

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education  
March 2009



**SCIENCE A**  
**Unit Biology B1a (Human Biology)**

**BLY1AP**

**BIOLOGY**  
**Unit Biology B1a (Human Biology)**

Wednesday 4 March 2009 Morning Session

**For this paper you must have:**

- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

Time allowed: 30 minutes

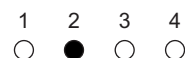
**Instructions**

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Biology Unit 1a' printed on it.
- Attempt **one Tier only**, either the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

**Instructions for recording answers**

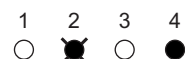
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:



- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



**Information**

- The maximum mark for this paper is 36.

**Advice**

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.  
The Higher Tier starts on page 16 of this booklet.

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**FOUNDATION TIER**

**SECTION ONE**

Questions **ONE** to **FIVE**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

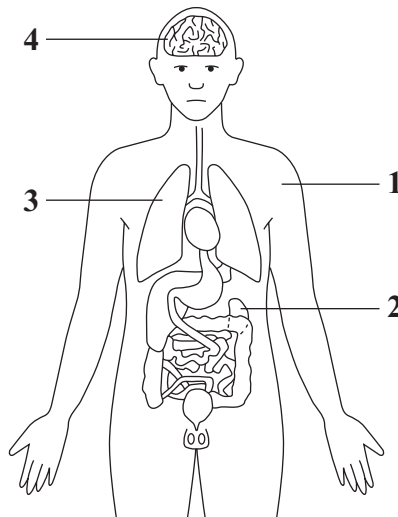
Use **each** answer only **once**.

Mark your choices on the answer sheet.

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**QUESTION ONE**

The diagram shows some of the organs which help to keep conditions inside the human body constant.



Match statements, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram.

- A** the skin, which produces sweat
- B** a lung, which breathes out carbon dioxide
- C** the brain, which coordinates the other organs
- D** the kidney, which produces urine

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**QUESTION TWO**

What we eat affects our health.

Match diets, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

- A** a diet low in fat
- B** a diet high in sugar
- C** a diet high in salt
- D** a diet high in saturated fat

<b>1</b>	should be avoided by a person with diabetes
<b>2</b>	could lead to high blood pressure
<b>3</b>	is suitable for someone trying to lose weight
<b>4</b>	might raise the level of cholesterol in the blood

**Turn over for the next question**

**Turn over ►**

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**QUESTION THREE**

There are both legal drugs and illegal drugs.

Match substances, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

**A** alcohol

**B** cocaine

**C** tobacco

**D** thalidomide

<b>1</b>	is linked to lung cancer
<b>2</b>	slows people's reactions
<b>3</b>	is used to treat leprosy
<b>4</b>	is an illegal drug that is very addictive

**QUESTION FOUR**

The table shows the effectiveness of in vitro fertilisation (IVF) treatment in a fertility clinic in 2004 and 2005.

Age of women	2004				2005			
	Under 35	35–37	38–40	Over 40	Under 35	35–37	38–40	Over 40
<b>Number of IVF treatments</b>	130	100	29	20	142	62	33	11
<b>Average number of embryos transferred</b>	2.6	2.8	3.3	3.6	2.5	2.8	3.0	3.2
<b>Percentage of successful pregnancies</b>	43	30	21	13	43	48	30	27

Match figures, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** 30  
**B** 48  
**C** 99  
**D** 142

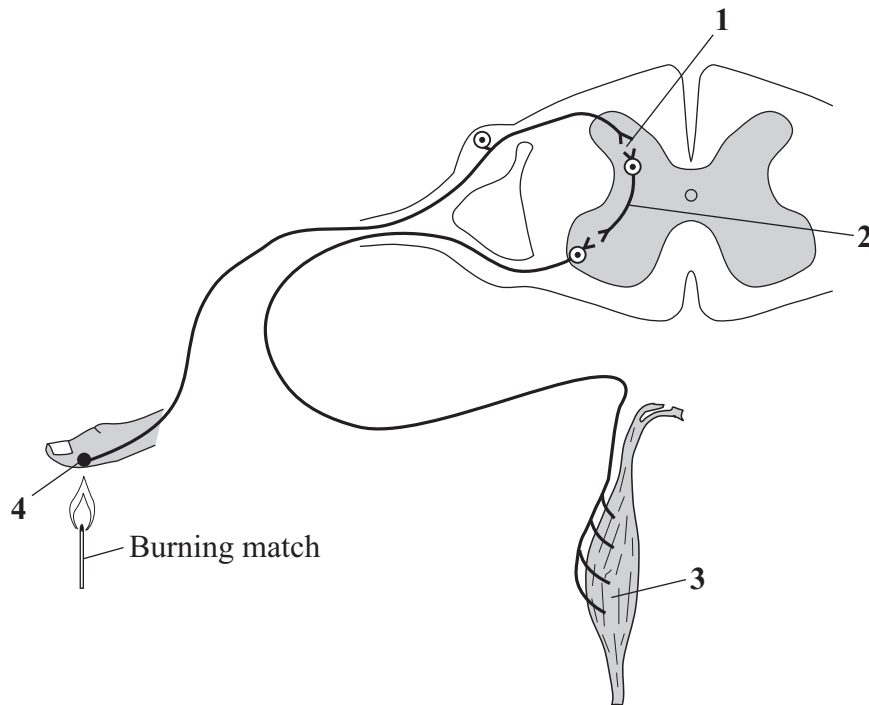
<b>1</b>	the number of IVF treatments for women under 35 in 2005
<b>2</b>	the highest percentage of successful pregnancies
<b>3</b>	the number of embryos transferred to women aged 38–40 in 2005
<b>4</b>	the number of successful pregnancies for women aged 35–37 in 2004

**Turn over for the next question**

**Turn over ►**

**QUESTION FIVE**

A student accidentally puts his hand close to a burning match. His hand automatically moves away from the flame. The drawing shows the parts involved in this reflex action.



