

# Infection and Response 4

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Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

Time: **69 minutes**

Marks: **69 marks**

Comments:

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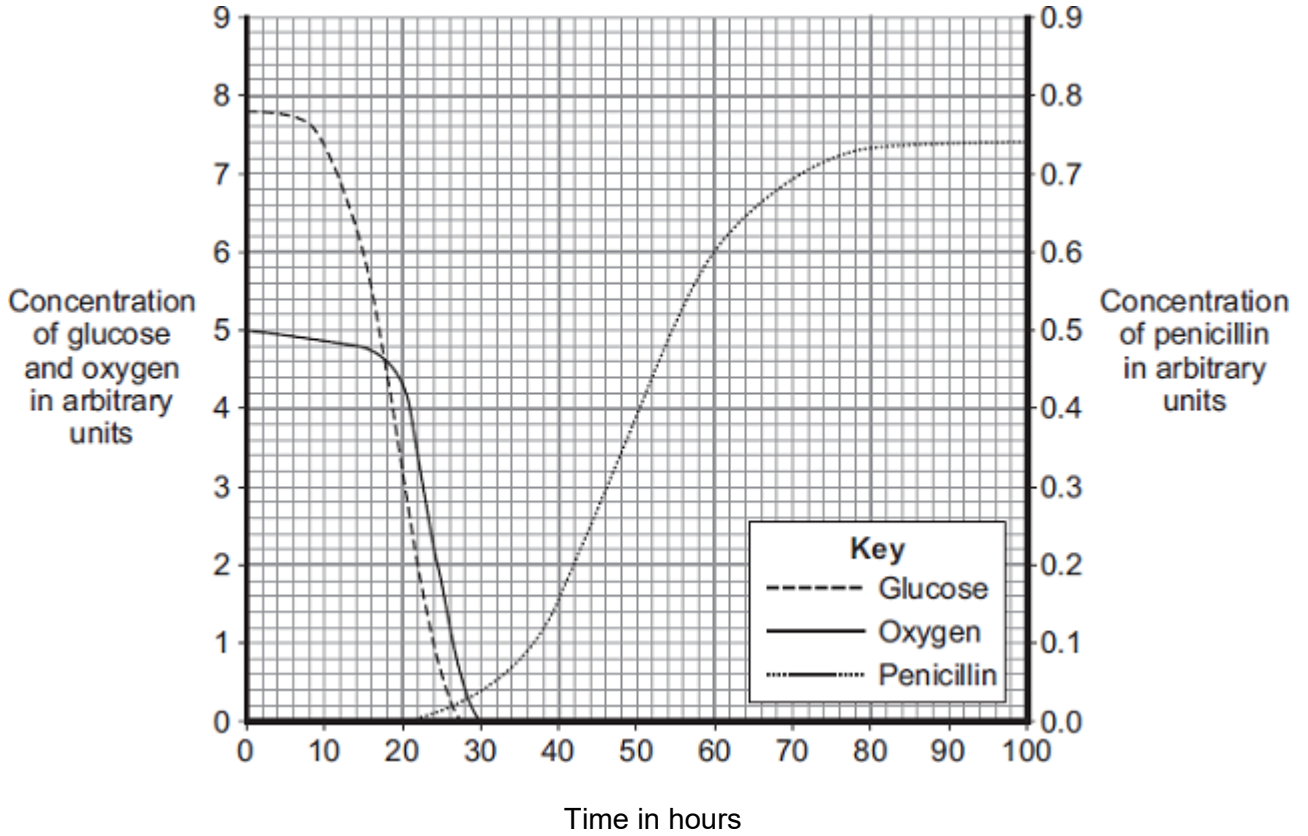
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**Q1.**

The mould *Penicillium* can be grown in a fermenter. *Penicillium* produces the antibiotic penicillin.

The graph shows changes that occurred in a fermenter during the production of penicillin.



(a) During which time period was penicillin produced most quickly?

Draw a ring around **one** answer.

**0 – 20 hours**

**40 – 60 hours**

**80 – 100 hours**

(1)

(b) (i) Describe how the concentration of glucose in the fermenter changes between 0 and 30 hours.

