

11.1 Antibody Production & Vaccination

Question Paper

| | |
|------------|--|
| Course | DP IB Biology |
| Section | 11. Animal Physiology (HL Only) |
| Topic | 11.1 Antibody Production & Vaccination |
| Difficulty | Easy |

Time allowed: 60
Score: /49
Percentage: /100

Question 1a

a)

Antigens are molecules which trigger and immune response in the human body.

Complete the table by adding a (✓) to show which of the features is true for antigens.

| Feature | A feature of antigens (✓) |
|--|---------------------------|
| Allow cell-to-cell recognition | |
| Can be glycolipids or glycoproteins | |
| Found on the surface of all pathogens only | |
| Responsible for allergic reactions | |
| Produced by activated B-lymphocytes | |
| Trigger complement proteins | |

[3 marks]

[3 marks]

Question 1b

b)

Blood donors who have blood type O- are considered 'universal donors' meaning they can donate blood to recipients of all other blood types without causing agglutination of the blood.

Which blood type is a universal receiver of blood?

[1 mark]

[3 marks]

Question 1c

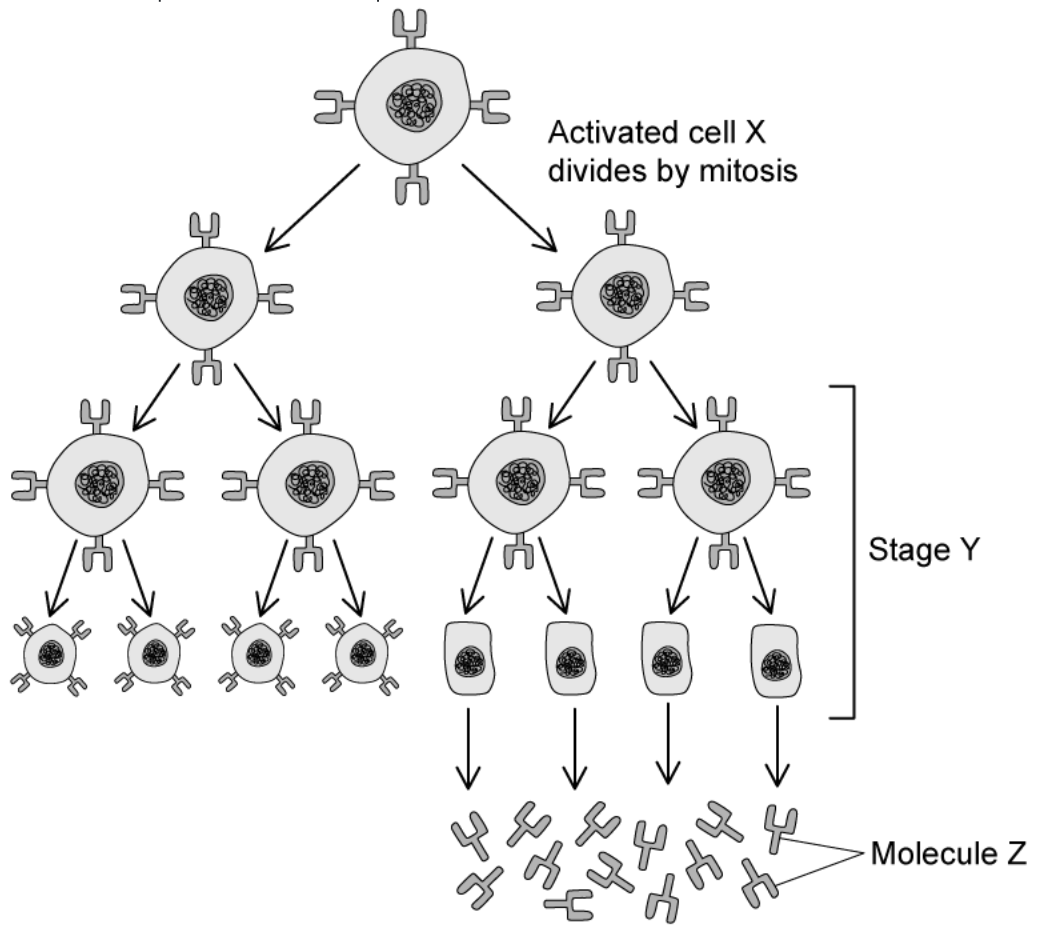
c)

