

Q1.

- (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 1
ignore to fly unqualified
- 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 1
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 1
allow spines / spikes / prickles
ignore stings
*do **not** accept thorns protect (the plant) from predators*
- (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]

Q2.

(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]**Q3.**

- (a) a fungus

1

- (b)
- Level 3 (5-6 marks):**

Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

Level 2 (3-4 marks):

Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

Level 1 (1-2 marks):

Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

Level 0

No relevant content

Indicative content

	defence	description of defence
animals	skin	sebum / oils to kill microbes dead layer difficult to penetrate
	nose	hairs keep out dust and microbes
	trachea / bronchi	mucus traps microbes cilia moves mucus



	stomach	(hydrochloric) acid kills bacteria
	white blood cells	produces antibodies produces antitoxins engulf microbes / phagocytosis
plants	cell wall	tough / difficult to penetrate
	waxy cuticle	tough / difficult to penetrate
	dead cells / bark	fall off, taking pathogens with them
	production of antibacterial chemicals	kill bacteria
fungi	antibiotic production	kill bacteria

6

(c) any **three** from:

- sterilise agar (before use)
- sterilise (Petri) dish before use
- disinfect bench (before use)
- pass inoculating loop (through flame)
- secure lid with (adhesive) tape
- minimise exposure of agar / culture to air / lift and replace lid as quickly as possible

allow:

- *dip loop into ethanol (after flaming)*
- *keep the lid on the plate for as long as possible*
- or**
- *minimise exposure of agar to air*
- or**
- *only tilt the lid off (rather than remove it)*
- *flame the neck of the bottle*

3

(d) to prevent the growth of a harmful pathogen

1

[11]

Q4.

(a) stinging hairs / can sting

1

(so) this harms herbivores / stops animals eating them

1

(so) less of the plant is removed / damaged

1

(b) clove (oil)

1

it has the largest areas with no bacteria growing
allow largest inhibition zone or description of largest inhibition zone

1

(c) antibiotics were not tested

1

[6]

Q5.

(a) **A**

1

(b) **D**

1

(c) use the same type of plant
or
 give equal amount of water to each plant
ignore size of pot

1

(d) (advantage) more minerals

1

(disadvantage) cost / not free

1

[5]

Q6.

(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]**Q7.**

- (a) compare them to (pictures in) a gardening manual / website

1

send to laboratory (for testing)

1

- (b) (nitrate) stunted growth

1

(magnesium) yellowing of leaves

allow chlorosis

1

- (c) (fertiliser
- S**
-)

has most nitrogen for good growth

if no other marks awarded allow 1 mark for (fertiliser s) has more minerals than compost

1

(and) has high(est) potassium content for stronger roots

1

(it is also) cheaper than fertiliser **T**

1

(however) has less phosphate than fertiliser **T** (although more than compost) so flowers / fruit perhaps less important for the gardener

1

[8]**Q8.**

- (a) protein

1

- (b) (i) (more) magnesium gives more growth / more leaves / more duckweed
-
- if converse must be clear that less magnesium gives less growth*

1

- (ii) **A** gave highest number of leaves / plants **or** more than others
it equals 'A'
*use of numbers must compare **A** with at least one other*

or

- A** gave most growth / most duckweed **or** more than others
allow faster / fastest / better / best growth
allow more growth with nitrate / less growth without nitrate
do not allow 'no' growth without nitrate

- (c) (i) mark (c) as a whole

sensible method:

e.g. mass / weighing

*ignore dry or fresh**allow other sensible method involving measuring eg length of roots – ignore 'size' of roots or measure roots unqualified*

1

- (ii) corresponding explanation:

*ignore accuracy*e.g. includes roots / includes whole plant**or**

leaves vary in size

or

(length / mass / surface area given in c(i)) is a continuous variable

1

[5]**Q9.**

- (a) less carbon dioxide used
or higher carbon dioxide (concentration) in jar
*do **not** allow no carbon dioxide used or no change in carbon dioxide*

1

because less photosynthesis **or** light was a limiting factor
*do **not** allow no photosynthesis*

1

- (b) magnesium / Mg
*do **not** allow manganese / Mn*
allow iron / Fe
ignore nitrates

1

[3]

Q10.

