INFECTION & RESPONSE TEST 1

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
Antibiotics are used to kill some types of pathogen.

(a) Which illness could be treated with an antibiotic?

Tick one box.

AIDS
Measles
Salmonella
Type 2 diabetes

Alexander Fleming discovered the antibiotic penicillin.

He noticed that one of his Petri dishes containing bacteria had become contaminated with a fungus.

The diagram shows the Petri dish.
(b) Read the information about the discovery of penicillin.

Draw one line from each piece of information to its description.

<table>
<thead>
<tr>
<th>Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleming noticed that there were only a few bacterial colonies growing near the fungus.</td>
<td>Conclusion</td>
</tr>
<tr>
<td>Fleming thought the fungus must have produced a chemical (penicillin) that killed the bacteria around it.</td>
<td>Hypothesis</td>
</tr>
<tr>
<td>He injected 8 mice with bacteria and gave 4 of these mice an injection of penicillin.</td>
<td>Investigation</td>
</tr>
<tr>
<td>The 4 mice injected with penicillin survived. The 4 mice not given penicillin died.</td>
<td>Observation</td>
</tr>
<tr>
<td>The 4 mice injected with penicillin survived. The 4 mice not given penicillin died.</td>
<td>Result</td>
</tr>
</tbody>
</table>

(c) Look at the diagram of the petri dish.

The greater the distance from the fungus the more bacteria grew.

Suggest one reason for this.

____________________________________________________________________________
____________________________________________________________________________
(d) Give two reasons why Fleming's discovery was important.

1. _________________________________________________________________
   ___________________________________________________________________

2. _________________________________________________________________
   ___________________________________________________________________

(Total 8 marks)

Some diseases are communicable.

(a) What does communicable disease mean?

Tick one box.

A disease that can be spread from one person to another. [ ]

A disease that cannot be treated with antibiotics. [ ]

A disease that is not spread from animals to humans. [ ]

A disease that is passed on through genes. [ ]

(1)

(b) A woman becomes ill and has the following symptoms:

• pain when urinating
• thick yellow discharge from vagina.

Which communicable disease does the woman have?

Tick one box.

Gonorrhoea [ ]

HIV [ ]

Measles [ ]

Salmonella [ ]

(1)
Tuberculosis is a bacterial infection that affects the lungs.

Tuberculosis causes severe discomfort.

(c) What type of medicine should be used to kill the tuberculosis bacteria?

___________________________________________________________________

(d) What type of medicine should be used to treat the symptoms of TB?

___________________________________________________________________

(e) Describe the ways in which the human body defends itself against the tuberculosis bacterium.

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(4)

(Total 8 marks)

Figure 1 shows one type of white blood cell.

Figure 1
(a) **What is structure A?**

Tick **one** box.

- Cell membrane
- Cell wall
- Cytoplasm
- Nucleus

(b) **White blood cells help to defend the body against pathogens.**

How do the white blood cells do this?

Tick **three** boxes.

- Clone pathogens
- Engulf pathogens
- Produce antibiotics
- Produce antibodies
- Produce antitoxins
- Produce toxins
Measles is a serious disease. A person can die from measles.

**Figure 2** shows the number of cases of measles in England and Wales between 2012 and 2015.

(c) Use **Figure 2** to calculate the decrease in the number of cases of measles between 2012 and 2015.

___________________________________________________________________
___________________________________________________________________

Answer = ______________________ cases

(2)

(d) Suggest one reason for the decrease in the number of cases of measles between 2012 and 2015.

___________________________________________________________________
___________________________________________________________________

(1)
(e) Antibiotics cannot be used to treat measles.
Suggest why.
___________________________________________________________________
___________________________________________________________________

(f) Gonorrhoea is a disease caused by a bacterium.
Gonorrhoea can be treated with antibiotics.
Give one other way to control the spread of gonorrhoea.
___________________________________________________________________
___________________________________________________________________

A scientist investigated how effective different antibiotics were at killing gonorrhoea bacteria.

This is the method used.
1. Grow gonorrhoea bacteria on agar in a Petri dish.
2. Place one paper disc soaked in water onto the agar.
3. Place four other paper discs, each soaked in a different antibiotic, A, B, C, and D, onto the agar.
4. Use the same sized paper discs and the same concentration of each antibiotic.
5. Incubate the Petri dish for 3 days.