Match terms, **A**, **B**, **C** and **D**, with the labels **1–4** on the drawing.

- A** effector
- B** receptor
- C** relay neurone
- D** synapse

**Turn over for the next question**

**Turn over ►**

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**SECTION TWO**Questions **SIX** to **NINE**.

Each of these questions has four parts.

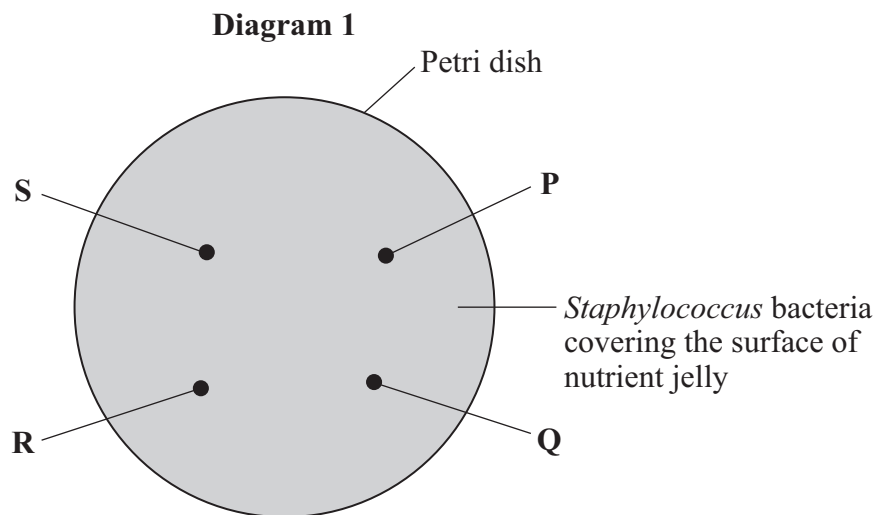
In each part choose only **one** answer.Mark your choices on the answer sheet.

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**QUESTION SIX**

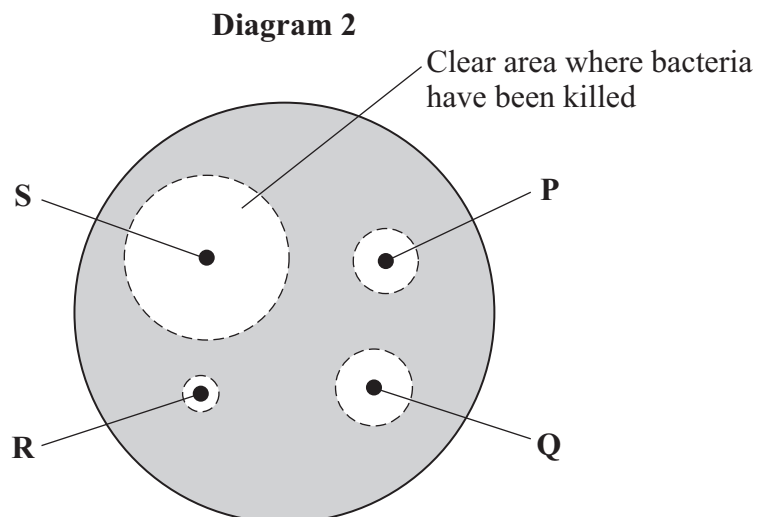
Students investigated the effectiveness of four different antibacterial mouthwashes, **P**, **Q**, **R** and **S**. Identical filter paper discs were soaked in mouthwashes **P**, **Q**, **R** and **S** respectively.

The discs were then placed on *Staphylococcus* bacteria growing in a Petri dish, as shown in **Diagram 1**.



The dish was covered and left for 48 hours.

**Diagram 2** shows the appearance of the Petri dish after 48 hours.





- 
- 6A** Which was the independent variable in this investigation?
- 1 the temperature of the room
  - 2 the type of mouthwash
  - 3 the time the dish was left for
  - 4 the size of the clear area
- 6B** Which was a control variable in this investigation?
- 1 the diameter of each bacterium
  - 2 the diameter of the Petri dish
  - 3 the diameter of the clear area
  - 4 the diameter of each filter paper disc
- 6C** Which mouthwash killed most *Staphylococcus* bacteria?
- 1 P
  - 2 Q
  - 3 R
  - 4 S
- 6D** The investigation would have been more reliable if the students had . . .
- 1 left the dish for 72 hours.
  - 2 left the dish uncovered.
  - 3 used larger discs of filter paper.
  - 4 compared their results with other groups.

**QUESTION SEVEN**

Vaccination protects us against some diseases.

**7A** It is important that a high proportion of children are vaccinated against measles . . .

- 1 to reduce the chance of a measles epidemic.
- 2 so that fewer people will suffer side effects from vaccination.
- 3 so that there is less chance of a resistant strain of measles developing.
- 4 so that fewer people will produce measles antibodies.

The table is taken from an information leaflet for parents of young children. It shows a recommended vaccination programme for children.