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(2)

- (ii) How does the change in the concentration of oxygen in the fermenter compare with the change in concentration of glucose between 0 and 30 hours?

Tick (✓) **two** boxes.

The oxygen concentration changes after the glucose concentration.

The oxygen concentration changes before the glucose concentration.

The oxygen concentration changes less than the glucose concentration.

The oxygen concentration changes more than the glucose concentration.

(2)

- (iii) What is the name of the process that uses glucose?

Draw a ring around **one** answer.

**distillation**

**filtration**

**respiration**

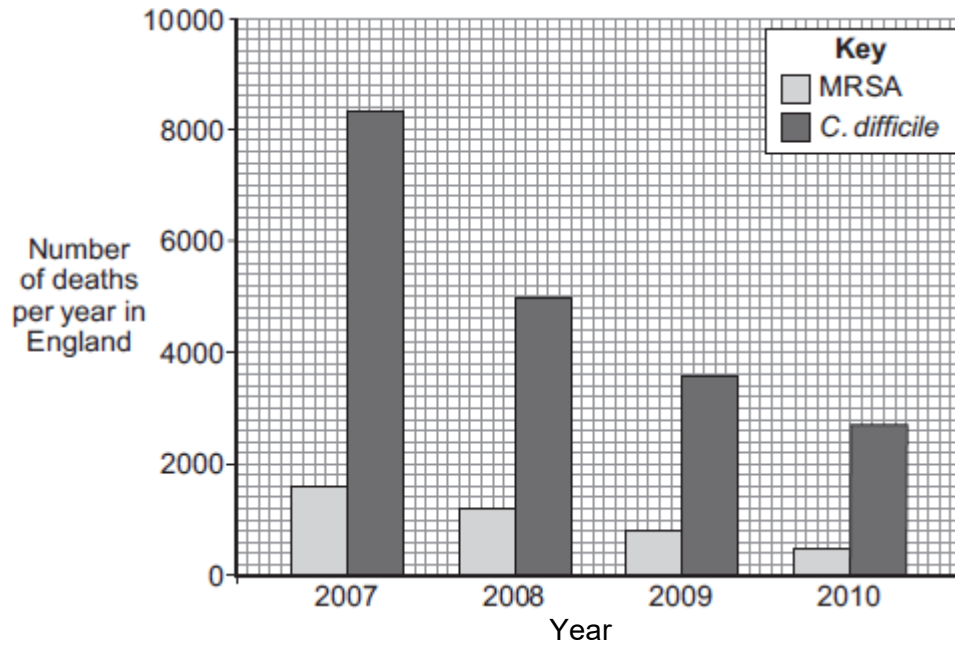
(1)

(Total 6 marks)

**Q2.**

Infections by antibiotic resistant bacteria cause many deaths.

The bar chart below shows information about the number of deaths per year in England from *Methicillin-resistant Staphylococcus aureus* (MRSA) and from *Clostridium difficile* (*C.difficile*) over 4 years.



(a) (i) Describe the trend for deaths caused by *C. difficile*.

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(2)

(ii) Suggest a reason for the trend you have described in part (a)(i).

Explain your answer.

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(2)

(iii) Calculate the percentage change in deaths caused by MRSA from 2009 to 2010.

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Percentage change in deaths caused by MRSA = \_\_\_\_\_ %

(2)

(iv) Numbers have not yet been published for 2011.

When the numbers are published, scientists do **not** expect to see such a large percentage change from 2010 to 2011 as the one you have calculated for 2009 to 2010.

Suggest **one** reason why.

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(1)

(b) Before 2007 there was a rapid increase in the number of deaths caused by MRSA.

Describe how the overuse of the antibiotic methicillin led to this increase.

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(3)

(Total 10 marks)

**Q3.**

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)





**Q5.**

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

- (a) Painkillers do **not** cure infectious diseases.

Why?

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(1)

- (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.

