Communicable Diseases, Disease Prevention and the Immune System (4

18 questions · 43 marks · about 52 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · AS Paper 2 · June 2024 · Q2(b) · 3 marks

(b) Complete the table with the type of pathogen that causes the communicable disease.

Communicable Disease	Type of Pathogen
Influenza	
Malaria	
Black sigatoka in bananas	

[3]

Question 2 · A level Paper 3 · June 2019 · Q6(c) · 2 marks

(c) Some microorganisms can be used by humans in industry. Some microorganisms are pathogenic.

Pathogenic microorganisms are transmitted in various ways.

Complete the following passage about the transmission of pathogenic microorganisms using the most appropriate terms.

Some pathogens are carried between host organisms by animals, which are often insects.

These animals suffer no symptoms of the disease and are known as ..... .

Other pathogens, such as *P. infestans* that causes potato blight, produce reproductive structures

called ..... , which can be carried on air currents to infect other hosts.

[2]

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Question 3 · information from earlier in the question

7 Pathogens are transmitted to animals and plants by a variety of methods.

(a) A group of scientists collected and analysed data about climate change and the number of cases of diseases transmitted by animal vectors.

The scientists wanted to know whether the number of cases of each disease had increased as a result of climate change.

They found that the number of cases had increased for 103 different animal vector-transmitted diseases.

The scientists concluded that climate change has increased the transmission of pathogens by animal vectors.

(i) Suggest **one** additional piece of information that is needed to assess the validity of the scientists' conclusion.

.....

.....

..... **[1]**

Question 3 · A level Paper 3 · June 2025 · Q7(a)(ii) · 1 mark

(ii) Suggest why climate change might result in more cases of diseases caused by animal vector-transmitted pathogens.

.....

.....

..... **[1]**

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Question 4 · A level Paper 3 · June 2025 · Q7(c) · 3 marks

(c) Plants lack immune cells, but they have other defences against pathogenic infection.

The sentences describe one form of plant defence against pathogens.

Complete the sentences using the most appropriate word or phrase.

When a pathogen is detected in plant tissue, a plant increases the production of a polysaccharide called ..... This polysaccharide is deposited in channels called ....., which pass through cell walls. This deposition stops the pathogen moving between cells. The polysaccharide is also deposited in the small gaps between sieve tube elements. These gaps are known as ..... This deposition stops the pathogen moving between different regions of the plant.

[3]

Question 5 · A level Paper 2 · June 2023 · Q19(a) · 2 marks

19 Animals are protected from infectious diseases by their immune system.

(a) Influenza is a viral disease that is common in winter months. It is transmitted when an uninfected person inhales droplets of moisture that an infected person has exhaled, often when coughing or sneezing.

Explain how mucous membranes make it more difficult for the influenza virus to enter the body.

.....

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.....

..... **[2]**

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2 (a) Fig. 2.1 shows a light micrograph of a blood smear.

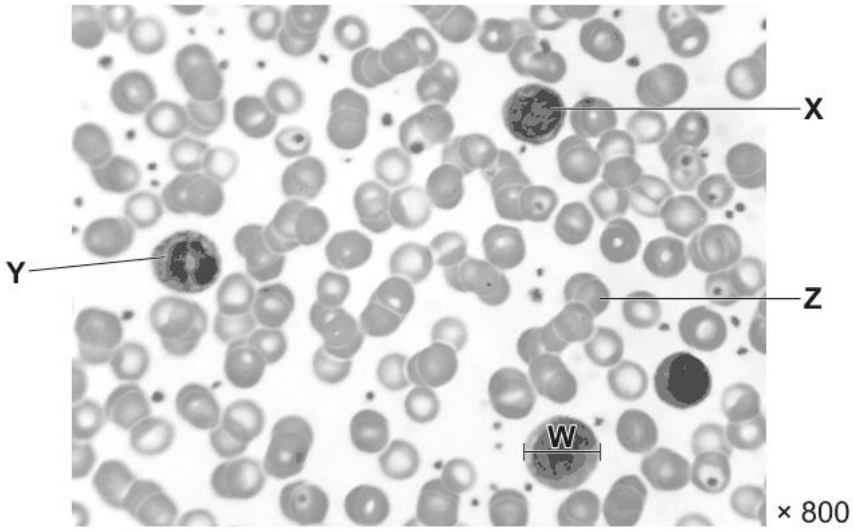


Fig. 2.1

(i) The cells labelled **X** and **Y** in **Fig. 2.1** are two different types of white blood cell.

