Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
March 2010

Science A
Unit Biology B1a (Human Biology)

Biology
Unit Biology B1a (Human Biology)

BLY1AP

F&H

Wednesday 3 March 2010 Morning Session

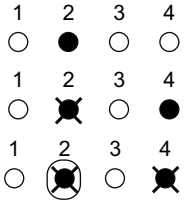
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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.

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

FOUNDATION TIER

SECTION ONE

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

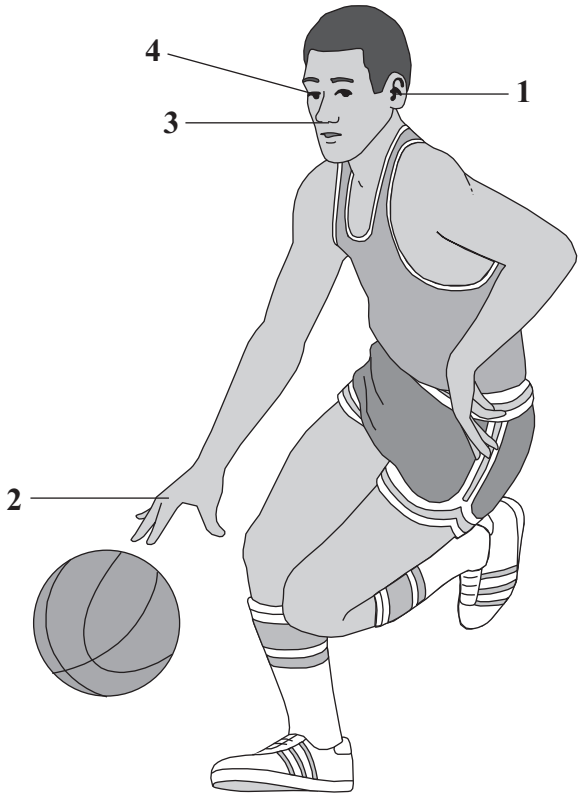
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1– 4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The drawing shows a basketball player.



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

A allows the player to hear the spectators

B allows the player to see the basket

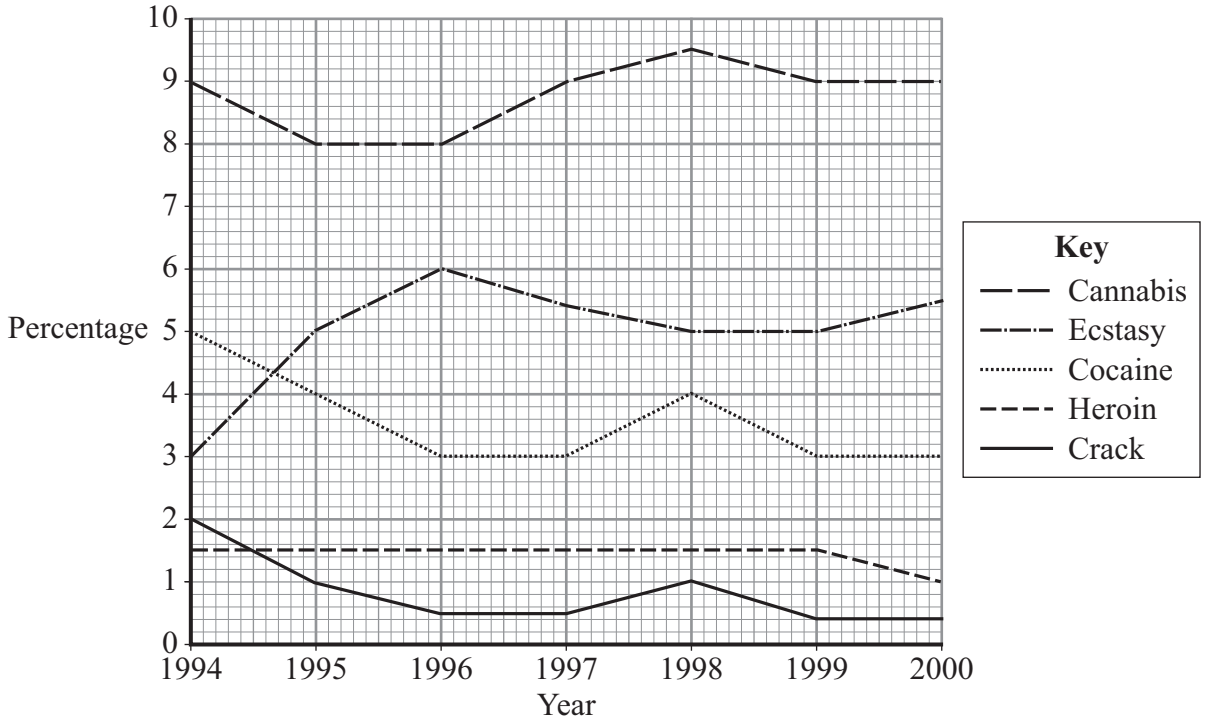
C allows the player to detect smells in the arena

