

Name:

Date:

B3  
INFECTION & RESPONSE  
TEST 3

**GCSE**

**BIOLOGY**

**AQA - COMBINED SCIENCE**

Mark

Score (%)

### Materials

For this paper you must have:

- Ruler
- Pencil, Rubber, Protractor and Compass
- Scientific calculator, which you are expected to use when appropriate

### Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown
- Do all rough work in this book. Cross out any rough work you don't want to be marked

### Information

- The marks for the questions are shown in brackets

1

Pathogens are microorganisms that cause infectious disease.

(a) Draw **one** line from each disease to the way the disease is spread.

Disease	Way the disease is spread
	Animals that draw blood
Cholera	Drinking contaminated water
Cold	Droplets in the air when people cough or sneeze
Malaria	Eating food that is contaminated
	Breathing air polluted with carbon dioxide

(3)

(b) One way the human body protects itself against the entry of pathogens is by producing antimicrobial chemicals.

Antimicrobial chemicals kill pathogens.

Give **two** other ways the human body protects itself against the **entry** of pathogens.

- 1. \_\_\_\_\_  
\_\_\_\_\_
- 2. \_\_\_\_\_  
\_\_\_\_\_

(2)

(c) Measles is a childhood disease caused by a microorganism.

Measles is **not** treated by antibiotics.

Give the reason why.

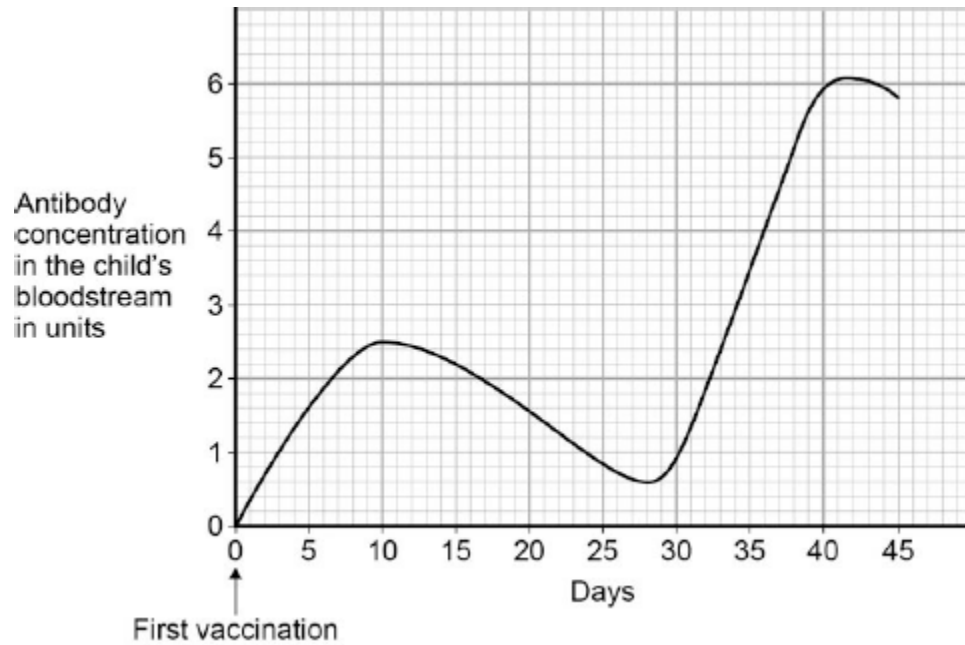
\_\_\_\_\_

(1)

- (d) Vaccinations help people become immune to infections.

In 2013, 92% of children in the UK had two vaccination injections against measles.

The figure below shows how the concentration of antibodies in the blood changes after each measles vaccination.



Suggest what day the second vaccination was given.

\_\_\_\_\_

(1)

- (e) What is the highest concentration of antibodies produced by the first vaccination?

\_\_\_\_\_

(1)

- (f) How will the number of children getting measles change as more children are vaccinated against measles?

Give a reason for your answer.

Change \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

(2)

(Total 10 marks)

**2**

White blood cells protect the body against pathogens such as bacteria and viruses.

(a) (i) Pathogens make us feel ill.

Give **one** reason why.

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**(1)**

(ii) White blood cells produce antibodies. This is one way white blood cells protect us against pathogens.