Identify the types of white blood cell labelled **X** and **Y**.

X .....

Y .....

[2]

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Question 7 · AS Paper 1 · June 2019 · Q26(a) · 5 marks

26 The specific immune system is based on white blood cells called lymphocytes.

(a) Complete the following passage by using the most appropriate terms from the list. You may use terms once, more than once or not at all.

memory **plasma** **killer T cell** **antigens** **antibodies**

interleukins **phagocyte** **meiosis** **mitosis** **hormones**

When a pathogen enters the body it is recognised due to specific molecules on the surface of its cells called ..... . A phagocyte will engulf the pathogen and process these molecules by displaying them on the surface of the phagocyte. This cell will now interact with a special type of T lymphocyte called a T helper cell. The T helper cells produce ..... that will activate the B lymphocytes. They start to divide by ..... . These cells now differentiate into ..... cells, which synthesise and release ..... .

[5]

Question 8 · AS Paper 2 · June 2022 · Q4(b)(i) · 1 mark

(b) Every winter a large proportion of the population are given a vaccine against the disease influenza.

(i) Identify the type of immunity given by an influenza vaccine.

..... **[1]**

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Question 9 · AS Paper 2 · June 2022 · Q4(b)(iii) · 2 marks

(iii) Outline the role of B memory cells in the secondary immune response.

.....

.....

.....

.....

..... **[2]**

Turn over

Question 10 · AS Paper 2 · June 2022 · Q4(c) · 3 marks

(c) Outline the roles of phagosomes and lysosomes in phagocytosis.

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..... **[3]**

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Question 11 · AS Paper 2 · June 2018 · Q3(c)(ii) · 1 mark

(ii) Antibodies are defensive proteins carried in the bloodstream. Fig. 3.2 shows the simplified, incomplete structure of an antibody.

Complete Fig. 3.2 by **drawing and labelling** the missing part(s) of the antibody.

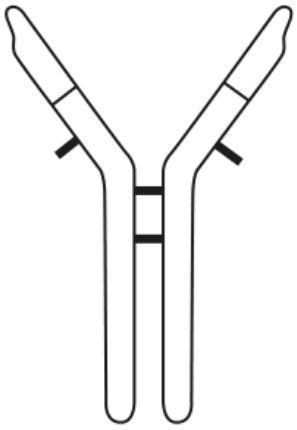


Fig. 3.2

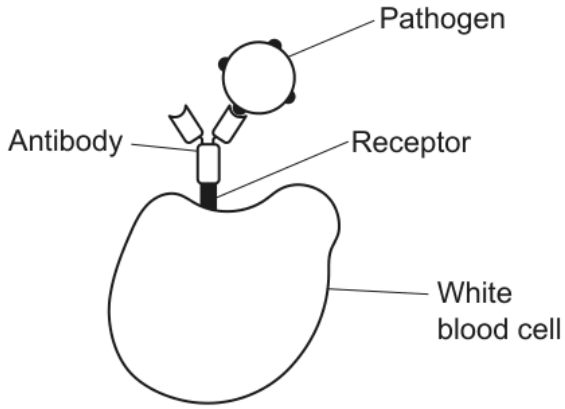
[Answer on Fig. 3.2] **[1]**

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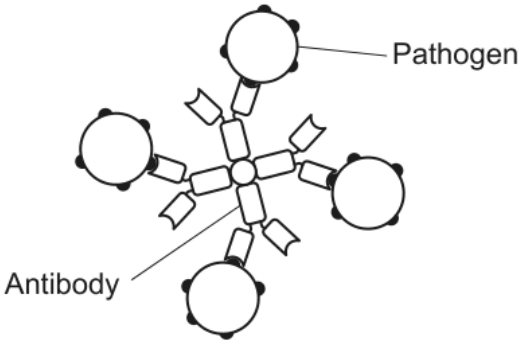
1 The heart can be affected by a variety of disorders, some of which involve the immune system.

(a) **Fig. 1.1** shows the roles of three different types of antibody, labelled **R**, **S** and **T**.