D allows the player to feel the ball

QUESTION TWO

Patterns of illegal drug taking have changed over recent years.

The graph shows the percentage of a population that used different illegal drugs between 1994 and 2000.



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

A cannabis

B cocaine

C ecstasy

D heroin

1	This is the most commonly used drug shown in the graph.
2	1.5% of the population used this drug in 1998.
3	The use of this drug increased between 1994 and 1996.
4	The pattern of use of this drug was most similar to that of crack between 1994 and 2000.

QUESTION THREE

A balanced diet is important for a healthy body.

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

A blood

B heart

C joints

D liver

Cholesterol is a substance made in the . . . **1** . . . .

Cholesterol is carried around the body by the . . . **2** . . . .

High levels of cholesterol increase the risk of disease of the . . . **3** . . . .

Obesity leads to arthritis which affects the . . . **4** . . . .

QUESTION FOUR

Some women find it difficult to become pregnant. Several methods are used to increase the chances of pregnancy for these women.

The table shows the percentage of women, of different ages, who became pregnant after treatment.

	Percentage of women who became pregnant after treatment		
Age in years	**Using drugs to stimulate egg production**	**IVF treatment using their own eggs**	**IVF treatment using donated eggs (eggs taken from other women)**
33	68	74	78
36	54	58	60
39	38	44	46
42	36	38	40

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

A 30

B 39

C 60

D 72

1	The percentage of 36 year old women who became pregnant after IVF treatment using donated eggs.
2	The age of women who had a 44% chance of becoming pregnant after IVF treatment using their own eggs.
3	Out of 200 women aged 42, the number who became pregnant after using drugs to stimulate egg production.
4	The decrease, between the ages of 33 and 39, in the percentage of women who became pregnant using IVF and their own eggs.

QUESTION FIVE

Most long-distance runners drink sports drinks during a race.

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

A energy

B enzymes

C mass

D sweat

Ions and water are lost during a race in . . . **1** . . . .

Sugar is added to sports drinks to replace the sugar used to release . . . **2** . . . .

In hot conditions, the athlete's body temperature may rise. This affects the working of . . . **3** . . . .

An athlete who drinks too much water during a race will probably gain . . . **4** . . . .

Turn over for the next question

SECTION TWO

Questions **SIX** to **NINE**.

Each of these questions has four parts.