Give **two** other ways that white blood cells protect us against pathogens.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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**(2)**

(b) Vaccination can protect us from the diseases pathogens cause.

(i) One type of virus causes measles.

A doctor vaccinates a child against measles.

What does the doctor inject into the child to make the child immune to measles?

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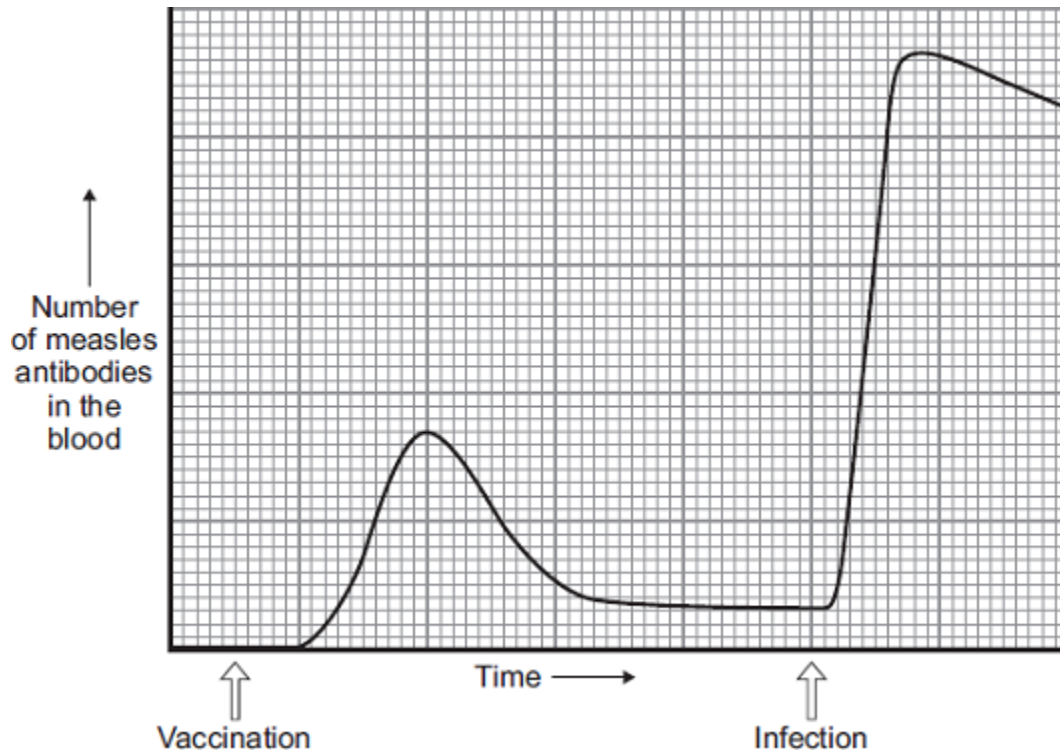
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**(2)**

- (ii) A few weeks after the vaccination, the child becomes infected with measles viruses from another person.

The graph shows the number of measles antibodies in the child's blood from before the vaccination until after the infection.



More measles antibodies are produced after the infection than after the vaccination.

Describe other differences in antibody production after infection compared with after vaccination.

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(3)

- (iii) Vaccination against the measles virus will **not** protect the child against the rubella virus.

Why?

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(1)

(c) What is the advantage of vaccinating a large proportion of the population against measles?

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**(1)**

**(Total 10 marks)**

**3**

Millions of people get salmonella food poisoning each year.

(a) A new vaccine has been developed to protect people against salmonella food poisoning.

Explain how the vaccine prevents people becoming ill with salmonella food poisoning.

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**(5)**

(b) *Salmonella* food poisoning is caused by *Salmonella* bacteria.

*Salmonella* is treated with an antibiotic called nalidixic acid.

Nalidixic acid is no longer effective for some strains of *Salmonella* bacteria.

Explain how these bacteria have evolved by natural selection.

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(3)

(Total 8 marks)

4

In 2014 there was an outbreak of Ebola virus disease (EVD) in Africa.

At the time of the outbreak there were:

- no drugs to treat the disease
- no vaccines to prevent infection.

(a) By March 2015 there were an estimated 9850 deaths worldwide from EVD.

The number of deaths is an estimate.

Suggest why it is an estimate rather than an exact number.

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(1)

(b) Why were no antibiotics used to treat EVD?