<b>When the vaccination is given</b>	<b>What the vaccine protects children against</b>	<b>How the vaccine is given</b>
At 2 months old <b>and</b> at 3 months old <b>and</b> at 4 months old	polio	by mouth
	diphtheria tetanus whooping cough	by one injection
Between 12 and 15 months old <b>and</b> at 4 to 5 years old	measles mumps rubella	by one injection
	polio	by mouth
	diphtheria tetanus	by one injection
At 10–14 years old	tuberculosis	by one injection

Use **only** the information in the table to answer questions **7B** and **7C**.

**7B** Which vaccine is given by mouth?

- 1 polio
- 2 tetanus
- 3 tuberculosis
- 4 whooping cough

**7C** Against how many diseases altogether has a 14 year-old child been vaccinated?

- 1 4
- 2 7
- 3 8
- 4 14

**7D** It is necessary to give the same vaccination against polio more than once because . . .

- 1 white blood cells only live for a few weeks.
- 2 the polio virus mutates frequently.
- 3 one vaccination does **not** result in a sufficient number of antibodies.
- 4 the older you are, the more likely you are to get polio.

**Turn over for the next question**

**Turn over ►**

**QUESTION EIGHT**

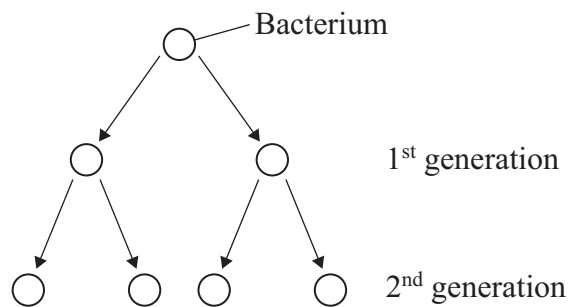
Some infections are caused by bacteria.

**8A** Bacteria can change into strains that are resistant to a particular antibiotic.

What causes this change in a bacterium?

- 1 immunity
- 2 mutation
- 3 natural selection
- 4 reproduction

The diagram shows how the number of bacteria in the body changes after infection.



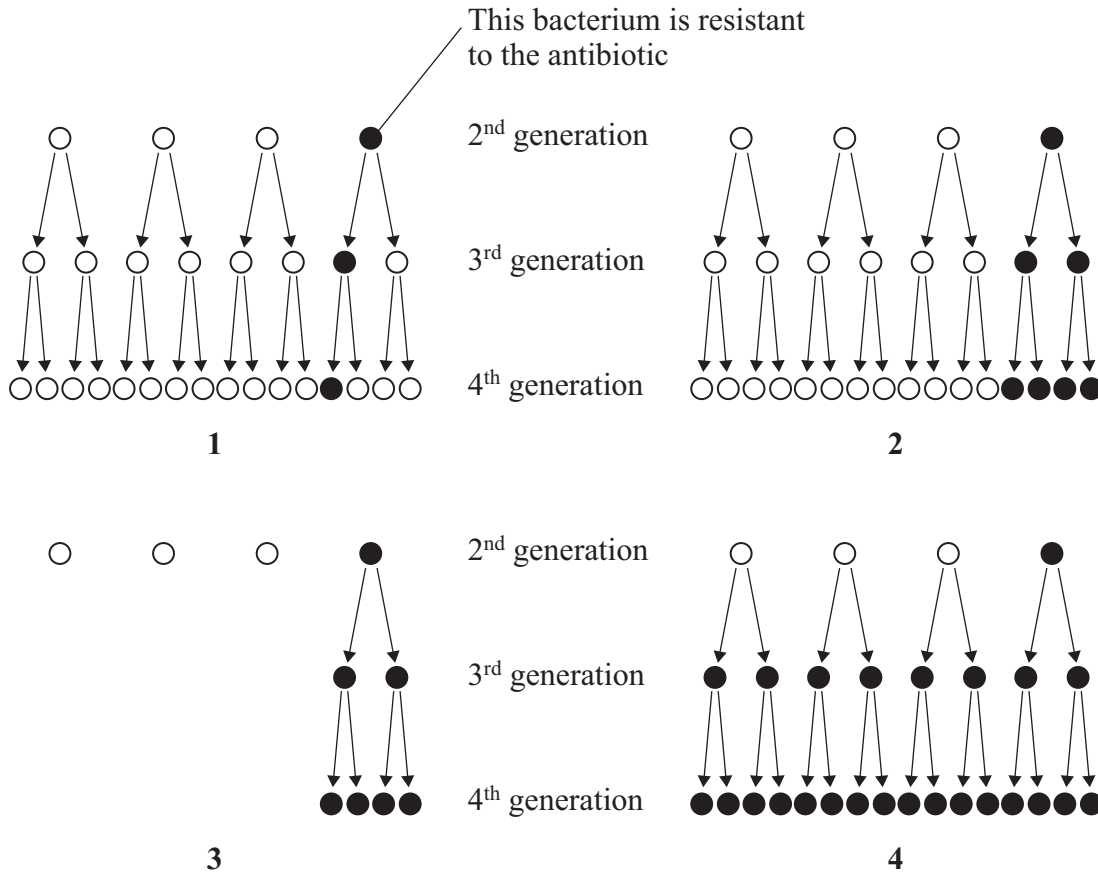
**8B** In ideal conditions, the population of bacteria doubles every 20 minutes.

In ideal conditions, how many bacteria will there be in the body 2 hours after infection with a single bacterium?

- 1 4
- 2 8
- 3 64
- 4 128

**8C** One of the second generation of bacteria changes so that it is resistant to an antibiotic.

Which diagram shows the way in which the population of bacteria changes when this generation is treated with the antibiotic?