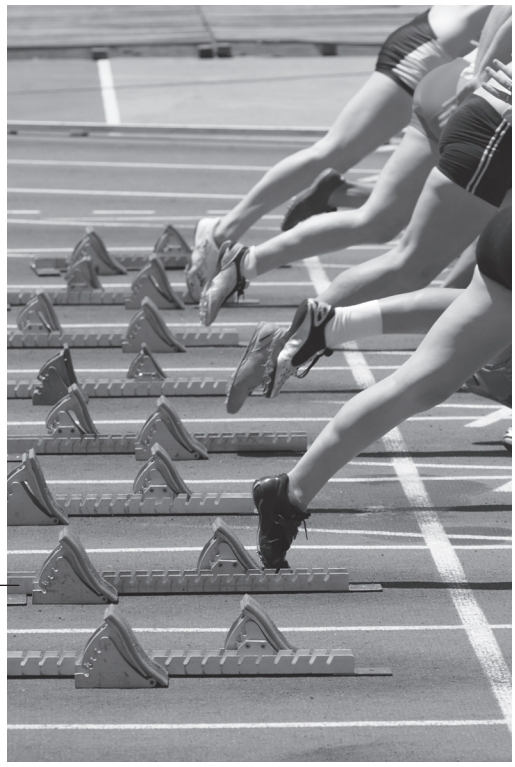
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SIX

A sports teacher wanted to find out which student had the quickest reaction time at the start of a 100 m race.

A starting pistol was fired from behind the start line and each student's reaction time was measured.



6A The stimulus to start running is . . .

1 heat.

2 light.

3 smell.

4 sound.

6B The reaction time is the time from when the pistol was fired to when the student . . .

1 left the starting block.

2 reached the end of the race.

3 had taken one complete stride.

4 heard the sound made by the pistol.

6C The gun was fired behind the students so that they would . . .

1 not anticipate the gun firing.

2 hear the gun firing better.

3 not be frightened by the gun being fired.

4 have a clear track to run on.

6D The student who left the blocks first would be the one with . . .

1 the longest reaction time.

2 the shortest reaction time.

3 the greatest range of reaction times.

4 the smallest range of reaction times.

