

Mark schemes

**Q1.**

(a) pathogens 1

(b) viruses reproduce inside cells, damaging them 1

(c) any **one** from:

- they do not have a cell membrane  
*do not accept they do not have a cell wall*
- they do not have cytoplasm
- they do not have a nucleus
- they do not have mitochondria (like most eukaryotic cells)
- they do not have ribosomes  
*do not accept they do not have chloroplasts / chlorophyll*  
*ignore they are not living / alive*  
*ignore they can only replicate inside cells*  
*ignore virus has a protein coat*

1

(d) a weakened form of a virus 1

(e)

1

(f) leaf 1

(g) y-axis labelled rate of photosynthesis in arbitrary units 1

correct scale 1

all bars plotted correctly  
*allow a tolerance of  $\pm \frac{1}{2}$  small square*  
*allow 2 correct bars for 1 mark*

- allow bars touching*  
*allow any width of bars*
- 2
- all bars correctly labelled  
*ignore letters*
- 1
- (h) as the level of infection (with TMV) increases, (the rate of) photosynthesis decreases  
*allow as TMV increases, photosynthesis decreases*  
*allow (the rate of) photosynthesis decreases as the level of infection (with TMV) increases*  
*allow as infection gets worse, photosynthesis decreases*  
*allow TMV reduces photosynthesis*
- 1
- (i) less chlorophyll  
*allow fewer chloroplasts*  
*allow less light absorbed*  
*ignore less photosynthesis*
- 1
- (so) less glucose / starch / protein made
- 1
- [14]

**Q2.**

- (a) (has) spikes / thorns / prickles  
*allow (has a) tough outer layer*
- 1
- (b) chemical
- 1
- (c) the plant will not lose as much water
- 1
- (d) chlorophyll / chloroplasts
- 1
- (e) to allow it to photosynthesise  
**or**  
to make sugar / glucose / carbohydrate / starch
- 1
- (f) organ
- 1
- (g) water / mineral ions

*allow named mineral ions*  
*allow minerals / ions*

1

(h) phloem (tissue)

1

**[8]****Q3.**

(a) will stop animals / herbivores eating it

*allow it will not be eaten*

1

(b) chemical

1

(c) thorns / spikes / spines / prickles (to stop animals / herbivores eating it)

1

(d) for respiration

1

to store as starch

1

(e) add Benedict's (solution / reagent to the liquid)

1

boil / heat

*allow any temperature of 65 °C or above*

1

(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick) red

1

(f) (nitrate ions are needed) to make proteins / amino acids

*allow to make chlorophyll / DNA / ATP / nucleic acid*

1

which are needed for growth / enzymes / new cells

*allow correct process for named molecule in mp1*

1

(g) in / on the (soil) water

*allow through air (spaces) in the soil*

1

(h) dosage

1

toxicity

(i) placebos

1

1

[14]

**Q4.**

(a) mechanical

*allow physical*  
*allow structural*

1

(b) any **one** from:

- to deter herbivores  
*ignore to injure animals, unqualified*  
*allow to deter animals eating it*  
*do **not** accept to deter predators*
- to prevent animals damaging it

1

(c) chemical

1

(d) any **two** from :

- lack of magnesium (ions) (1)  
  
(so) not enough chlorophyll for (efficient) photosynthesis (1)  
  
(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)  
*allow (so) lack of chlorophyll produced*  
*causes yellow leaves (1), (so) not*  
*enough*  
*photosynthesis to produce glucose*  
*which is used to make proteins for*  
*growth (1)*
- infection by pathogen / bacteria / virus / fungus (1)  
*allow correctly named pathogen*  
*allow has rose black spot / TMV*  
  
(so) leaves become discoloured / yellow so less photosynthesis (1)  
*allow other symptoms of named*  
*pathogens / disease*  
  
(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)  
*award once only*
- infected by aphids (1)

(which) remove sugars from phloem (1)	
(so) not enough glucose to make proteins for growth <b>or</b> not enough glucose to release energy for growth (1)	
<i>award once only</i>	
• lack of (available) light (1)	
(so) chlorophyll breaks down (1)	
(so) not enough glucose to make proteins for growth <b>or</b> not enough glucose to release energy for growth (1)	
<i>award once only</i>	5
(e) (bacteria) obtain glucose / sugar (from the plant)	1
(glucose used) for respiration <b>or</b> (glucose used) for making other named substances	
<i>allow (glucose used) to release energy</i>	1
(f) (gorse plant) obtains nitrate (ions)	1
needed for amino acids / proteins	
<i>allow needed to make chlorophyll / DNA</i>	1
(g) willow bark	1
	<b>[13]</b>

**Q5.**

(a) phloem	1
(b) translocation	1
(c) either:	
less (sugars for) respiration	1
(so) less energy released	1
<b>or</b>	
less amino acids made (1)	
(so) less protein produced <b>or</b> 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]

**Q6.**

(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**

	<b>defence</b>	<b>description of defence</b>
<b>animals</b>	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
<b>plants</b>	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
<b>fungi</b>	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]

**Q7.**

(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]

**Q8.**

- (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]

**Q9.**

- (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]

**Q10.**

- (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]