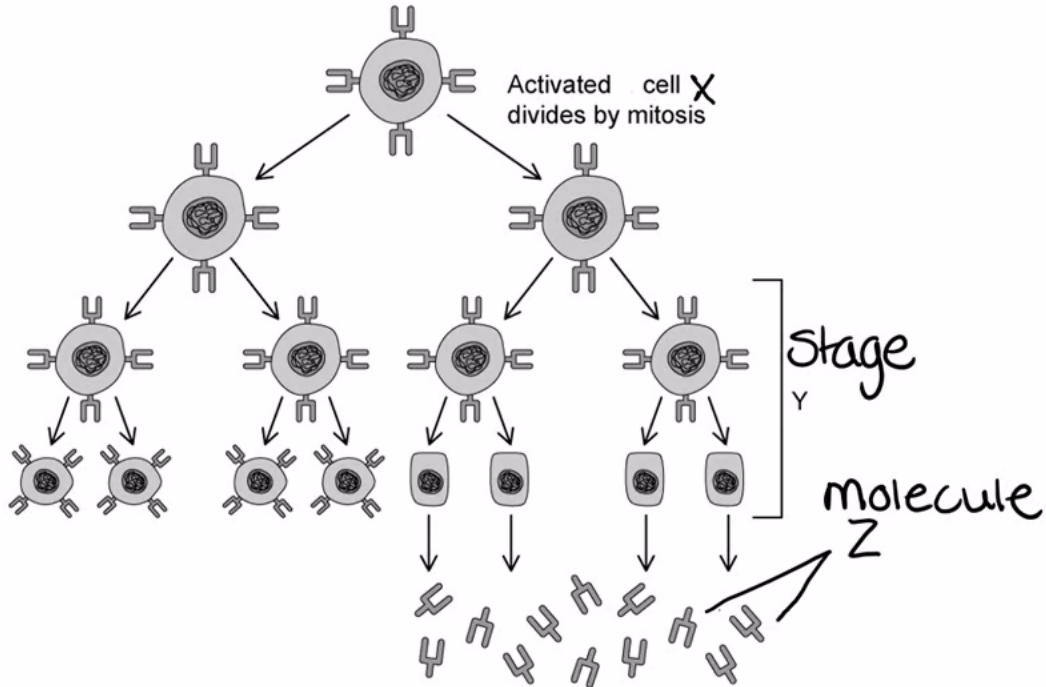
State what component of a blood cell determines blood group of an individual.

[1 mark]**[1 mark]**

Question 2a

a)
The image shows part of the the specific immune response.





i) Identify the cell type represented by cell 'X'

[1 mark]

ii) Identify the molecules labelled 'Z'

[1 mark]

[1 mark]

Question 2b

b) Name the stage Y from the image in part a) and describe what occurs during this stage of the immune response.

[2 marks]

[1 mark]

Question 2c

c) Give two ways in which a primary immune response is different to a secondary immune response.

[2 marks]

[2 marks]

Question 2d

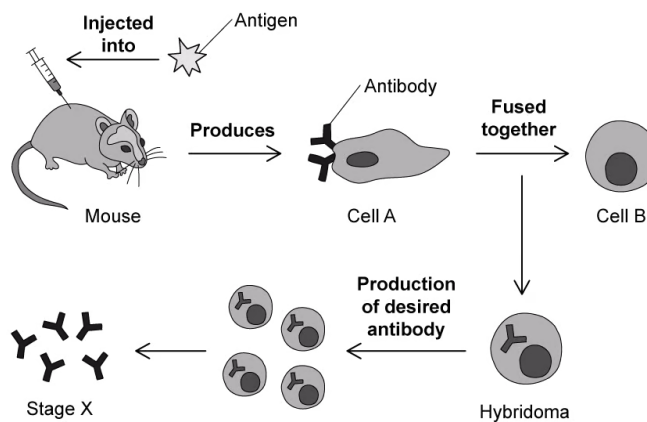
d)
A secondary immune response relies on the presence of two key components within the blood of an individual.
Name these components.