R



S



T

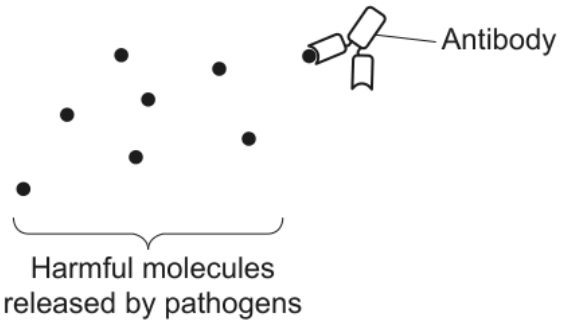


Fig. 1.1

State the names of the **three** different types of antibody shown in **Fig. 1.1**.

R .....

S .....

T .....

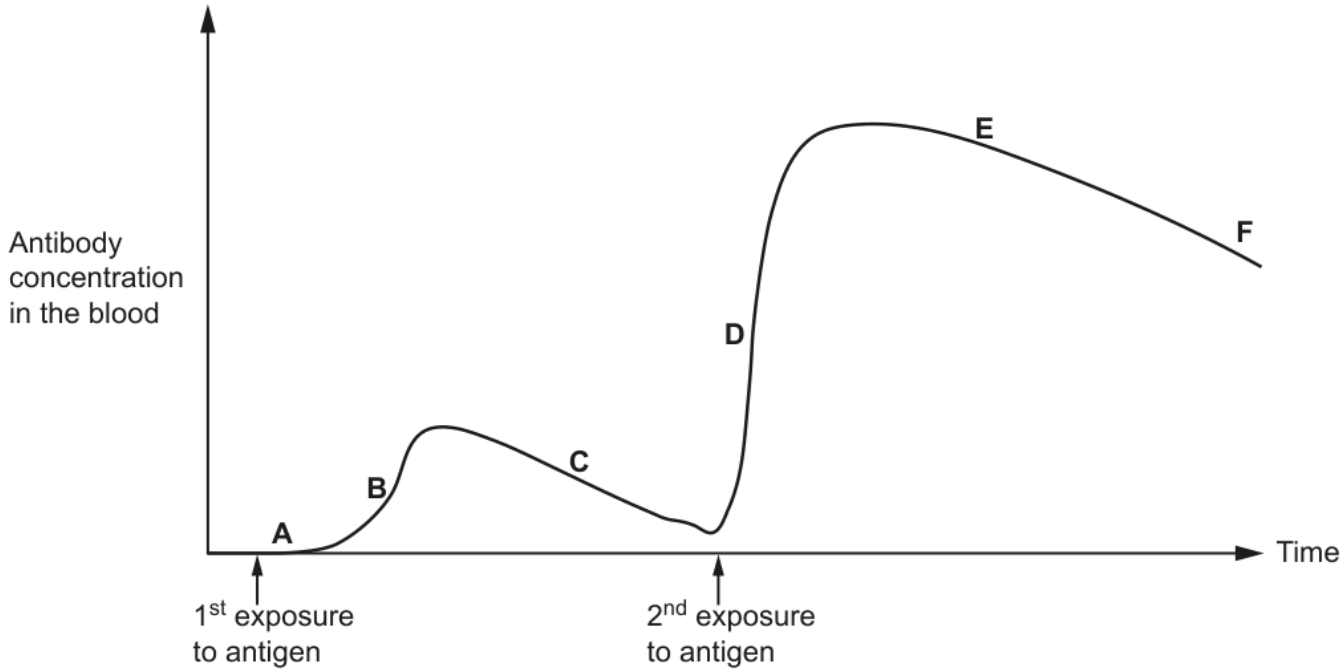
[3]

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(b) Antigens on the surface of pathogens can provoke an immune response in a patient.

Fig. 19.1 shows the changes in antibody concentration in the blood of a patient.

Fig. 19.1



Different events during these immune responses have been represented as areas on the graph labelled with letters, **A** to **F**.

Complete the table with a letter or letters to indicate where on the graph the event is represented.

Event	Letter or letters
Antigen presentation	
Clonal expansion	
Clonal selection	
High T-helper cell activity	
Highest number of memory cells	

[5]

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Question 14 · AS Paper 2 · June 2023 · Q5(a)(iii) · 3 marks

(iii) A student made the following statement about the influenza (flu) vaccination programme:

'The flu vaccination programme involves giving the same flu vaccine to different age groups and to medically vulnerable people every year, as it is for the same disease.'

Discuss the accuracy of the student's statement.

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.....

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.....

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.....

..... **[3]**

Turn over

Question 15 · AS Paper 2 · June 2023 · Q5(a)(iv) · 2 marks

(iv) Explain how vaccination programmes can play a role in preventing epidemics.