Figure 3 shows the scientist’s results.

A clear area around the disc means the antibiotic has killed the bacteria.

Figure 3
Scientists at a drug company developed a new pain-killing drug, drug X.

(a) Painkillers do not cure infectious diseases.

Why?

(b) The scientists compared drug X with two other pain-killing drugs, drug A and drug B.

In their investigation the scientists:
  • chose 600 volunteers. The volunteers were all in pain
  • gave 200 of the volunteers a standard dose of drug A
  • gave 200 of the volunteers a standard dose of drug B
  • gave 200 of the volunteers a standard dose of drug X.

Over the next seven hours the volunteers recorded how much pain they felt.

To get valid results the three groups of volunteers should be matched for as many factors as possible.

Suggest two of the factors that should be matched.

Antibiotic ___________________________________________________________

Reason ____________________________________________________________
(c) The graph shows the results of the investigation.

(i) How much pain did the volunteers still feel, four hours after taking drug A?

______________________________ percent

(ii) Give one advantage of taking drug A and not drug B.

___________________________________________________________________________
___________________________________________________________________________

(iii) Give two advantages of taking drug B and not drug A.

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

(1)
(d) Drug X is much more expensive than both drug A and drug B.

A pharmacist advised a customer that it would be just as good to take drug A and drug B together instead of drug X.

Do you agree with the pharmacist's advice?

Give reasons for your answer.

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(3)
(Total 10 marks)

New drugs have to be thoroughly tested before they are sold.

The diagram shows a time line for the testing of a new drug.

\[\begin{array}{c|c|c|c|c|c|c|c|c|c|c|c|c}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 \\
\hline
Pre-clinical testing & Clinical testing & Drug on sale \\
\hline
Laboratory tests including tests on animals & Phase 1 & Phase 2 & Phase 3 \\
\hline
10–100 volunteers & 200–400 patients & 3000+ new patients \\
\end{array}\]

(a) What is the main purpose of pre-clinical testing?

___________________________________________________________________

(1)
(b) In Phase 1 of the clinical testing, very low doses of the new drug are used on a small number of volunteers.

(i) What is the main purpose of Phase 1 testing?

___________________________________________________________________

___________________________________________________________________

(1)

(ii) In Phase 1 testing, healthy volunteers are used rather than patients. Suggest one reason for this.

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___________________________________________________________________

(1)

(c) What is the main purpose of the Phase 2 and Phase 3 testing?

___________________________________________________________________

___________________________________________________________________

(1)

(d) During Phase 3 testing, many of the patients are given a placebo.

(i) What is meant by a placebo?

___________________________________________________________________

___________________________________________________________________

(1)

(ii) During the testing, who knows which patients are receiving the placebo?

Tick (√) one box.

Only the patients

Only the doctors

Both patients and doctors

Neither patients nor doctors

(1)

(Total 6 marks)
MRSA strains of bacteria are causing problems in many hospitals.

(a) The diagram shows a hand-gel dispenser.

[Diagram of hand-gel dispenser]

Hand-gel dispensers are now placed at the entrance of most hospital wards.

Explain why.

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(b) Explain, as fully as you can, how MRSA strains of bacteria became difficult to treat.

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(Total 5 marks)
Many strains of bacteria have developed resistance to antibiotics.

The table shows the number of people infected with a resistant strain of one species of bacterium in the UK.

<table>
<thead>
<tr>
<th>Year</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people infected with the resistant strain</td>
<td>3499</td>
<td>3553</td>
<td>3767</td>
<td>3809</td>
<td>4131</td>
</tr>
</tbody>
</table>

(a) Calculate the percentage increase in the number of people infected with the resistant strain between 2004 and 2008.

Show clearly how you work out your answer.

Percentage increase = _________________________

(2)

(b) Explain, in terms of natural selection, why the number of people infected with the resistant strain of the bacterium is increasing.

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(3)(Total 5 marks)

Influenza is caused by a virus.

(a) How do viruses cause illness?

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(1)
A British company making a reality television show in the Peruvian Amazon has been accused of starting an influenza epidemic. This epidemic allegedly killed four members of a remote Indian tribe and left others seriously ill.

The members of the television crew did not show symptoms of influenza, but members of the Indian tribe died from the disease.

Suggest an explanation for this.

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(3)
(Total 4 marks)