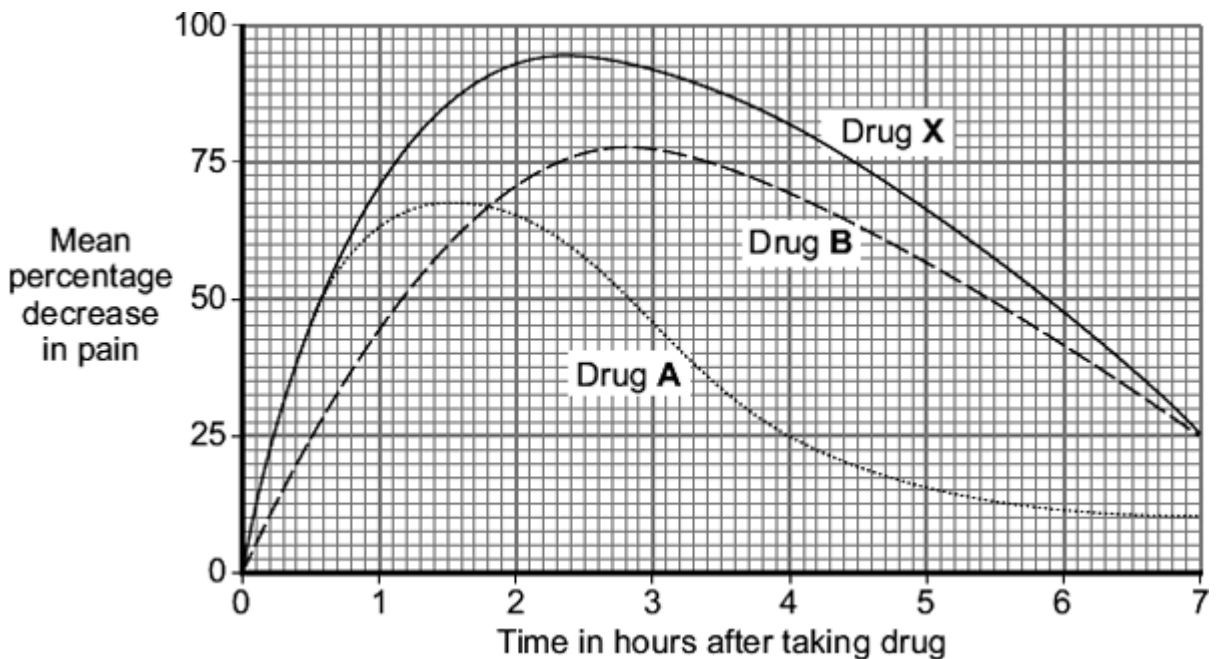
Suggest **two** of the factors that should be matched.

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(2)

- (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

(1)

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

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(1)

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

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(2)

(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)

**Q6.**

Read the article.

Parents all over the world advise children to 'wrap up warm or you'll catch a cold'.

Scientists at Cardiff University recruited 180 volunteers to take part in an investigation to find out if the advice was true. The investigation took place during the city's common cold season.

Half of the volunteers put their feet in bowls of ice cold water for 20 minutes. The other volunteers sat with their feet in empty bowls.

Over the next few days, almost a third of the volunteers who put their feet into cold water developed colds. Fewer than one in ten of the other volunteers developed colds.

- (a) Draw a ring around the correct answer to complete the sentence.

The advice 'wrap up warm or you'll catch a cold' is an example of

hearsay.  
a hypothesis.  
a prediction.

(1)

- (b) What was the experimental control in the investigation?

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(1)

- (c) The scientists did **not** prove that the advice 'wrap up warm or you'll catch a cold' is true.

Explain why.

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(3)

**(Total 5 marks)**

**Q7.**

People may be immunised against diseases using vaccines.

- (a) (i) Which part of the vaccine stimulates the body's defence system?

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**(2)**

- (ii) A person has been vaccinated against measles. The person comes in contact with the measles pathogen. The person does **not** catch measles.

Explain why.

