

GCSE Biology (9 – 1)

Disease and Immunity

Name:

Group:



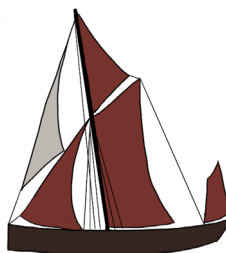
Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.

For markers use	
Question	Mark
1	/5
2	/8
3	/14
4	/9
5	/8
6	/5
7	/14
8	/14
9	/6
10	/7
Total	/90
%	
Grade	

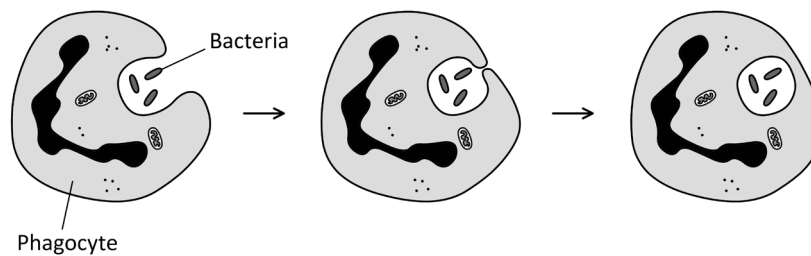
Information

- The maximum mark for this paper is 90 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. The human immune system is a complex network that defends the body against pathogens. Answer the following questions. Circle the letter of the correct answer for each.

a) The figure below shows one of the ways the body can defend itself against pathogens.



What is the name of this immune response?

- A** – Production of antibodies. **B** – Vaccination. **C** – Osmosis. **D** – Phagocytosis. (1 mark)

b) Which are both chemical barriers to the transmission of pathogens?

- A** – mucus and stomach acid **B** – mucus and white blood cells **C** – skin and hairs in the nose (1 mark)

c) The figure below shows a lymphocyte.



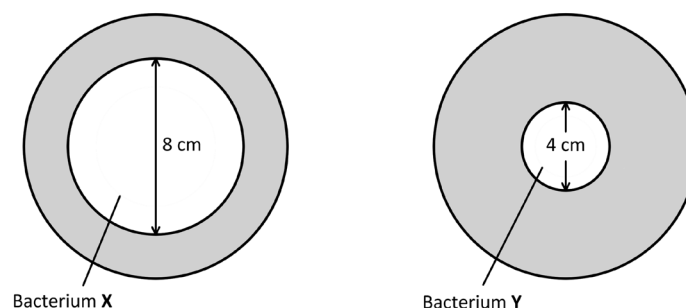
What do lymphocytes produce?

- A** – antibodies **B** – antibiotics **C** – antigens **D** – memory cells (1 mark)

d) The immune system identifies and neutralises pathogens. What characteristic of a pathogen allows the immune system to recognise it as foreign?

- A** – antibodies **B** – antibiotics **C** – antigens **D** – memory cells (1 mark)

e) The figure below shows colonies of bacteria growing on two different agar plates.



What is the ratio of the area covered by bacterium X to the area covered by bacterium Y? (The area of a circle = πr^2)

- A** – 4 : 2 **B** – 1 : 3 **C** – 2 : 1 **D** – 4 : 1 (1 mark)

(Total for Question 1 is 5 marks)

2. Measles is a highly contagious disease that can cause serious complications, especially in young children. Vaccination programmes have been successful in reducing the incidence of measles in many countries.

a) State the type of microorganism that causes measles

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(1 mark)

b) Explain how a measles vaccination protects an individual from developing the disease.

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(3 marks)

c) Describe **two** ways, other than vaccination, that the spread of measles can be controlled.

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(2 marks)

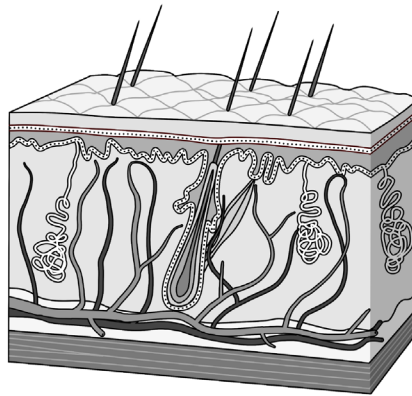
d) Suggest why it is important to maintain a high percentage of the population vaccinated against measles.

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(2 marks)

(Total for Question 2 is 8 marks)

3. The human body has multiple methods of defence against pathogens. These defences can be broadly categorised as physical and chemical barriers, and cellular responses.

The figure below shows a section through the skin of a human.



- a) Describe **two** physical or chemical barriers that prevent pathogens from entering the body. For each barrier, explain how it provides protection.

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(4 marks)

- b) Explain how phagocytes defend the body against pathogens that have entered the tissues.

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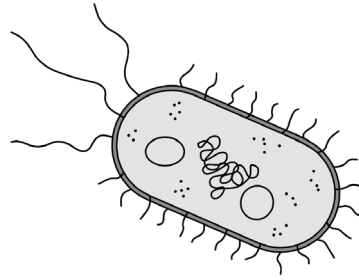
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(4 marks)

Many bacteria that cause disease produce toxins. The figure below shows a typical bacterial cell.



c) Describe **one** way that the body can neutralise these toxins.