Turn over for the next question

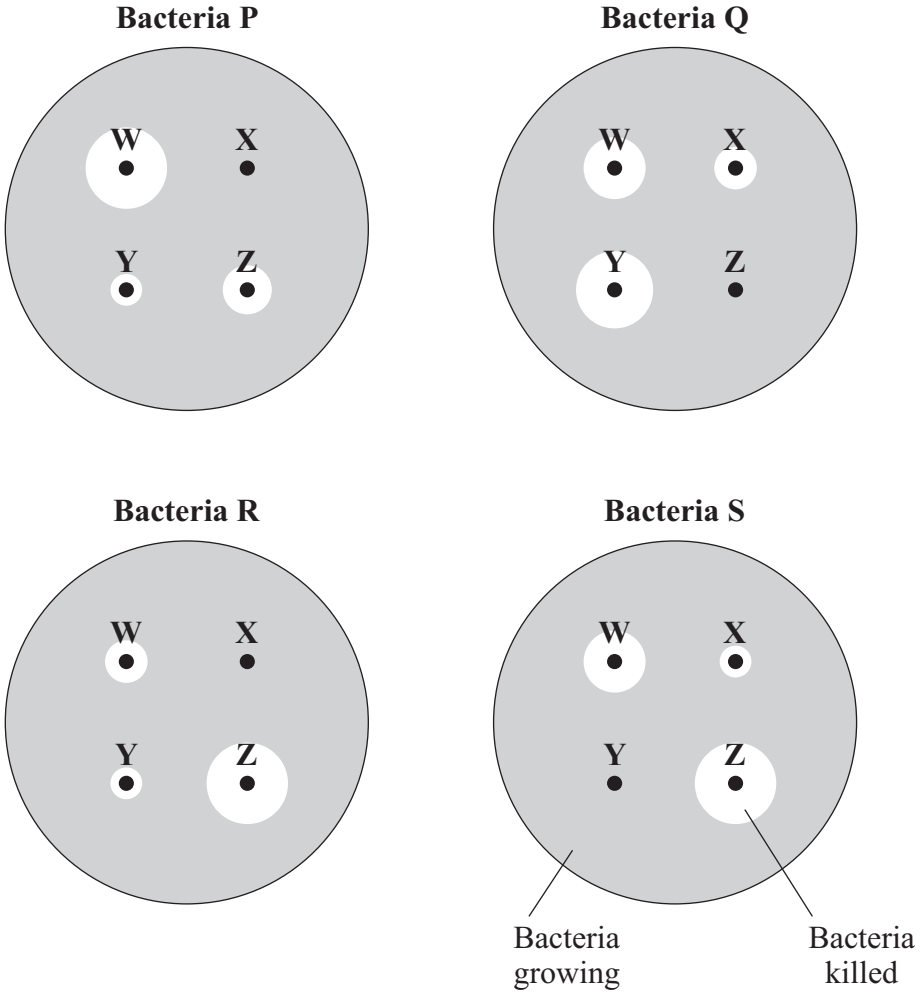
QUESTION SEVEN

A group of students investigated how effective four different antibiotics were at killing four different bacteria.

In this investigation:

- the four bacteria, **P**, **Q**, **R** and **S**, were spread on separate dishes containing nutrient agar
- paper discs were dipped into the four different antibiotics, **W**, **X**, **Y** and **Z**
- one of each disc was placed onto the agar in each of the four dishes.

The diagram shows the appearance of the dishes after three days. If the antibiotic kills the bacteria there is a clear space around the disc. The larger the clear space, the more effective the antibiotic is.



7A Which of the following is **not** an important control variable in this investigation?

1 the diameter of the dishes

2 the temperature at which the dishes were kept

3 the concentration of the antibiotics

4 the volume of antibiotic on each disc

7B How could the students improve the reliability of their investigation?

1 calculating the mean clear area for all the antibiotics in one dish

2 repeating the investigation using different antibiotics and different bacteria

3 repeating the investigation and calculating the mean clear area for each antibiotic

4 ignoring all the results where bacteria were **not** killed

7C Using the information in the diagrams, which antibiotic could be used to kill any of the bacteria?

1 antibiotic **W**

2 antibiotic **X**

3 antibiotic **Y**

4 antibiotic **Z**

7D Using the information in the diagrams, which antibiotic worked equally well in killing bacteria **R** and **S**?

1 antibiotic **W**

2 antibiotic **X**

3 antibiotic **Y**

4 antibiotic **Z**

Turn over for the next question

QUESTION EIGHT

Measles is a dangerous viral disease which kills about one person in every 1000 people infected. It gives long-term complications for many others. Worldwide, almost 350 000 people, mainly of school age, are killed by measles every year.

After a UK health scare, some parents refused to have their children vaccinated.

In England and Wales:

- in 2006 there were 756 cases of measles
- in 2007 there were 971 cases of measles
- in 2008 there were more than 1300 cases of measles.

8A Approximately how many people are **infected** by measles across the world each year?

1 971

2 350 000

3 350 000 000

4 It is impossible to tell from the data.

8B The rise in the number of people suffering from measles in the UK in recent years . . .

1 can be described as a pandemic.

2 is due to measles viruses mutating.

3 is due to antibiotic resistance.

4 can be described as an epidemic.

8C White blood cells can protect us from pathogens.

Which row in the table shows the way(s) in which this protection can occur?

	Ingesting pathogens	**Producing antitoxins**	**Producing antibodies**
1	✓	✓	✗
2	✓	✗	✓
3	✗	✓	✓
4	✓	✓	✓

8D School-age children are more likely to catch measles than adults.

This is because . . .

1 large numbers of children are often close together.

2 children have a poorly developed immune system.

3 the virus multiplies in the soil in playing fields.

4 new vaccines are less effective than older ones in protecting against measles.

Turn over for the next question

QUESTION NINE

Read the passage about the discovery of thalidomide.

A small German drugs company first made thalidomide in 1953. The company scientists could not find any beneficial effects of thalidomide, including antibiotic activity, in mice and rats. However, the new chemical seemed to be harmless. Very high doses did not kill rodents, rabbits, cats or dogs. In addition, the animals showed no other side effects.

In further testing, the animals did not appear to become sleepy or calmer when given thalidomide. However, the company thought that selling thalidomide as a sleeping drug would make them lots of money.