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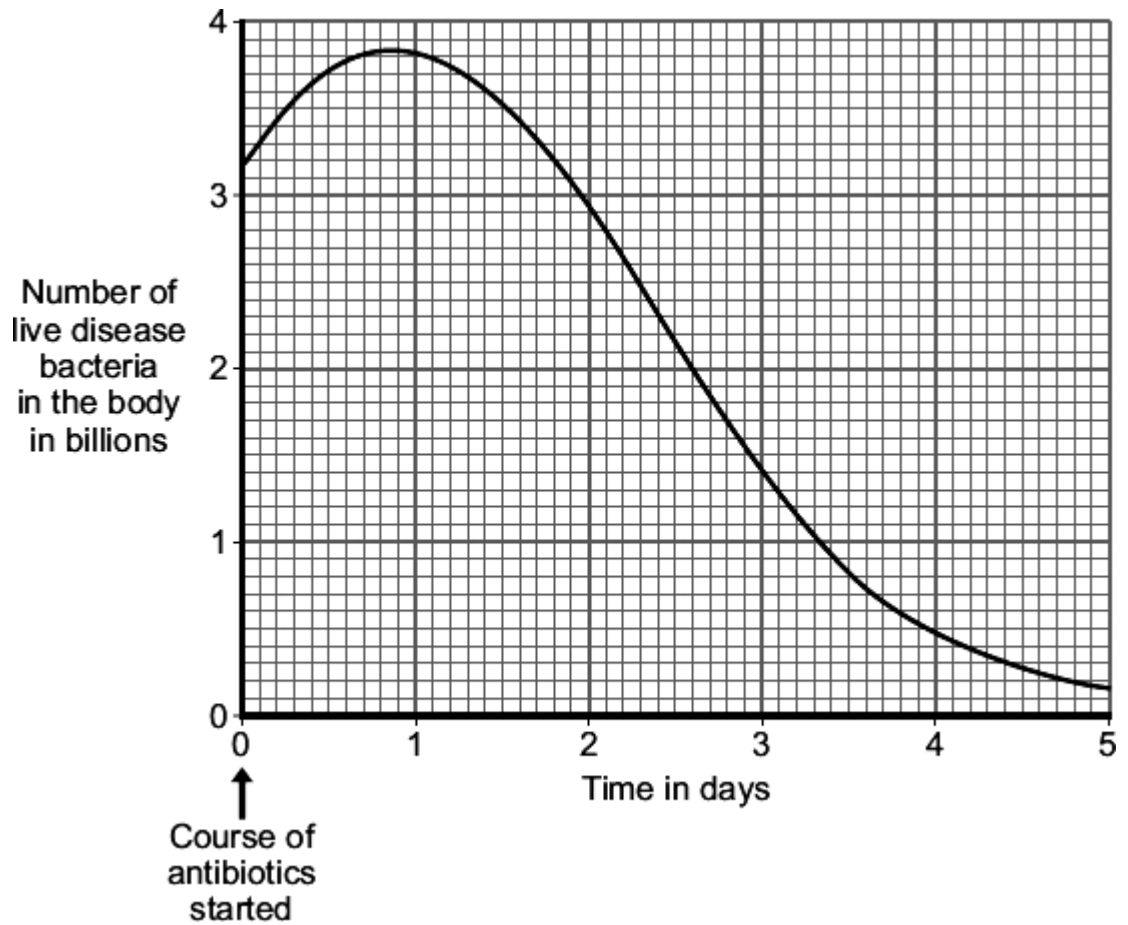
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**(3)**

- (b) A man catches a disease. The man has **not** been immunised against this disease. A doctor gives the man a course of antibiotics.

The graph shows how the number of live disease bacteria in the body changes when the man is taking the antibiotics.



- (i) Four days after starting the course of antibiotics the man feels well again. It is important that the man does **not** stop taking the antibiotics.

Explain why.

Use information from the graph.

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(2)

(ii) Occasionally a new, resistant strain of a pathogen appears.

The new strain may spread rapidly.

Explain why.

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(3)  
(Total 10 marks)

**Q8.**

Obesity is linked to several diseases.

(a) Name **two** diseases linked to obesity.

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

(2)

(b) Scientists trialled a new slimming drug.

The table shows their results after one year.

Percentage change in mass of each volunteer	Number of volunteers
gained mass or lost 0 to 3.9 %	1900
lost 4.0 to 4.9 %	1100
lost 5.0 to 9.9 %	1500
lost 10 % or more	1500

(i) Calculate the proportion of the volunteers who lost 10 % or more of their mass.