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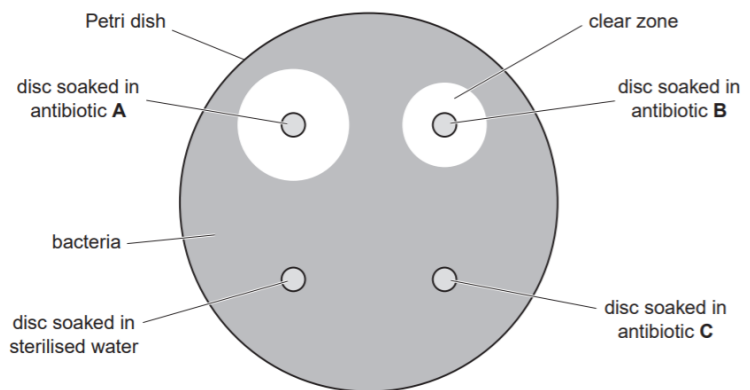
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(2 marks)

A student is investigating the effectiveness of different antibiotics on a species of bacteria.

The student set up a sterile petri dish as shown below with four paper discs soaked in four different antibiotics and one disc soaked in distilled water.



not to scale

d) What is the purpose of the paper disc soaked in distilled water?

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(2 marks)

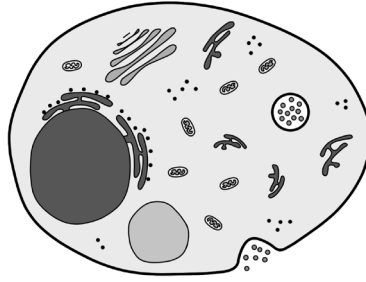
e) Calculate the area of the clear zone for Antibiotic B. Use the formula πr^2 . Diameter of clear zone is 1.2 cm. Give your answer to three significant figures.

Area = ...

(2 marks)

(Total for Question 3 is 14 marks)

4. Malaria is a serious disease caused by a parasite transmitted to humans through the bite of infected mosquitoes. The figure below shows the malaria parasite.



- a) Name the type of pathogen that causes malaria.

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(1 mark)

- b) Describe the role of mosquitoes in the transmission of malaria.

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(2 marks)

- c) Explain **two** different methods used to control the spread of malaria.
For each method, explain **how** it reduces the number of cases.

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(4 marks)

- d) Scientists are constantly developing new drugs to treat malaria.
Explain why it is important to continue developing new drugs, even if effective treatments already exist.

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(2 marks)

(Total for Question 4 is 9 marks)

BMI and waist : hip ratio can be used to find out if a person is obese.
 The figure below shows data from two females.

Female	BMI	Waist : Hip Ratio
1	x	0.75
2	25	0.89

BMI is calculated using the following equation:

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

- b) Female 1 has a mass of 80 kg and a height of 1.65 m.
 Calculate the BMI of female 1. Give the answer to 3 significant figures.

BMI = ...

(2 marks)

(Total for Question 5 is 8 marks)

6. Measles is a disease caused by a virus. The death rate from measles is 0.15%.
 In 2023, 107,500 people died from measles. Deaths were mostly of unvaccinated children under five.

- a) Calculate the number of people infected with measles in 2023.
 Give your answer in standard form.

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(3 marks)

- b) The spread of measles is prevented by herd immunity. Describe herd immunity.

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(2 marks)

(Total for Question 6 is 5 marks)

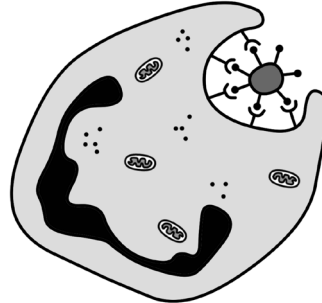
7. The human immunodeficiency virus (HIV) can, if left untreated, lead to the development of acquired immunodeficiency syndrome (AIDS). When HIV infects the body it begins destroying cells.

a) Which type of cell is destroyed by the HIV virus?

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(1 mark)

The figure below shows a phagocyte engulfing a microorganism.



b) Name the process shown in the diagram.

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(1 mark)

c) Explain why this process is important for the body.

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(2 marks)

d) Describe how the phagocyte destroys the bacterium after it has been engulfed.

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(3 marks)

e) Phagocytes are part of the non-specific immune response. What is meant by the term "non-specific immune response?"

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(2 marks)

[illegible]

(Total for Question 7 is 14 marks)

8. Tuberculosis (TB) is a disease caused by a bacterium called *Mycobacterium tuberculosis*. It primarily affects the lungs, but can also affect other parts of the body. TB is spread through the air when an infected person coughs or sneezes.

a) State the type of pathogen that causes TB.

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(1 mark)

Tuberculosis (TB) is a communicable disease.