Soon the drug was being sold in 46 countries without any additional independent testing. Thalidomide became the drug of choice for pregnant women with morning sickness.

9A Nowadays, all drugs are thoroughly tested before being marketed.

Which stage of drug testing was not done by the company scientists?

1 tests on animals

2 toxicity tests

3 tests on humans

4 antibiotic activity

9B The company marketed thalidomide quickly because . . .

1 they thought that they could make a big profit.

2 they wanted to cure morning sickness in women.

3 it was a good sleeping drug.

4 it was a good antibiotic.

9C When clinical trials of a new drug are carried out, half the volunteers are given a placebo.

A placebo contains . . .

1 only inactive substances.

2 a small quantity of the drug.

3 an antibiotic.

4 a painkiller.

9D Thalidomide was banned when its side effects became known.

It has recently been approved for the treatment of . . .

1 morning sickness.

2 leprosy.

3 limb abnormalities.

4 mental illness.

END OF TEST

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

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.

QUESTION ONE

Most long-distance runners drink sports drinks during a race.

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

A energy

B enzymes

C mass

D sweat

Ions and water are lost during a race in . . . **1** . . . .

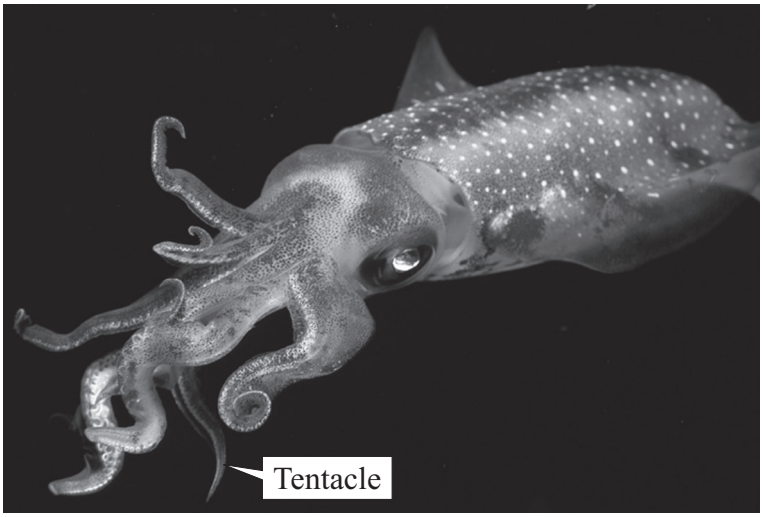
Sugar is added to sports drinks to replace the sugar used to release . . . **2** . . . .

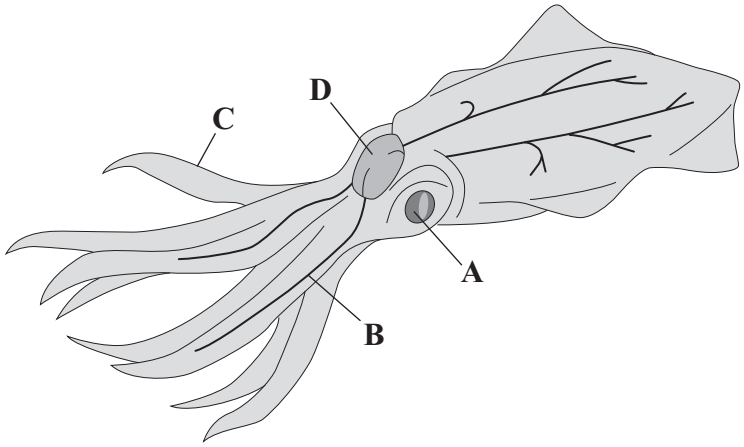
In hot conditions, the athlete's body temperature may rise. This affects the working of . . . **3** . . . .

An athlete who drinks too much water during a race will probably gain . . . **4** . . . .

QUESTION TWO

The photograph shows a squid. The diagram shows some of its organs. When a squid sees a fish, it tries to catch it with its tentacles.





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

1	brain
2	effector
3	nerve
4	receptor

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.

