M1.(a) 1. (Releases) toxins;
2. Kills cells / tissues.

2. Accept any reference to cell / tissue damage

Ignore infecting / invading cells

2

(b) 1. Water potential in (bacterial) cells higher (than in honey) / water potential in honey lower (than in bacterial cells);

Q candidates must express themselves clearly

1. Must be comparative e.g. high WP in cell and low WP in honey

2. Water leaves bacteria / cells by osmosis;
3. (Loss of water) stops (metabolic) reactions.

3. Needs a reason why lack of water kills the cell

3

[5]

M2.(a) Any **two** from:
1. (Decrease linked to) few(er) cases of whooping cough;
2. (Decrease linked to) risk of / fear of side effects;
3. Insufficient vaccine available / too expensive to produce / distribute.

3. Too expensive unqualified is insufficient for mark

2 max

(b) 1. Vaccination rate increases;
2. Fewer people to spread the disease / whooping cough / more people immune / fewer susceptible.

2. Neutral − greater herd effect

2. Allow description of immune

***Q** Reject 'resistant'.*

2

(c) 1. More people are immune / fewer people carry the pathogen;

If neither point 1 or 2 awarded

Herd immunity = 1 mark

Unvaccinated does not mean infected

*1. **Q** Do not accept disease for pathogen*

2. So susceptible / unvaccinated people less likely to contact infected people.

2

[6]

M3.(a) Regulator protein.

Accept regulator protein antigen

Reject regulator protein receptor

Ignore regular protein

1

(b) 1. Lipid soluble / hydrophobic
2. Enters through (phospholipid) bilayer

OR

3. (Protein part of) LDL attaches to receptor
4. Goes through carrier / channel protein.

4. Accept by facilitated diffusion or active transport

4. Reject active transport through channel protein

2

(c) Any **two** from:

1. (Monoclonal antibody) has a specific tertiary structure / variable region / is complementary to regulator protein

Do not award MP1 if reference to active site.

2. Binds to / forms complex with (regulator protein)

"It" refers to monoclonal antibody in MP1 and MP2

3. (So regulator protein) would not fit / bind to the receptor / is not complementary to receptor

3. Reject receptor on LDL

2 max

(d) 1. Injection with salt solution

1. Accept inject placebo in salt solution

2. Otherwise treated the same.

2

[7]

M4.(a) (i) 1. (Tumour suppressor) gene inactivated / not able to control / slow down cell division;

Ignore: references to growth

2. Rate of cell division too fast / out of control.

1 and 2 Accept: mitosis

1 and 2 Reject: meiosis

2

(ii) 1. (Genetic) code degenerate;

Accept: codon for triplet

Accept description of degenerate code, e.g. another triplet codes for the same amino acid

2. Mutation in intron.

Accept: mutation in non-coding DNA

1 max

(b) 1. Antibody has specific tertiary structure / binding site / variable region;

Do not accept explanations involving undefined antigen

2. Complementary (shape / fit) to receptor protein / GF / binds to receptor protein / to GF;

Ignore: same shape as receptor protein / GF

3. Prevents GF binding (to receptor).

3

[6]

M5.(a) 1. Outside of virus has antigens / proteins;

2. With complementary shape to receptor / protein in membrane of cells;

3. (Receptor / protein) found only on membrane of nerve cells.

Accept converse argument

3

(b) 1. No more (nerve) cells infected / no more cold sores form;
2. (Because) virus is not replicating.

2

(c) Prevents replication of virus.

1

(d) MicroRNA binds to cell's mRNA (no mark)
1. (Binds) by specific base pairing;
2. (So) prevents mRNA being read by ribosomes;
3. (So) prevents translation / production of proteins;
4. (Proteins) that cause cell death.

4

[10]

M6.(a) 1. Antibody has tertiary structure;
2. Complementary to binding site on protein.

2

(b) 1. Prevents false negative results;
2. (Since) shows antibody **A** has moved up strip / has not bound to any *Plasmodium* protein.

2

(c) 1. Person is infected with *Plasmodium* / has malaria;
2. Infected with (*Plasmodium*) *vivax*;
3. Coloured dye where antibody **C** present;
4. That only binds to protein from *vivax* / no reaction with antibody for *falciparum*.

Person is infected with P. vivax / Plasmodium vivax = 2 marks (MP1 and MP2)

4

[8]