

Q1.

- (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]**Q2.**

- (a) any **two** from:
- regular hand washing
 - or**
 - use hand sanitiser / alcohol gel
 - cover nose / mouth when coughing / sneezing

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- allow wear a face mask*
- put used tissues (straight) in the bin
 - don't kiss uninfected people
- allow isolate patient from others*
- or**
- don't share cutlery / cups / drinks with uninfected people
- clean / disinfect / sterilise surfaces regularly
- ignore responses referring to infected people*
- 2
- (b) any **three** from:
- stimulate (mouse) lymphocytes to produce antibody
- for marking points 1 and 2 lymphocyte must be used at least once*
- combine (mouse) lymphocyte with tumour cell
- or**
- (create a) hybridoma
 - clone (hybridoma) cell
 - (hybridoma) divides rapidly **and** produces the antibody
- 3
- (c) any **two** from:
- (monoclonal) antibody binds to virus **or** antibody binds to antigen on surface of virus
 - (monoclonal) antibody is complementary (in shape) / specific to antigen (on surface of virus)
 - white blood cells / phagocytes kill / engulf the virus(es)
- 2
- (d) as a control
- or**
- to see / compare the effects of the treatment (vs. no treatment)
- 1
- (e) $(4.8 + 10.4) \div 2 \div 100 \times 1500$
- or**
- $(4.8 \div 100 \times 750) + (10.4 \div 100 \times 750)$
- 1
- 114
- an answer of 114 scores 2 marks*
- allow 228 for 1 mark*
- 1
- (f) **(supports the conclusion because)**
- over double the number / % of patients (in the trial) were hospitalised with the placebo (compared to MAB)
- 1
- (does not support the conclusion because)**
- no information on patients not hospitalised / still unwell at home
- or**
- other factors may have affected those admitted to hospital
- allow correct named factor e.g. age / gender / other illness*
- or**
- don't know if it was a double blind trial

Q3.

- (a) **A** 1
- (b) any **one** from:
• identify / locate specific molecules / other hormones
• locate blood clots
• diagnose / treat some cancers 1
- (c) (as) urine passes through reaction zone 1
- HCG hormone binds to the mobile HCG antibody (in the reaction zone) 1
- (passes up the stick) HCG hormone binds to the immobilised HCG antibodies in the results zone 1
- (the other) antibodies which do not attach to HCG 1
- bind to antibodies in control zone 1
- blue dye appears in both control and results zones (to show positive result) 1

[8]