[2 marks]

[2 marks]

Question 2e

e)
Monoclonal antibodies are artificially produced antibodies which have multiple applications in science and medicine. The process of producing monoclonal antibodies can be seen below.



i)
Which cell from cell **A** and cell **B**, represents the tumour cell used to give the hybridoma cell immortality.

[1 mark]

ii)
Give one use of the monoclonal antibodies isolated in stage **X**.

[1 mark]

[2 marks]

Question 3a

a)

Antibodies are produced to destroy pathogens that have invaded the body.

Some of the mechanisms for destruction of pathogens are detailed below.

| | |
|-----------------------|---|
| Complement activation | Antibodies trigger proteins which create holes in the cell walls of pathogens |
| Agglutination | Antibodies attach to bacteria making them identifiable to phagocytes |
| Opsonisation | Antibodies cause clumping together of pathogens |
| | Antibodies can act as antitoxins by binding to toxins |
| | Antibodies can attach to flagella of bacteria making them less active |

Match up the labels to the correct descriptions.

[3 marks]

[3 marks]

Question 3b

b)

Vaccinations are given to individuals in order to trigger a specific immune response.

Some vaccines contain attenuated versions of pathogens.

i)

State why attenuation is important.

[1 mark]

ii)

What is meant by a specific immune response?

[1 mark]

[2 marks]

Question 3c

c)

Some new diseases originate from animal populations and so current vaccines would not be effective in preventing infection.

i)

What is the term given to diseases which are able to cross the species barrier

[1 mark]

ii)

Give **two** examples of diseases which have crossed the species barrier.

[2 marks]

[3 marks]

Question 3d

d)

Explain why current vaccines could not provide immunity from new diseases which may have crossed the species barrier or mutated from previously encountered diseases.

[3 marks]

[3 marks]

Question 4a

a)

Smallpox was a deadly disease caused by a pathogen which was finally eradicated in 1980.

i)

Define the term pathogen.

[1 mark]

ii)

Identify the type of pathogen which caused the development of smallpox.

[1 mark]

[2 marks]

Question 4b

b)

Prior to the development of Jenner's smallpox vaccination, doctors in the 1700's used a method which involved scratching smallpox material, into the arms of patients to trigger mild symptoms.

State the name of this method used by doctors.

[1 mark]

[1 mark]

Question 4c

c)
Under current legislation, the methods by which Edward Jenner developed the vaccination for smallpox would not be approved by the Research Ethics Committee.

Indicate with a (✓) which of the following statements correctly identifies a reason why Jenner's methods would not have been accepted.

| Statement | (✓) |
|---|-----|
| Jenner observed the response of milkmaids to infection of cowpox | |
| Jenner carried out tests on animals before investigating the effects on humans | |
| Jenner infected a child with smallpox prior to using his vaccination | |
| Jenner did not carry out laboratory research | |
| Jenner hypothesised that milkmaids would not be affected by smallpox | |
| Jenner created a cowpox vaccination which successfully gave a 9-year old boy immunity to smallpox | |

[Total: 3 marks]

[3 marks]

Question 4d

d)
Smallpox was eventually eradicated in 1980 as a result of a global eradication program implemented by the World Health Organisation.

The success of the program was attributed to many factors.

Describe two features of the program which resulted in its eventual success.

[2 marks]

[2 marks]

Question 5a

a)
Describe the changes in blood antibody concentration after initial and secondary infection from one pathogen.

[4 marks]

[4 marks]

Question 5b

b)
Allergens such as pollen trigger the release of histamines into the blood, which lead to the development of symptoms which are characteristic of an allergic reaction.

List the symptoms which may result from histamine release in the blood.

[4 marks]

[4 marks]

Question 5c

c)

Describe how the study of epidemiology allows a greater understanding of diseases globally.

[7 marks]**[7 marks]**