You should first calculate the total number of volunteers, then work out the proportion.

\_\_\_\_\_

\_\_\_\_\_

Proportion of volunteers = \_\_\_\_\_

(2)

(ii) The National Health Service (NHS) gave permission for the drug to be used.

Use information from the table to suggest a reason why the NHS gave permission for the drug to be used.

\_\_\_\_\_

\_\_\_\_\_

(1)

(Total 5 marks)

**Q9.**

(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)

## Mark schemes

### Q1.

(a) 40 – 60 hours 1

(b) (i) decrease 1

1<sup>st</sup> slowly then faster / appropriate detail from the graph – e.g. from 7.8 to 0 / faster after 4 – 10h 1

(ii) oxygen after glucose  
*extra box ticked cancels 1 mark* 1

oxygen less than glucose 1

(iii) respiration 1

[6]

### Q2.

(a) (i) decrease 1

rate of decrease slows 1

(ii) any **one** from:  
• more use of disinfectant  
*allow any reasonable increase in hygiene or sterilisation precautions*  
• more use of hand washing  
• more careful / more often cleaning of patient facilities  
• raised awareness / education about hygiene 1

Explanation:  
stops / reduces the bacteria being transferred / spreading 1

(iii)  $800 - 500 / 800 \times 100 =$  1

37.5 (%)  
*correct answer with or without working gains 2 marks* 1

(iv) any **one** from:  
• numbers quite low now so hard to reduce further  
• was a big campaign / much publicity (in 2009) so more people already doing it

- hygiene / cleaning now good so hard to improve
- hospitals short of money so less staff to clean

1

- (b) mutation occurred giving resistance (to methicillin)  
*do **not** accept overuse caused mutation*

1

resistant bacteria not able to be treated / not killed

1

these bacteria multiplied / reproduced / spread quickly

1

[10]

### Q3.

- (a) (i) any **one** from:

- cells
- tissues
- (live) animals / named  
*allow mammals*

1

- (ii) any **three** from:

(to test for)

- toxicity / check not poisonous / not harmful  
*allow side-effect*  
*allow converse*
- interaction with other drugs
- efficacy **or** to see if they work **or** check if they treat the disease  
*allow converse*
- dosage **or** how much is needed

3

- (b) **argued evaluation**

*comparison can be written anywhere in evaluation allow use of 'only' for implied comparison for each point eg **only** statins damage muscles / kidneys / organs*

any **six** from:

- statin can damage / muscles / kidneys / organs but cholesterol blockers don't  
*ignore liver*  
*if neither of the first 2 points are given accept for 1 mark*
- statins can cause death but cholesterol blockers don't  
*statins are more dangerous than cholesterol blockers **or***

*statins have more side effects*

- cholesterol blockers can interfere with action of other drugs but statins don't
- statins are for a life time but cholesterol blockers are not
- statins (might) reduce cholesterol to zero but cholesterol blockers only reduce it **or** statins reduce cholesterol more  
*allow statins (might) stop membrane / hormone production  
but cholesterol blockers don't*
- statins better for people with inherited high cholesterol
- cholesterol blockers better for people with dietary cholesterol problems
- taking/using statins/cholesterol blockers is better than dying from heart attack or build up of fat in blood vessels or reduced blood flow

6

[10]

#### Q4.

- (a) dead or inactive or weak form of pathogen / bacterium / virus / microorganism introduced

*ignore disease / germ*

1

(stimulates) white cells / lymphocytes / leucocytes

*accept B and T cells*

*ignore phagocytes*

1

to produce antibodies

*ignore antitoxins / antigens*

1

antibodies made quickly on re-infection / idea of memory cells

*ignore already has antibodies*

*ignore 'body remembers'*

1

- (b) (i) alters / causes chemical processes / body chemistry

*ignore craving / withdrawal symptoms*

1

(ii) any **two** from:

- combined molecule / vaccine stimulates antibody production
- if nicotine taken, antibodies bind to nicotine molecules  
*ignore destroys nicotine*
- making them too large to get to brain / making them ineffective  
*allow prevents nicotine entering brain*