(a) photosynthesis

*do **not** accept other additional processes*

1

(b) (i) any **three** from, eg:

ignore time / apparatus

- mass of pondweed

type of pondweed = max 2

accept amount / volume / length / size

ignore number / surface area of leaves / pondweed unqualified

- volume of water

accept amount

- other reasonable features of the water

- light intensity

accept distance between light source and tube / pondweed

- light colour

accept light if neither colour nor intensity is given

- carbon dioxide

- temperature

- pH

3

(ii) any **one** idea from, eg:

ignore reference to cost

- how much oxygen they give off

- is pondweed poisonous to fish

- will fish eat pondweed

- is pondweed harmful to environment

- how long the pondweed lives

- growth rate / size of pondweed

- reference to appearance / aesthetics

- availability

1

(c) magnesium / Mg



accept iron / Fe
ignore ion and + or -
ignore nitrate

1

[6]

Q11.

(a) root

1

(b) (i) chlorophyll

1

(ii) absorbs / traps / takes in light

*do **not** accept attracts / solar energy / sunshine / sun*

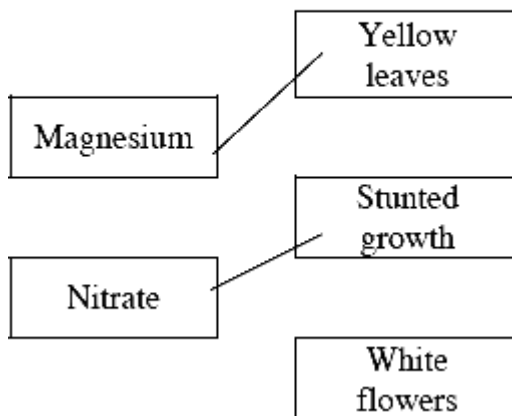
1

(for) photosynthesis

accept to make food / glucose / sugar/ biomass

1

Mineral ion	Effect of its shortage
-------------	------------------------



(c)

1 mark per correct line
extra line from a mineral ion cancels the mark

2

[6]

Q12.

(a) any **three** from:

- ((mean) mass) increases up to 7 / 8 units (of light) then levels off
- light limiting factor up to 7 / 8 units
- for photosynthesis
must be in correct context
- other factor / temperature limiting above 7 / 8 units

3

(b) any **two** from:

- cost of providing conditions / heat / light / CO₂
- effect of treatment on profit
allow too much of factor is wasteful
- relevant use of data from graph eg limiting factors
- named other factors eg fertiliser / pest control / weeds / density of planting
allow taste / appearance

2

(c) **nitrate function**

produce amino acids / proteins / enzymes
ignore DNA
*do **not** allow chlorophyll*

1

nitrate deficiency

stunted growth
allow description
ignore plant dies

1

magnesium function

produce chlorophyll
ignore chloroplasts

1

magnesium deficiency

yellow leaves / plant
ignore plant dies

1

[9]

Q13.

use less nitrate / fertiliser

accept use none
use a different fertiliser is neutral
prevent nitrate fertiliser run off is neutral

1

any **two** from:

explanation that with less or none the crops still grow

make more land available to grow more crops

monitoring of water

legislation

organic farming / manure

genetically modified crops

give babies bottled water

2

[3]**Q14.**

- (a) *idea:*
 wood goodness recycled/crops goodness removed
gains 1 mark

1

but
 wood minerals/nutrients recycled/crops remove nutrients/minerals
gains 2 marks

wood and crops compared
for 1 mark

2

- (b) (add) fertiliser/nutrients/minerals
 (add) manure/animal waste/compost
any two for 1 mark each

(accept move to new area for 1 mark)
 rotation

max marks 2

2

[5]