.....

.....

.....

.....

..... **[2]**

Question 16 · AS Paper 2 · June 2023 · Q5(b)(i) · 1 mark

(b) Rheumatoid arthritis is an autoimmune disease that causes pain in skeletal joints.

(i) Explain the meaning of the term **autoimmune disease**.

.....

..... **[1]**

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Question 17 · A level Paper 2 · June 2023 · Q19(d) · 3 marks

(d) Infectious disease caused by pathogenic bacteria can be treated using antibiotics. The first antibiotics became widely available in the middle of the 20th Century.

Explain why many varieties of pathogenic bacteria are now resistant to a range of antibiotics.

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.....

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.....

.....

.....

..... **[3]**

Question 18 · AS Paper 1 · June 2024 · Q24(d) · 1 mark

(d) Scientists have suggested that personalised medicine may be used to help with the problem of antibiotic resistance.

State what is meant by personalised medicine.

.....

.....

..... **[1]**

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Mark schemes

Question 1 · AS Paper 2 · June 2024 · Q2(b) · 3 marks

(b)

Communicable Disease	Type of Pathogen
Influenza	virus
Malaria	protoctist
Black sigatoka in bananas	fungus

✓✓✓

Total

3	**DO NOT ALLOW** more than one answer for each type of pathogen **ALLOW** protist/protozoa for 'protoctist'
11	

Question 2 · A level Paper 3 · June 2019 · Q6(c) · 2 marks

c	vectors ✓ spores ✓	**2**
	Total	**70**

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Question 3 · A level Paper 3 · June 2025 · Q7(a)(ii) · 1 mark

7	**(a)**	**(ii)**	increases / changes to , range / migration , of (named) , vector / host / animals ✓ **increases** , reproduction (rate) / population size / number , of (named) , vectors / pathogens ✓ more (standing) water for (named) vector breeding areas ✓	**1 max**	2.1	**ALLOW** vector present for a longer part of the year **ALLOW** vector / pathogen , can reproduce for more of the year **ALLOW** greater food supply for vector **CON** 'disease' for 'pathogen'

Question 4 · A level Paper 3 · June 2025 · Q7(c) · 3 marks

7	**(c)**	callose ✓ plasmodesma(ta) ✓ sieve pores ✓	**3**	1.1 1.2	**IGNORE** callus / callous **IGNORE** 'tube / plate' after 'sieve'

Question 5 · A level Paper 2 · June 2023 · Q19(a) · 2 marks

19	**(a)**	mucus traps , pathogen / virus ✓ cilia , move / AW , mucus / pathogens (away from lungs) ✓	**2**	

1.2	**ALLOW** pathogen / virus / microorganism , sticks to mucus **IGNORE** germs / bacteria / microbes **ALLOW** ciliated , cells / epithelium , waft mucus out of the body

Question 6 · A level Paper 3 · June 2022 · Q2(a)(i) · 2 marks

2	**(a)**	**(i)**	(X) (T or B) lymphocyte ✓ (Y) neutrophil ✓	**2**	2.3

ALLOW T cell / B cell / T helper cell / T killer cell / T regulator cell
ALLOW phagocyte

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Question 7 · AS Paper 1 · June 2019 · Q26(a) · 5 marks

26	(a)		antigens ✓ interleukins ✓ mitosis ✓ plasma ✓ antibodies ✓	5

Question 8 · AS Paper 2 · June 2022 · Q4(b)(i) · 1 mark

4	(b)	(i)	artificial active (immunity) ✓	1	AO 1.1	

Question 9 · AS Paper 2 · June 2022 · Q4(b)(iii) · 2 marks

4	(b)	(iii)	**1** (memory cells) divide to form plasma cells ✓ **2** plasma cells, produce / release, antibodies (rapidly) ✓ **3** antibodies, bind to / disable / destroy, antigen / virus ✓	**2 max**	AO 1.2 AO 2.1	**3 ALLOW** pathogen for 'virus'

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Question 10 · AS Paper 2 · June 2022 · Q4(c) · 3 marks

4	(c)	**1** phagocyte engulfs pathogen in a, vesicle / phagosome / endosome ✓ **2** lysosomes combine with, phagosome / vesicle / endosome ✓ **3** (lysosyme) enzymes, break down / digest / destroy, pathogen ✓	3