QUESTION THREE

Measles is a dangerous viral disease which kills about one person in every 1000 people infected. It gives long-term complications for many others. Worldwide, almost 350 000 people, mainly of school age, are killed by measles every year.

After a UK health scare, some parents refused to have their children vaccinated.

In England and Wales:

- in 2006 there were 756 cases of measles
- in 2007 there were 971 cases of measles
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3A Approximately how many people are **infected** by measles across the world each year?

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3B The rise in the number of people suffering from measles in the UK in recent years . . .

1 can be described as a pandemic.

2 is due to measles viruses mutating.

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3C White blood cells can protect us from pathogens.

Which row in the table shows the way(s) in which this protection can occur?

	Ingesting pathogens	**Producing antitoxins**	**Producing antibodies**
1	✓	✓	✗
2	✓	✗	✓
3	✗	✓	✓
4	✓	✓	✓

3D School-age children are more likely to catch measles than adults.

This is because . . .

1 large numbers of children are often close together.

2 children have a poorly developed immune system.

3 the virus multiplies in the soil in playing fields.

4 new vaccines are less effective than older ones in protecting against measles.

Turn over for the next question

QUESTION FOUR

Read the passage about the discovery of thalidomide.

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In further testing, the animals did not appear to become sleepy or calmer when given thalidomide. However, the company thought that selling thalidomide as a sleeping drug would make them lots of money.

Soon the drug was being sold in 46 countries without any additional independent testing. Thalidomide became the drug of choice for pregnant women with morning sickness.

4A Nowadays, all drugs are thoroughly tested before being marketed.

Which stage of drug testing was not done by the company scientists?

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2 toxicity tests

3 tests on humans

4 antibiotic activity

4B The company marketed thalidomide quickly because . . .

1 they thought that they could make a big profit.

2 they wanted to cure morning sickness in women.

3 it was a good sleeping drug.

4 it was a good antibiotic.

4C When clinical trials of a new drug are carried out, half the volunteers are given a placebo.

A placebo contains . . .

1 only inactive substances.

2 a small quantity of the drug.

3 an antibiotic.

4 a painkiller.

4D Thalidomide was banned when its side effects became known.

It has recently been approved for the treatment of . . .

1 morning sickness.

2 leprosy.

3 limb abnormalities.

4 mental illness.

