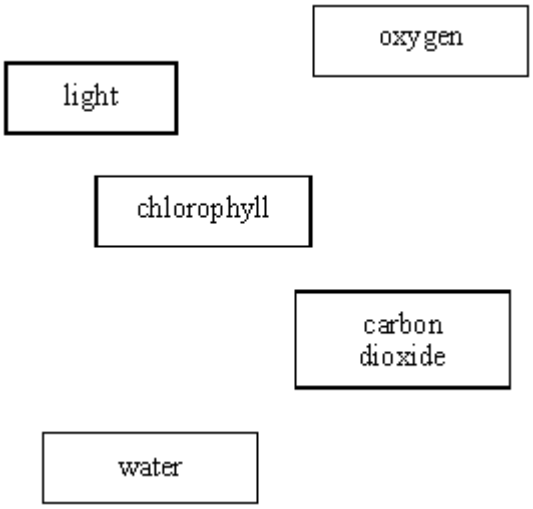
- palisade (mesophyll)
- lots of chloroplasts **or** chlorophyll **or** main site for photosynthesis **or** absorb maximum amount of light
- guard cells
- CO_2 in **or** O_2 out **or** water vapour out
- controls size of stoma **or** pores in leaf
  ***allow** stomata*

4

[12]

Q8.

(a)



5

(b) (i) sugar **or** carbohydrate

1

(ii) it can be stored **or** it is insoluble
accept it has no osmotic effect

1

(iii) any **one** from:
respires it **or** releases **or** transfers energy
turns it **or** stores it as fructose **or** sucrose **or** lipid **or** protein **or** cellulose

1

(c) (i) photosynthesis

1

(ii) any **one** from:
flat surface
stomata
thin
chloroplasts
veins
large surface area
air spaces

*do **not** accept chlorophyll*

1

[10]

Q9.

(i) the mass got less

accept it got lighter

*award **1** mark for water was lost from the plant*

1

water was taken into the plant **or** roots absorbed water

*do **not** accept soaked into plant*

1

and lost through transpiration **or** the leaves **or** evaporated from the leaves **or** stomata

1

(ii) to check the effect of the plant **or** to act as a control **or** to show that it was not due to evaporation from water

*do **not** accept to keep it fair **or** to check that it was fair*

*do **not** accept fair test*

1

[4]

Q10.

(a) mesophyll / / / / (all correct) sperm / / x / (all correct)

for 1 mark each

2

(b) (i) absorbs light/to produce food/photosynthesis
(allow references to gaseous exchange)
for 1 mark

1

(ii) has chlorophyll/chloroplasts to absorb light/produce food
for 1 mark each
(if linked to gas exchange allow – moist surface/ dissolve gases)

2

[5]

Q11.

(a) quick
cheap / many can be produced from one plant
cuttings produce plants identical (to parents) / outcome known
any two for 1 mark each

2

(b) *idea that* provides damp atmosphere / less likely to wilt
reduces or stops transpiration or water loss / keeps it warmer
(*reject prevents animals eating it*)
for 1 mark

1

[3]

Q12.

(a) water / damp / wet
or
suitable temperature / warm / heat / hot
or
light / sun
(*accept* rooting powder / soil qualified e.g. fine / nutrients / fertiliser / minerals)
(*do NOT allow* oxygen / carbon dioxide / food)
for 1 mark

1

(b) *advantage*
quick / cheap / several from one plant / known outcome / same as <u>parent</u>
(*reject* all the same)
disadvantage
<u>all</u> the same / all get same disease
for 1 mark each

2

[3]

Q13.

(a) (long) roots

1

(b) prevents water from evaporating

accept to reduce/stop water loss

1

[2]

Q14.

(a) 6 6 6

all required

accept a '6n 6 n n 6n' version of the balanced equation provided it is correct in every detail

1

(b) any **two** of

- (presence of) chlorophyll **or** (amount of) chloroplasts

  accept green leaves (or other green parts)

- (sufficient) light (intensity)

- (light) of **a** suitable wavelength

  any light other than green light

  do not credit Sun's energy or sunshine or Sun

2

(c) **guard cells**

any **two** of

* control by osmosis
* the movement of gases

*accept movement of carbon dioxide **or** oxygen **or** water vapour beware movement of CO_2 out*

accept a diagram or description

* through the stoma

2

palisade cells

any **two** of

* near the upper surface
* contain (a great) many **or** more chloroplasts
* (so) contain the most chlorophyll

2

(d) any three of

* for respiration
* conversion to (insoluble) starch

or to food store **or** to (other)carbohydrates
* (conversion to) sucrose **or** to food store **or** to (other) carbohydrates

or polysaccharides

*do not credit just to grow **or** live*

***or** survive*

accept conversion to food store

***or** to (other) carbohydrates once only*

* (conversion to) lipids **or** fats **or** oils
* (conversion to) amino acids **or** (plant) proteins **or** auxins **or** (plant) hormones **or** enzymes

3

[10]

Q15.

(a) (i) photosynthesis

1

(ii) respiration

do not credit combustion

do not credit decay

1

(iii) dry

*accept hot **or** windy **or** drought*

1

(b) any **three** from

* evaporation (of water)

***or** loss of water vapour*

* (mostly) from the leaf / leaves

do not credit incorrect reference to leaves

* through the stomata

accept through each stoma

accept through the stomas(sic)

* causing a pull

***or** causing an increase in osmotic potential (at the top of the plant)*
***or** causing an increase in water potential (at the top of the plant) **or** causing a decrease in osmotic pressure (at the top of the plant)*

* (so that) water moves up (through the plant)

do not credit water vapour moves up through the plant

* as the transpiration stream

* water enters through roots (and goes up plants)

3

[6]