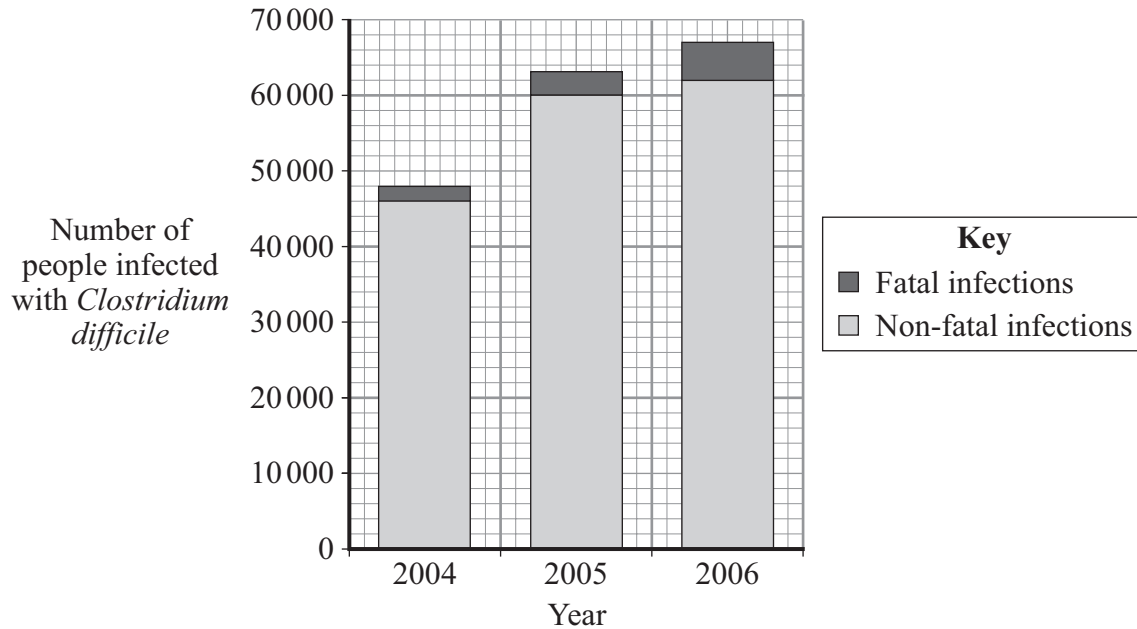
**8D** The change in the proportions of non-resistant and resistant bacteria by the fourth generation is due to . . .

- 1 genetic engineering.
- 2 mutation.
- 3 natural selection.
- 4 reproduction.

Turn over ►

### QUESTION NINE

The bar chart shows the number of recorded cases of illness and of deaths caused by *Clostridium difficile* in the UK.



**9A** What proportion of people infected with *Clostridium difficile* in 2004 died from the infection?

- 1 1 in 24
- 2 1 in 46
- 3 1 in 48
- 4 1 in 65

**9B** The data indicates that . . .

- 1 treatment of infections caused by *Clostridium difficile* is becoming more effective.
- 2 the rise in *Clostridium difficile* cases is causing a pandemic.
- 3 an infection of *Clostridium difficile* was less likely to kill a patient in 2004 than in 2006.
- 4 there were fewer antibiotic resistant strains of *Clostridium difficile* in 2006 than in 2004.

One leading surgeon has said: “It is believed that one sixth of all cases of infections caused by *Clostridium difficile* are not diagnosed.”

**9C** The surgeon’s statement is . . .

- 1 likely to be accurate as a prominent scientist made the statement.
- 2 likely to be inaccurate as it was reported in a newspaper.
- 3 a valid conclusion based on observations.
- 4 hearsay, because no-one knows the real number of cases.

**9D** If the surgeon’s statement were correct, this would suggest that . . .

- 1 *Clostridium difficile* has developed resistance to some drugs.
- 2 fewer people die of *Clostridium difficile* infections than is reported.
- 3 it is often difficult to determine the cause of an infection.
- 4 *Clostridium difficile* infections are out of control.

**END OF TEST**

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.  
The Foundation Tier is earlier in this booklet.

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## HIGHER TIER

### SECTION ONE

Questions **ONE** and **TWO**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

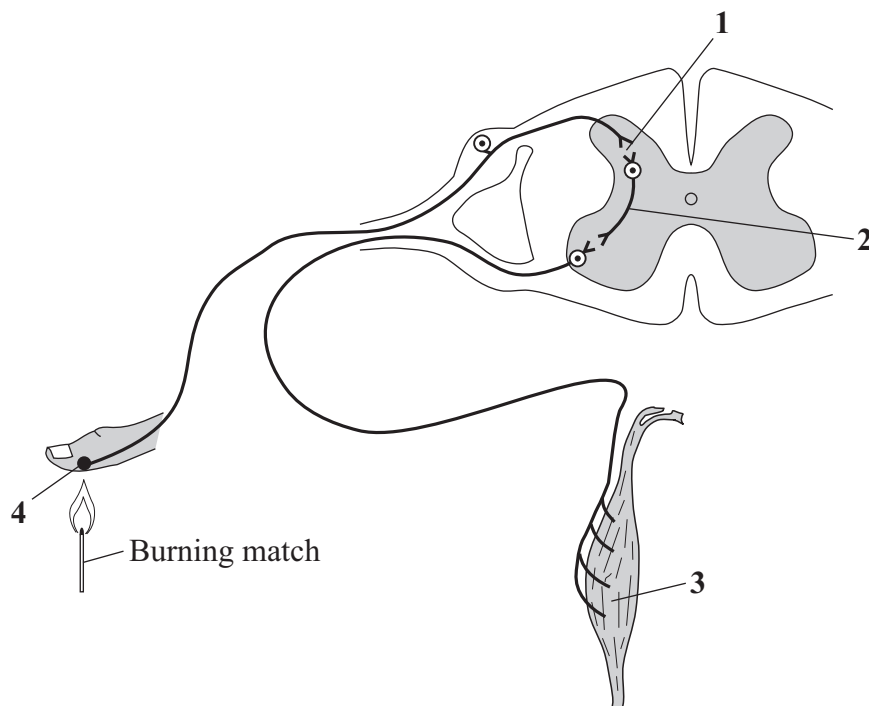
Use **each** answer only **once**.