AO 1.1	**1 ALLOW** encloses / traps / captures / AW for 'engulfs' **1 ALLOW** vacuole for 'vesicle' **2 ALLOW** fuse with / join to / attach to / bind to, for 'combine' **3 IGNORE** combat / fight / attack, for 'destroy' **3 DO NOT ALLOW** lysozymes for 'enzymes'

Question 11 · AS Paper 2 · June 2018 · Q3(c)(ii) · 1 mark

3(c)(ii)	minimum of one light chain drawn on outside of heavy chain **and** label to, light (polypeptide) chain / variable region / antigen-binding site ✓

Question	**Answer**
1	**GUIDELINES for drawing:** Light chain should start at tip of arm of Y and be 25–50% the length of the heavy chain. **ALLOW** label line not touching if label written near correct region

Mark	**Guidance**

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Question 12 · A level Paper 3 · June 2022 · Q1(a) · 3 marks

1	**(a)**	(R) opsonin ✓ (S) agglutinin ✓ (T) anti-toxin ✓	**3**	2.5

ALLOW R = opsonisation / opsonising
ALLOW S = IgM / agglutin / agglutanin / agglutination / agglutinising / agglutinator
ALLOW T = neutralisation / neutralising
IGNORE detoxifying

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(b)

Event	Letter or letters
Antigen presentation	**A**
Clonal expansion	**B and D**
Clonal selection	**A**
High T-helper cell activity	**B and D**
Highest number of memory cells	**E**

✓✓✓✓✓

5	2.2	**DO NOT CREDIT** if any incorrect or ambiguous letters appear in a box **IGNORE D** **IGNORE A / E**

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	(iii)	*Any three from:* *Incorrect because* **1** different, vaccines are given to different age groups ✓ **2** this vaccine is, changed/ different, from year to year ✓ **3** because the, virus/pathogen, mutates (regularly) ✓ **4** so antigens (on the surface of the virus) change ✓ **5** immune system may not, recognise it/ respond to it ✓ *Correct because* **6** vaccine is recommended to, pregnant/ >50 years old/ diabetic / asthma / AW (medically vulnerable) ✓

Max 3	**3.3**	**1 ALLOW** same flu vaccine not given to different ages **1 IGNORE** ref to dose of vaccine for 'different vaccines' **2 ALLOW** vaccine has to be up to date (with changing virus) / vaccine is newly produced/ vaccine is changed frequently **3 ALLOW** new strains of virus emerge **4 ALLOW** vaccine (must) contain new antigen **5 ALLOW** new antibodies need to be made/old antibodies no longer effective

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Question 15 · AS Paper 2 · June 2023 · Q5(a)(iv) · 2 marks

(iv)	*Any two from:* **1** mass vaccination (at start of epidemic) can prevent spread of, pathogen/disease (into the wider population) ✓ **2** herd immunity ✓ **3** minimises possibility of, another outbreak of the disease/ a variant spreading✓

Max 2	1.2	**ALLOW** immunised for 'vaccinated' throughout **1 ALLOW** if everyone vaccinated the disease cannot spread **e.g** 'if population immunised pathogen is killed before it can spread' = mp1 **IGNORE** 'if more people are immune' for 'mass vaccination'

Question 16 · AS Paper 2 · June 2023 · Q5(b)(i) · 1 mark

	(b)	**(i)**	(named part of) Immune system attacks, cells/tissues, as it recognises them as, foreign/non self. ✓

1	**1.2**	**IGNORE** body attacks itself for 'immune system attacks' **ALLOW** have an abnormal immune response as body cells treated as foreign

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Question 17 · A level Paper 2 · June 2023 · Q19(d) · 3 marks

(d)	widespread / AW , use ✓ at low dose / unfinished course ✓ natural selection / antibiotic is selective agent ✓ AVP ✓	**3**

1.1	**ALLOW** have been used a lot / overprescribing / use in agriculture / used to treat viral infections **CREDIT** description that includes genetic variation and differential survival and passing on traits **IGNORE** immune **CREDIT** sharing of , DNA / plasmids (containing resistance gene) , between bacteria **ALLOW** horizontal (gene) transmission

Question 18 · AS Paper 1 · June 2024 · Q24(d) · 1 mark

	(d)		choosing medicines / drugs / treatments, based on a person's, genes / genome / genotype / genetic profile / base sequence ✓ *idea of* medicine / treatment created for a specific patient matched to the bacterial infection they have ✓
			Total

1 max	**ALLOW** DNA for, genes / genome
10	

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