2

[7]

**Q5.**

- (a) don't kill pathogens / bacteria / viruses / microbes / microorganisms  
*allow don't contain antibiotics*  
*ignore antibodies / attack / fight*  
*allow only treat symptoms / pain*  
*ignore kill disease / germs*

1

- (b) any **two** from:

- age
- gender
- extent / severity of pain  
**or** how long had pain before trial
- type of pain / illness / site of pain  
*accept 'the pain' for 1 mark, if neither extent or type given*  
*ignore pain threshold*
- (body) mass / weight / height  
*allow body size / physique*
- other medical issues / drugs taken / health / fitness
- ethnicity

2

- (c) (i) 75  
*ignore calculations / %*

1

- (ii) faster pain relief / decrease  
*allow pain relief sooner*  
**or** *it works quicker*  
  
*or more pain relief at start / in first  $1 \frac{3}{4}$  hours*

1

- (iii) decrease of pain higher / more  
  
*ignore more effective unless qualified by time  $> 1 \frac{3}{4}$  hours*  
*allow effect lasts longer*

1

decrease of pain is longer lasting

1

- (d) any **three** from:  
*ignore yes or no*

**(Yes because)**

- rapid pain relief (from A)

- long lasting pain relief (from B)
- and it costs less
- the sum of the pain relief (from A + B) is greater (than X)

**(No because)**

- drug X gives more pain relief
- (A + B / they ) might interact with each other
- could result in overdose
- could be more / new side effects

*if neither points gained  
allow (more) dangerous*

3

[10]

**Q6.**

(a) hearsay

1

(b) (volunteers with feet in) empty bowls

*accept bowl with no (iced) water*

*do **not** accept mention of bowl with iced water*

1

(c) any **three** from:

*ignore control variables, eg age, gender*

- only some of those whose feet were in cold water caught colds
- some controls caught colds
- only feet were cold in experimental group  
*allow (control) not wrapped up warm*
- only kept feet in cold water for 20 minutes
- insufficient evidence for 'proof' / only showed increased risk  
*allow small sample size*
- don't know activities of individuals before / after the investigation  
(eg exposure to cold virus) / reference to immune system  
*allow investigation done in 'cold season'*

3

[5]

**Q7.**

(a) (i) dead / inactive / weakened

*allow antigen / protein*

*ignore ref to other components*

	<i>ignore small amount</i>	1
	pathogen / bacterium / virus / microorganism <i>ignore germs / disease</i>	1
(ii)	<i>antigen / antibiotic instead of antibody = max 2</i>	
	white blood cells produce / release antibodies <i>accept lymphocytes / leucocytes / memory cells produce antibodies</i> <i>do not accept phagocytes</i>	1
	antibodies produced quickly	1
	(these) antibodies destroy the pathogen <i>allow kill</i> <i>do not accept antibodies engulf pathogens</i>	1
(b)	(i) (live) bacteria still in body <i>ignore numbers</i>	1
	would reproduce <i>ignore mutation / growth</i>	1
(ii)	antibiotics / treatment ineffective <b>or</b> resistant pathogens survive <i>accept resistant out compete non-resistant</i>	1
	these reproduce	1
	population of resistant pathogens increases <i>allow (resistant pathogens reproduce) rapidly</i>	1

[10]

**Q8.**

- (a) any **two** from:
- ignore eating disorder*
  - ignore cancer*
  - arthritis  
*accept worn joints*
  - diabetes  
*accept high blood sugar*
  - high blood pressure



*Students have been informed that the headline is not justified*

- reference to reliability, eg only a small number of mice tested  
**or** trial too short  
**or** investigation not repeated
- reference to control, eg mice given caffeine not coffee  
**or** 6 cups (equivalence) is more than 1 dose
- (and) the effect on mice might not be same as on humans  
*allow only tested on mice*
- (also) text suggests that the treatment improves memory loss (rather than delays it)  
*accept text suggests disease cured*

**or** mice already have memory loss or experiment only showed improvement in memory

**or** does not show **delays** Alzheimer's

**or** experiment not done on old mice

*allow reference to the fact that mice engineered to have it*

3

[6]