Mark your choices on the answer sheet.

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### QUESTION ONE

A student accidentally puts his hand close to a burning match. His hand automatically moves away from the flame. The drawing shows the parts involved in this reflex action.



Match terms, **A**, **B**, **C** and **D**, with the labels **1–4** on the drawing.

- A** effector
- B** receptor
- C** relay neurone
- D** synapse



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**QUESTION TWO**

A combination of balanced diet and regular exercise is needed to keep our bodies healthy.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

- A** constant
- B** greater
- C** insufficient
- D** irregular

Lack of food can result in a woman's periods becoming . . . **1** . . . .

Obesity may result from . . . **2** . . . exercise.

When an adult's energy intake balances their energy consumption, their body mass will be . . . **3** . . . .

When people do more exercise, their metabolic rate becomes . . . **4** . . . .

**Turn over for the next question**

**Turn over ►**

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**SECTION TWO**Questions **THREE** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

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**QUESTION THREE**

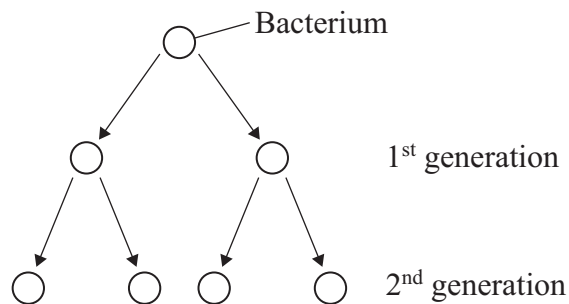
Some infections are caused by bacteria.

**3A** Bacteria can change into strains that are resistant to a particular antibiotic.

What causes this change in a bacterium?

- 1 immunity
- 2 mutation
- 3 natural selection
- 4 reproduction

The diagram shows how the number of bacteria in the body changes after infection.

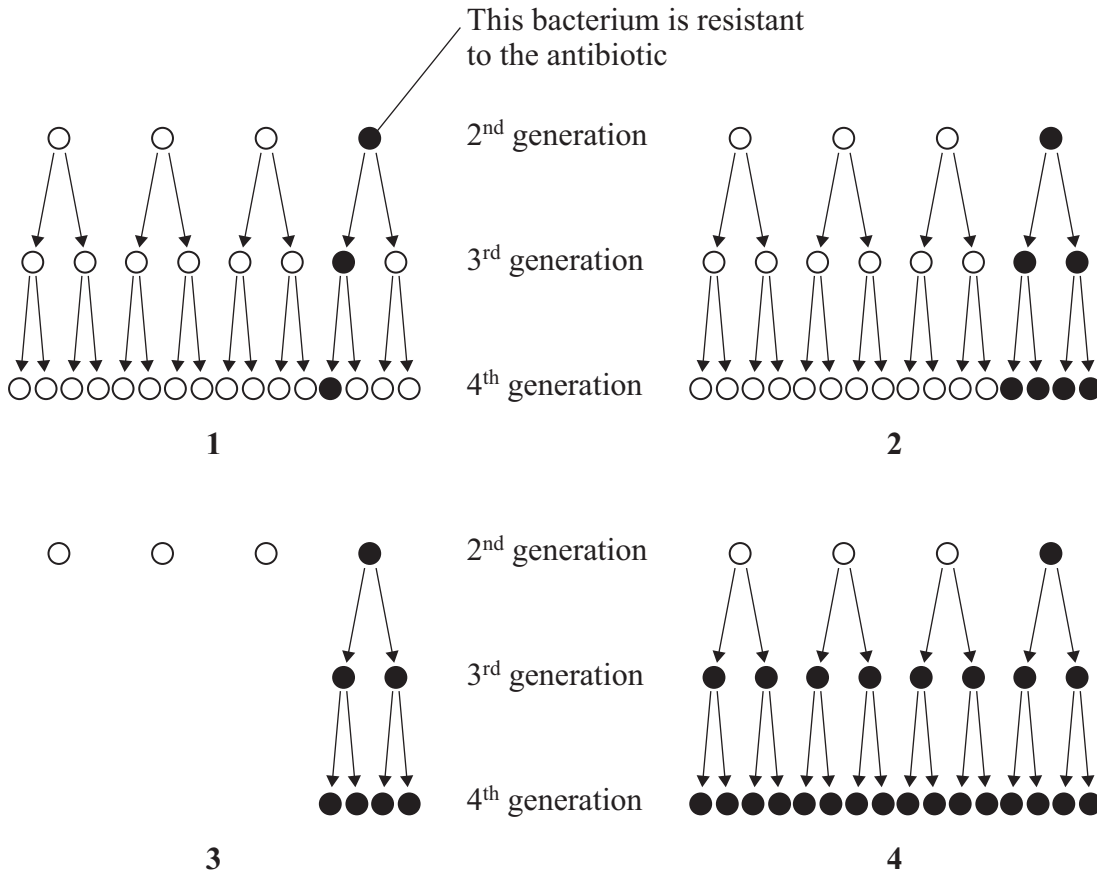
**3B** In ideal conditions, the population of bacteria doubles every 20 minutes.

