



**Exampro A-level Biology
(7401/7402)**

Name:

Class:

Immunology MS

Author:

Date:

Time: **115**

Marks: **85**

Comments:

These questions mix the different styles of questions. Short answers, practical techniques, experimental data analysis, extended answer and comprehension Work through these, the more you do the better you will become with your exam technique.

M1. (a) Phagocytes engulf pathogens / microorganisms;
Enclosed in a vacuole / vesicle / phagosome;
Lysosomes have enzymes;
That digest / hydrolyse molecules / proteins / lipids / microorganism;

3 max

(b) (i) Get another strain / there are different strains;
Therefore does not have memory cells against second strain;
Q The second marking point should only be awarded in the context of memory cells.

2

(ii) Vaccines only work against certain strains because the antigens they possess are different;
Enables company to target strain likely to be prevalent later / most common strain;

2
[7]

M2. (a) divide by mitosis / form clones;
produce plasma cells;
(plasma cells) make antibodies;
(plasma cells) produce memory cells;

4

(b) glycoprotein;
different shape to body proteins / body phospholipids are the same / located on the outside of the cell / the haemoglobin is located inside the cell;

2
[6]

M3.(a) Has more than one / four polypeptide chains / made up of polypeptide chains;

1

- (b)
1. Antibody / variable region has specific amino acid sequence / primary structure;
 2. The shape / tertiary structure of the binding site is complementary to / fits / binds with these antigens;
2. Do not accept active site for this point.
 3. Forms complex between antigen and antibody;

3

[4]

M4.(a) (To diagnose AIDS, need to look for / at)

1. (AIDS-related) symptoms;
2. Number of helper T cells;
Neutral: 'only detects HIV antibodies' as given in the question stem

2

- (b)
1. HIV antibody is not present;
Accept HIV antibodies will not bind (to antigen)
 2. (So) second antibody / enzyme will not bind / is not present;

2

- (c)
1. Children receive (HIV) antibodies from their mothers / maternal antibodies;
 2. (So) solution will always turn blue / will always test positive (before 18 months);
Allow 1 mark for the suggestion that the child does not produce antibodies yet so test may be negative

2

(d) (Shows that)

1. Only the enzyme / nothing else is causing a colour change;
2. Washing is effective / all unbound antibody is washed away;

2

[8]

- M5.(a)** Straight lines point to point as not possible to predict intermediate values / values between points; 1
- (b) Increases then levels / falls;
Maximum antibody production 180 units / at dose of 0.25 g per kg; 2
- (c) Two marks for correct answer of 57.14 / 57.1;;
One mark for incorrect answer in which candidate clearly divides difference in antibody production / 60 by 105; 2
- (d) Takes into account different masses of mice / allows comparison;
Accept different weights of mice.
Do not accept different size. 1
- (e) Sheep red blood cells have antigens (on their surface);
Antigens are proteins foreign to mice / are non-self;
Stimulate B cells to produce antibodies; 3
- (f) Response only observed in mice;
Disease organisms not investigated;
Not all disease caused by pathogens / cured by antibodies;
i.e. not tested on humans 2 max

[11]

- M6.(a)** (i) To show whether immune response occurred / because cats are (genetically) related to cheetahs;
Ignore reference to control. 1

(ii) To show that rejection did not normally occur / skin could (successfully) be grafted;

1

(b) (i) Rapid rejection between unrelated (domestic) cats / cats are **not** genetically similar;
Rapid rejection between (domestic) cat and cheetah / cats and cheetahs are not genetically similar;
Slow / no rejection in cheetahs / cheetahs are genetically similar;

3

(ii) Sample size small;
Time observed was short;

1 max

(iii) Similar (antigens on all cheetahs);
Accept same / not very different

1

(iv) Protein / antigen production determined by alleles / genes / base sequence on DNA;
The more similar the proteins the more similar their alleles / genes / base sequence on DNA / the more they are genetically similar;

2

[9]

M7. (a) Injection of antigens / toxoids;

(Antigen from) attenuated microorganism / non-virulent microorganisms / dead

microorganisms / isolated from microorganism;

Stimulates the formation of memory cells;

max 2

(b) (i) Antibodies are specific to mumps antigen;
2nd antibodies specific to mumps antibody;

1

(ii) Removes unbound 2nd antibodies;
Otherwise enzyme may be present / may get colour change

anyway / false positive;

2

- (iii) No antibodies to bind (to antigen);
Therefore 2nd antibody (with the enzyme) won't bind / no enzyme /
enzyme-carrying antibody present
(after washing in step 4);

2

[7]

- M8.** (a) (i) protein / immunoglobulin;
specific to antigen;
idea of 'fit' / complementary shape;

2 max

- (ii) 1. virus contains antigen;
2. virus engulfed by phagocyte / macrophage;
3. presents antigen to B-cell;
4. memory cells / B-cell becomes activated;
5. (divides to) form clones;
6. by mitosis;
7. plasma cells produce antibodies;
8. antibodies specific to antigen;
9. correct reference to T-cells / cytokines;

6 max

- (b) 1. antibody gene located using gene probe;
2. cut using restriction enzyme;
3. at specific base pairs;
4. leaving sticky ends / unpaired bases;
5. cut maize / DNA / vector using same restriction enzyme;
6. join using DNA ligase;
7. introduce vector into maize / crop / recombinant DNA into maize;

4 max

- (c) passive / person is not making own antibodies / antibodies not replaced;
memory cells not produced;

2

- (d) fewer ethical difficulties / less risk of infection;

1

[15]

- M9.(a)** 1. Infected by / susceptible to (other) pathogen(s) / named disease caused by a
pathogen (from environment);

Context is where immune system cannot prevent or stop these events

Allow attack / kill

2. Pathogen(s) reproduce / cause disease (in host);
MPs not given in context of HIV
3. Damage cells / tissues / organs;
4. Release toxins;

3 max

- (b) (i)
1. (HIV enters cells) before antibodies can bind to / destroy it;
Ignore SAFETY comments
1. and 2. Relate to antibodies
 2. Antibodies cannot enter cells (to destroy HIV) / stay in blood;

OR

3. (Enters cells) before (secondary) immune response caused / before memory cells have time to respond;
3. and 4. Relate to virus
4. So no antibodies present (to attack HIV);

OR

5. Vaccine taken up too quickly to cause immune response;
5. and 6. Relate to vaccine
6. So no antibodies / memory cells formed;

2 max

- (ii)
1. Antigen (on HIV) changes;
Accept mutates
 2. (Specific) antibody / receptor no longer binds to (new) antigen;
Ignore SAFETY comments

OR

3. Many different strains of HIV / many antigens present on HIV;
4. Not possible to make a vaccine for all antigens / vaccine may not stimulate an antibody for a particular antigen;

2 max

- (c) 3 suitable suggestions;;;

QWC ignore reference to HIV cells

E.g.

1. Inactive virus may become active / viral transformation;
2. Attenuated virus might become harmful;
3. Non-pathogenic virus may mutate and harm cells;
4. Genetic information / protein (from HIV) may harm cells;
5. People (may) become / test HIV positive after vaccine used;
Vaccinated people may develop disease from a different strain to that in the vaccine
6. This may affect their work / life;
May continue high risk activities and develop or pass on HIV

3 max

[10]

- M10.(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]