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(1)

(c) After the outbreak began, drug companies started to develop drugs and vaccines for EVD.

A drug has to be thoroughly tested and trialled before it is licensed for use.

Testing, trialling and licensing new drugs usually takes several years.

Draw **one** line from each word about drug testing to the definition of the word.

**Word about drug testing**

**Definition**

Dose

Side effects making the person ill

Efficacy

The concentration of the drug to be used and how often the drug should be given

Toxicity

Whether the drug works to treat the illness

(2)

(d) The results of drug testing and drug trials are studied in detail by other scientists.

Only then can the results be published by the drug company.

Suggest **one** reason why the results are studied by other scientists.

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(1)

(Total 5 marks)



5

(a) **List A** gives the names of three stages in trialling a new drug.

**List B** gives information about the three stages.

Draw a line from each stage in **List A** to the correct information in **List B**.

**List A  
Stage**

**List B  
Information**

Tests on humans  
including a placebo

Used to find if the drug is toxic

Tests on humans using  
very small quantities of  
the drug

The first stage in the clinical trials  
of the drug

Tests on animals

Used to find the optimum dose  
of the drug

Used to prove that the drug is  
effective on humans

(3)

(b) Read the passage.

**Daily coffee dose delays development of Alzheimer's in humans.**

Alzheimer's is a brain disease that causes memory loss in elderly people. Scientists studied 56 mice that had been genetically engineered to develop Alzheimer's.

Before treatment all the mice did badly in memory tests.

Half the mice were given a daily dose of caffeine in their drinking water. The dose was equivalent to the amount of caffeine in six cups of coffee for a human.

The other mice were given ordinary water.

After two months, the caffeine-drinking mice did better in memory tests than the mice drinking ordinary water.

The headline for the passage is not justified.

Explain why as fully as possible.

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**(3)**  
**(Total 6 marks)**

**6**

Some diseases can be cured by using antibiotics or prevented by vaccination.

(a) (i) Explain fully why antibiotics cannot be used to cure viral diseases.

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**(2)**

(ii) There has been a large increase in the populations of many antibiotic-resistant strains of bacteria in recent years.

Explain why.

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**(2)**

(b) A person can be immunised against a disease by injecting them with an inactive form of a pathogen.

Explain how this makes the person immune to the disease.

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**(3)**

**(Total 7 marks)**

7

(a) Explain how vaccination makes a person immune to a disease.

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(4)

(b) Scientists are trialling a ‘nicotine vaccine’ that might help **wean smokers off** the drug nicotine.  
The trials so far have produced very mixed results.  
Nicotine molecules are very small and can get through the protective layers around the brain.

(i) How does nicotine cause a person to become addicted?

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(1)

(ii) The ‘nicotine vaccine’ is made by attaching proteins to nicotine molecules. After ‘vaccination’ the body reacts to the nicotine in the same way as it reacts to pathogens.

Suggest how the ‘nicotine vaccine’ might help wean a smoker off nicotine.

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(2)

(Total 7 marks)

8

Drugs must be trialled before the drugs can be used on patients.

- (a) (i) Before the clinical trials, drugs are tested in the laboratory. The laboratory trials are **not** trials on people.

What is the drug tested on in these laboratory trials?

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(1)

- (ii) Drugs must be trialled before the drugs can be used on patients.

Give **three** reasons why.

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(3)

- (b) Read the information about cholesterol and ways of treating high cholesterol levels.

Diet and inherited factors affect the level of cholesterol in a person's blood. Too much cholesterol may cause deposits of fat to build up in blood vessels and reduce the flow of blood. This may cause the person to have a heart attack. Some drugs can lower the amount of cholesterol in the blood.

The body needs cholesterol. Cells use cholesterol to make new cell membranes and some hormones. The liver makes cholesterol for the body.

Some drugs can help people with high cholesterol levels.

**Statins** block the enzyme in the liver that is used to produce cholesterol. People will normally have to take statins for the rest of their lives. Statins can lead to muscle damage and kidney problems. Using some statins for a long time has caused high numbers of deaths.

**Cholesterol blockers** reduce the absorption of cholesterol from the intestine into the blood. Cholesterol blockers can sometimes cause problems if the person is using other drugs.

Evaluate the use of the two types of drug for a person with high cholesterol levels.

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**(6)**  
**(Total 10 marks)**