In ideal conditions, how many bacteria will there be in the body 2 hours after infection with a single bacterium?

- 1 4
- 2 8
- 3 64
- 4 128

**3C** One of the second generation of bacteria changes so that it is resistant to an antibiotic.

Which diagram shows the way in which the population of bacteria changes when this generation is treated with the antibiotic?



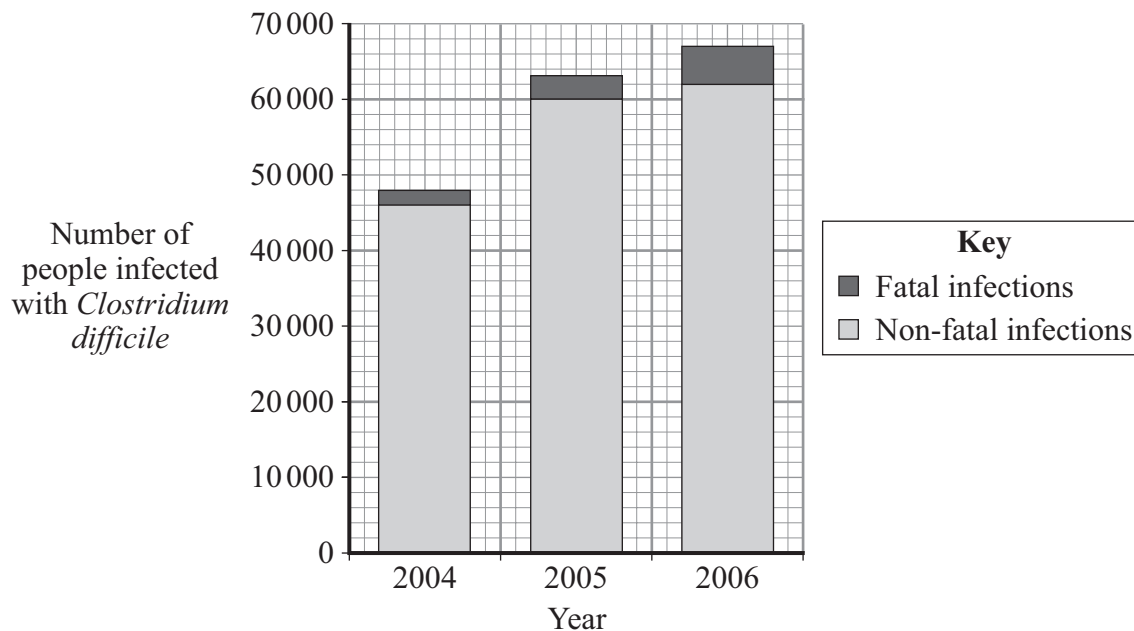
**3D** The change in the proportions of non-resistant and resistant bacteria by the fourth generation is due to . . .

- 1 genetic engineering.
- 2 mutation.
- 3 natural selection.
- 4 reproduction.

Turn over ►

**QUESTION FOUR**

The bar chart shows the number of recorded cases of illness and of deaths caused by *Clostridium difficile* in the UK.



**4A** What proportion of people infected with *Clostridium difficile* in 2004 died from the infection?

- 1 1 in 24
- 2 1 in 46
- 3 1 in 48
- 4 1 in 65

**4B** The data indicates that . . .

- 1 treatment of infections caused by *Clostridium difficile* is becoming more effective.
- 2 the rise in *Clostridium difficile* cases is causing a pandemic.
- 3 an infection of *Clostridium difficile* was less likely to kill a patient in 2004 than in 2006.
- 4 there were fewer antibiotic resistant strains of *Clostridium difficile* in 2006 than in 2004.

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One leading surgeon has said: “It is believed that one sixth of all cases of infections caused by *Clostridium difficile* are not diagnosed.”

4C The surgeon’s statement is . . .

- 1 likely to be accurate as a prominent scientist made the statement.
- 2 likely to be inaccurate as it was reported in a newspaper.
- 3 a valid conclusion based on observations.
- 4 hearsay, because no-one knows the real number of cases.

4D If the surgeon’s statement were correct, this would suggest that . . .

- 1 *Clostridium difficile* has developed resistance to some drugs.
- 2 fewer people die of *Clostridium difficile* infections than is reported.
- 3 it is often difficult to determine the cause of an infection.
- 4 *Clostridium difficile* infections are out of control.