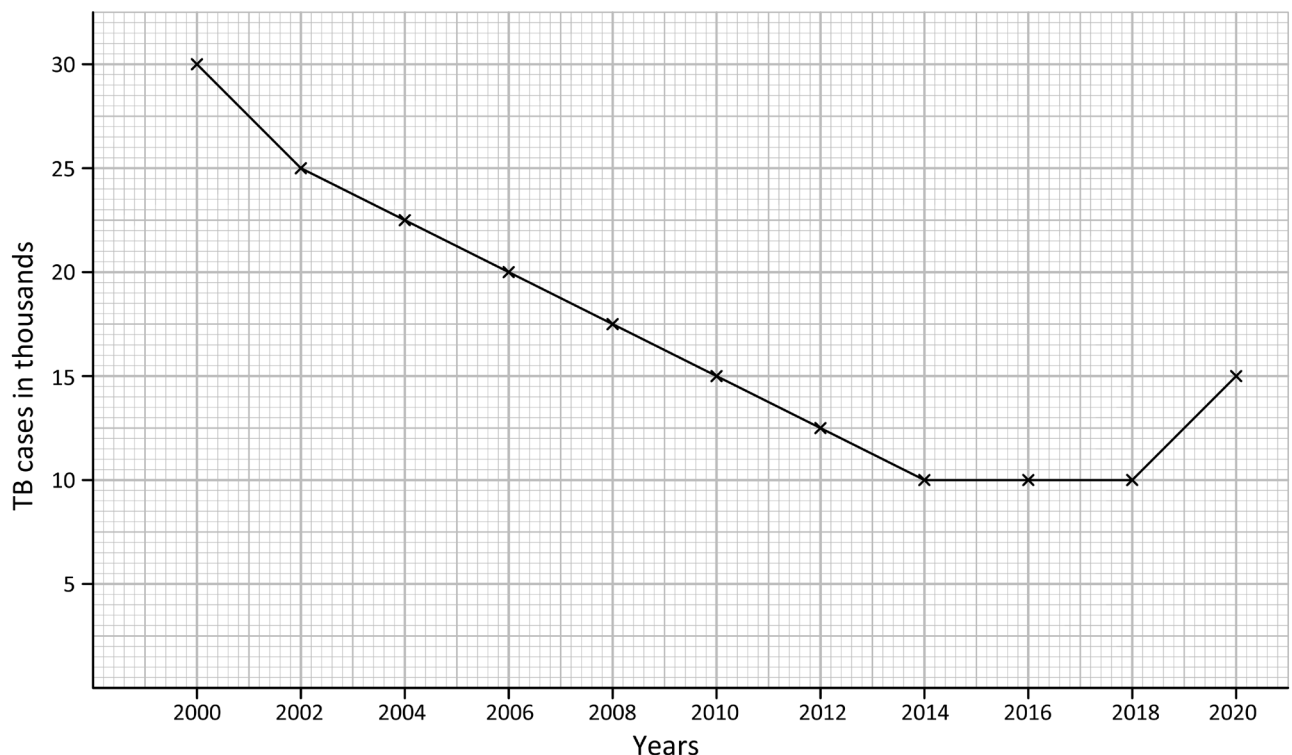
b) State **two** ways that communicable diseases are different from non-communicable diseases.

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(2 marks)

c) Explain one way that the spread of tuberculosis (TB) can be reduced or prevented.

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(2 marks)

The graph below shows the number of TB cases reported in a certain country between 2000 and 2020.



d) Describe the trend shown in the graph.

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(2 marks)

e) Suggest **two** reasons why the number of TB cases might have increased slightly after 2018.

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(2 marks)

f) TB can be treated with antibiotics. However, antibiotic resistance is becoming an increasing problem. Explain how antibiotic resistance can develop in bacteria.

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(3 marks)

g) Explain why people with AIDS are more susceptible to TB.

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(2 marks)

(Total for Question 8 is 14 marks)

9. The figure below shows the number of people diagnosed with sexually transmitted infections (STIs) in the UK during 2023.

Sexually transmitted infections	Number of diagnosed infections
Syphilis	10000
Chlamydia	195000
Gonorrhoea	85000
Genital warts	26000

- a) Calculate the mean number of sexually transmitted infections diagnosed in 2023.

Mean = ...

(2 marks)

- b) State why chlamydia can be described as a communicable disease.

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(1 mark)

- c) Give one way the spread of chlamydia can be prevented.

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(1 mark)

- d) Chlamydia can be cured using antibiotics. Explain how chlamydia can be treated with antibiotics.

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(2 marks)

(Total for Question 9 is 6 marks)

10. Developing new medicines is a long and complex process. It involves several stages, including pre-clinical testing, clinical trials, and regulatory approval.

a) What is meant by the term "pre-clinical testing" in drug development?

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(1 mark)

b) State **two** reasons why pre-clinical testing is important.

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(2 marks)

A new drug has been developed to treat high blood pressure.
Before it can be made available to the public, it must undergo clinical trials.

c) Describe the steps that should be taken to ensure that the new drug is safe and effective, before it is made available to the general public.

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(4 marks)

(Total for Question 10 is 7 marks)