



## Mark schemes

<b>1</b>	(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	1	
	<i>allow largest inhibition zone or description of largest inhibition zone</i>	1	
	(c) antibiotics were not tested	1	
		1	<b>[6]</b>
<b>2</b>	(a) <b>A</b>	1	
	(b) <b>D</b>	1	
	(c) use the same type of plant	1	
	<b>or</b>		
	give equal amount of water to each plant	1	
	<i>ignore size of pot</i>	1	
	(d) (advantage) more minerals	1	
	(disadvantage) cost / not free	1	
		1	<b>[5]</b>
<b>3</b>	(a) to kill virus	1	
	<b>or</b>		
	to prevent virus spreading	1	
	(b) take (stem) cells from meristem	1	
	<b>or</b>		
	tissue culture	1	
	<i>allow take cuttings</i>	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]****4**

- (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]****5**

- (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]****6**

- (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]

7

(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 <sup>+</sup> or <sup>-</sup>*

*ignore nitrate*

1

**[6]****8**

- (a) root

1

- (b) (i) chlorophyll

1

- (ii) absorbs / traps / takes in light

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

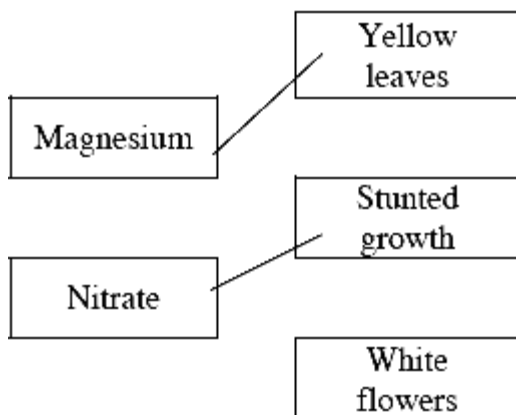
1

- (for) photosynthesis

*accept to make food / glucose / sugar/ biomass*

1

(c) **Mineral ion**                      **Effect of its shortage**



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

2

[6]

9

(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 / CO<sub>2</sub>
- 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]



**10**

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]****11**(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]**