**Turn over for the next question**

**Turn over ►**

## QUESTION FIVE

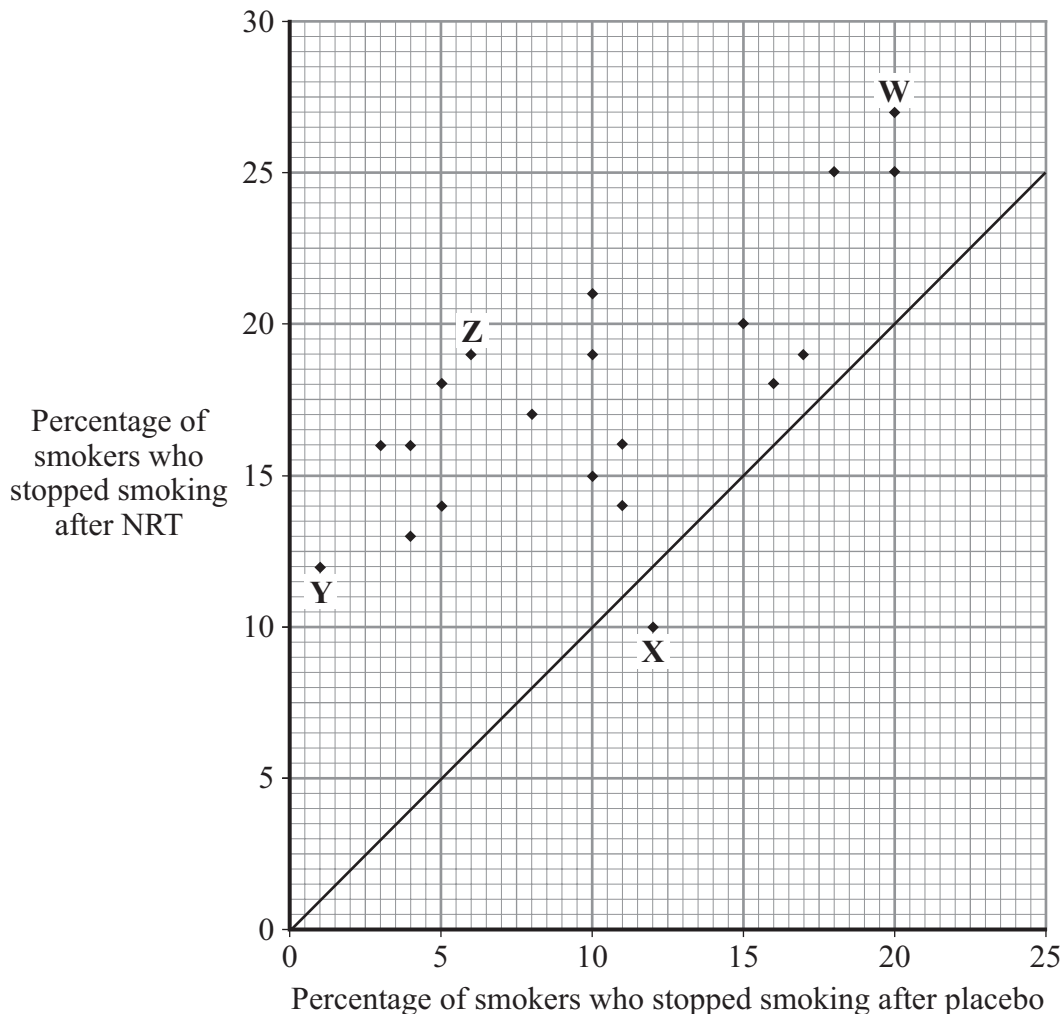
Nicotine replacement therapy (NRT) is used to help people to stop smoking.

**5A** NRT is used to help people to stop smoking because nicotine . . .

- 1 reduces the amount of oxygen carried by the blood.
- 2 causes lung cancer.
- 3 alters chemical processes in the body.
- 4 increases appetite.

The scattergram shows the results of 20 investigations into the use of different types of NRT tablets. In each investigation, some smokers were given NRT and some were given a placebo.

Each plot represents **one** investigation. Each plot represents the percentage of smokers who stopped smoking after NRT and the percentage of people who stopped smoking after being given a placebo in that investigation.



**5B** In these investigations, the placebo would be . . .

- 1 a tablet that tasted of nicotine.
- 2 a white tablet.
- 3 a tablet with sugar.
- 4 a tablet with no nicotine.

**5C** In which investigation did more people stop smoking after using the placebo than after using NRT?

- 1 **W**
- 2 **X**
- 3 **Y**
- 4 **Z**

**5D** What conclusion can be drawn from the results of the investigations?

- 1 NRT was more effective than a placebo in most of the investigations.
- 2 Patients given a placebo do not stop smoking.
- 3 All the people given NRT stopped smoking.
- 4 Most of the people in the investigations gave up smoking.

**Turn over for the next question**

**Turn over ►**

**QUESTION SIX**

Body mass index (BMI) is an indication of a person's obesity.

A person's BMI is calculated using the formula below.

$$\text{BMI} = \frac{\text{body mass in kg}}{(\text{height in m})^2}$$

The table shows the relationship between BMI and obesity.

<b>BMI</b>	<b>Obesity category</b>
less than 18.5	underweight
18.5–24.9	normal
25.0–29.9	overweight
30.0 and over	obese

**6A** A 1.83 m tall adult with a body mass of 61 kg is . . .

- 1 underweight.
- 2 normal.
- 3 overweight.
- 4 obese.

**6B** Scientists want to survey 2000 adults for BMI.

Which factor would be most difficult to control in the survey?

- 1 age
- 2 ethnic origin
- 3 diet type
- 4 gender



- 
- 6C** Compared with an adult female whose BMI is 19, an adult female with a BMI of 28 is more likely to have . . .
- 1 a high blood sugar level.
  - 2 irregular periods.
  - 3 a low blood LDL level.
  - 4 reduced resistance to infection.
- 6D** Muscle tissue is more dense than fat. Athletes who train regularly build up their muscles. As a result, they have a higher muscle to fat ratio than non-athletes.
- An adult athlete with a BMI of 26.2 . . .
- 1 is likely to be healthy and fit even though he is outside the ‘normal’ guideline in the obesity category.
  - 2 should begin a diet programme to encourage weight loss.
  - 3 should still be classed as ‘normal’ in the obesity category.
  - 4 would have a lower metabolic rate than non-athletes.

**Turn over for the next question**

**Turn over ►**

**QUESTION SEVEN**

In the first 10 months of 2006, 15 000 cases of chickenpox were reported in Scotland.

Over the same period in 2007, 19 500 cases of the disease were reported.

**7A** What was the percentage rise in the number of cases of chickenpox reported in Scotland from 2006 to 2007?

- 1 3.0
- 2 4.5
- 3 23.1
- 4 30.0

**7B** Doctors suggested that the actual number of cases during the whole of 2007 would be over 24 000.

This suggestion is . . .

- 1 hearsay.
- 2 a conclusion.
- 3 a hypothesis.
- 4 a prediction.

Read the extract from the article.

Most children with chickenpox suffer only a few uncomfortable days. Yet we are being told that it is a serious disease against which we need to vaccinate. These recommendations are based on research which included all children admitted to hospitals in the UK and Ireland over a 13-month period. The researchers found that, out of a total population of over 10 million children, 112 children had serious complications with chickenpox. Six deaths were reported, but four of these children also had other chronic health problems.

**7C** The author of the article is against vaccination against chickenpox because . . .

- 1 it may further increase the number of cases of autism caused by vaccination.
- 2 chickenpox causes death in only a very small number of cases.
- 3 children with chickenpox do not get complications.
- 4 children already have too many painful vaccinations.

**7D** The author also claims that: ‘Vaccination will push the disease into older age groups. These groups will catch the illness as their vaccine-induced immunity wears off. We have seen this happen with mumps.’

‘Vaccine-induced immunity’ will wear off because . . .

- 1 the number of white blood cells increases with age.
- 2 older people are less sensitive to antibiotics.
- 3 the number of antibodies in the blood gradually decreases with age.
- 4 older people do not produce antitoxins.

**Turn over for the next question**

**Turn over ►**

**QUESTION EIGHT**

Influenza (flu) is caused by a virus.

**8A** Viruses can reproduce . . .

- 1 anywhere in the human body.
- 2 only in human lungs.
- 3 inside human cells.
- 4 on the surface of the human skin.

Bird flu virus does not normally infect humans. In 1997, one strain of bird flu, HN51, spread from infected chickens to 18 people in Hong Kong and killed 6 of them.

Since 2003 there have been over 300 cases of HN51 in humans. The World Health Organisation is worried that mutations of the HN51 virus will enable it to spread rapidly from human to human. Scientists believe that 13 different mutations of the HN51 virus will be required for it to transfer rapidly between humans. Up to now, two of these mutations have occurred.

**8B** Bird flu cannot be treated with antibiotics.

This is because . . .

- 1 white blood cells do not recognise the bird flu virus.
- 2 antibiotics only work in humans.
- 3 bird flu is caused by a virus.
- 4 antibiotics do not affect the toxins produced by the bird flu virus.

**8C** Which row of the table is correct?

	<b>Statement</b>	<b>Reason</b>
<b>1</b>	Human-to-human transfer of HN51 could cause millions of deaths.	It could be transferred rapidly between people living in cities.
<b>2</b>	Human-to-human transfer of HN51 will never occur.	The virus could never undergo enough mutations to make this possible.
<b>3</b>	It is not possible to vaccinate people against all strains of bird flu.	Vaccines damage body cells.
<b>4</b>	The World Health Organisation should ignore the possibility of a HN51 pandemic.	There have been very few cases of HN51 in humans.

- 8D** The success of vaccinating humans against HN51 may be limited because . . .
- 1 some people may catch HN51 from the vaccine.
  - 2 HN51 mutates frequently.
  - 3 vaccines are only effective against bacterial infections.
  - 4 vaccines only work on certain people.

**Turn over for the next question**

**Turn over ►**

**QUESTION NINE**

In vitro fertilisation (IVF) is used to help women who have difficulty conceiving.

**9A** Which hormone treatment is given to a woman during IVF?

- 1 FSH is given to stimulate eggs to mature.
- 2 LH is given to stimulate eggs to mature.
- 3 Oestrogen is given to stimulate the thickening of the lining of the womb.
- 4 FSH is given to stimulate the release of eggs.

**9B** Which statement correctly describes one stage in IVF treatment?

- 1 Sperm cells are inserted into the mother's womb when eggs are released from the ovary.
- 2 Fertilised eggs develop into embryos outside the mother's body.
- 3 Eggs are collected from the mother after every menstrual period.
- 4 Fertilisation takes place inside the woman's body.

The table shows the effectiveness of IVF treatment in a fertility clinic in 2004 and 2005.

Age of woman	2004				2005			
	Under 35	35–37	38–40	Over 40	Under 35	35–37	38–40	Over 40
<b>Number of IVF treatments</b>	130	100	29	20	142	62	33	11
<b>Average number of embryos transferred</b>	2.6	2.8	3.3	3.6	2.5	2.8	3.0	3.2
<b>Percentage of successful pregnancies</b>	43	30	21	13	43	48	30	27

**9C** What conclusion can be drawn from the data?

- 1 The more embryos transferred, the greater the chance of a successful pregnancy.
- 2 There were more multiple births in 2005 than in 2004.
- 3 Older women are less likely to have a successful pregnancy by IVF.
- 4 More women were given IVF treatment in 2005 than in 2004.

**9D** Many people oppose the use of IVF.

What information from the table could be used by people campaigning against IVF on ethical grounds?

- 1 A high proportion of women in the country are being treated with IVF.
- 2 High doses of hormones cause side effects in many women.
- 3 Many embryos die in IVF treatment.
- 4 IVF treatment is too expensive for most women.

**END OF TEST**

**There are no questions printed on this page**