Turn over for the next question

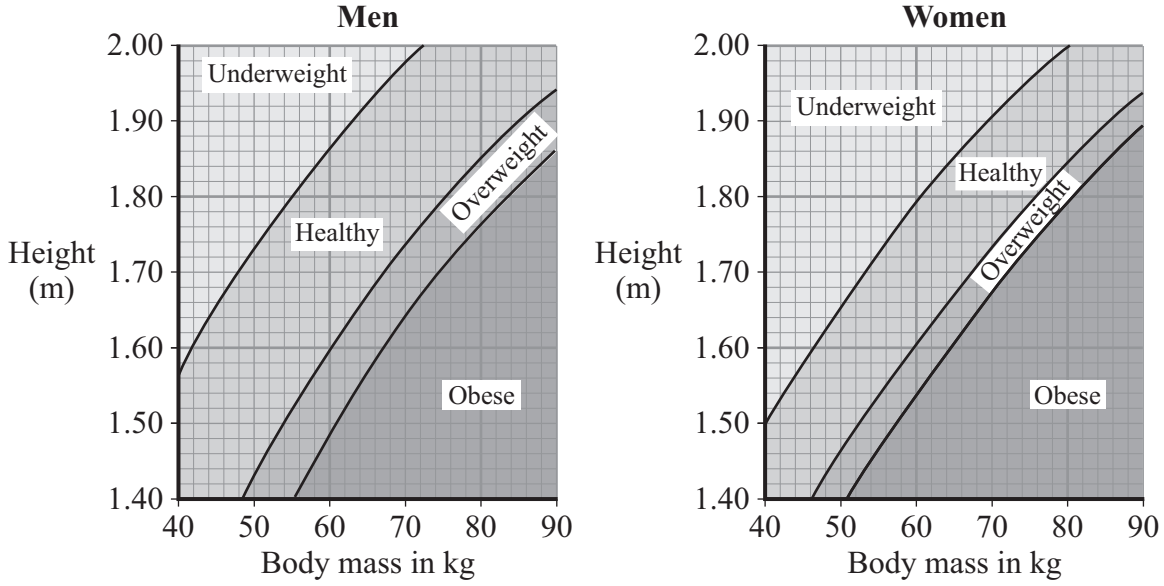
QUESTION FIVE

A combination of a balanced diet and exercise are needed to keep the body healthy.

5A Which row in the table correctly shows a cause and an effect of obesity?

	Cause of obesity		Effect of obesity	
	High salt	**High fat**	**Arthritis**	**Lung cancer**
1	✓		✓	
2		✓		✓
3	✓			✓
4		✓	✓	

The charts are used to find if a person has a healthy mass for his/her height.



5B A woman is 1.6 m tall and has a mass of 66 kg.

From the chart, she is . . .

1 underweight.

2 healthy.

3 overweight.

4 obese.

5C A man is 1.70 m tall. He is overweight.

His body mass is between . . .

1 48 and 68 kg.

2 66 and 72 kg.

3 67 and 74 kg.

4 76 and 84 kg.

5D The metabolic rate of a healthy person eating a balanced diet will **not** be affected by . . .

1 the proportion of muscle to fat in the body.

2 taking vitamin tablets.

3 inherited factors.

4 the amount of exercise taken.

Turn over for the next question

QUESTION SIX

Antibiotic-resistant bacteria are causing severe problems in many hospitals.

6A What is the main cause of the increase in the numbers of antibiotic-resistant bacteria in hospitals?

1 Antibiotics cause mutations.

2 Antibodies are released into the environment.

3 Toxins from bacteria are no longer effective.

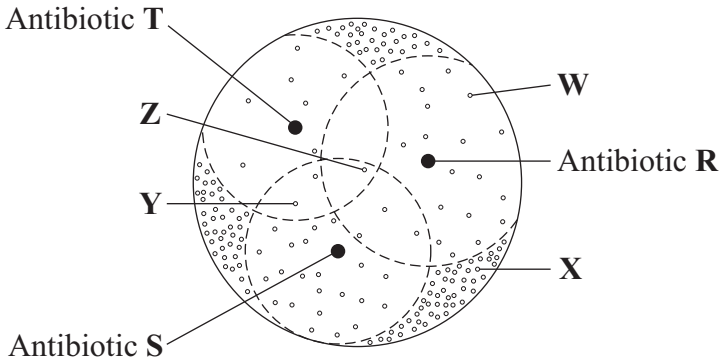
4 Antibiotics are overused.

A group of students investigated the effects of different antibiotics on one type of bacterium.

- A solution of one type of bacterium was spread across sterile nutrient jelly in a dish.
- Discs of absorbent paper containing three different antibiotics, **R**, **S** and **T**, were placed on the dish and were left for two days.

The diagram shows the appearance of the dish after two days. Four colonies of bacteria are labelled **W**, **X**, **Y** and **Z**.

The dotted circles indicate the distance to which each antibiotic diffused.



6B Which row in the table shows the effectiveness of the antibiotics?

	Most effective →		Least effective
1	**R**	**S**	**T**
2	**T**	**S**	**R**
3	**T**	**R**	**S**
4	**R**	**T**	**S**

6C Which of the four colonies of bacteria is resistant to all three antibiotics?

1 **W**

2 **X**

3 **Y**

4 **Z**

6D An individual antibiotic-resistant bacterium is originally produced by . . .

1 vaccination.

2 natural selection.

3 antibiotics.

4 mutation.

Turn over for the next question

QUESTION SEVEN

The success of in vitro fertilisation (IVF) treatment depends on several factors.

7A During IVF, a woman is usually treated with . . .

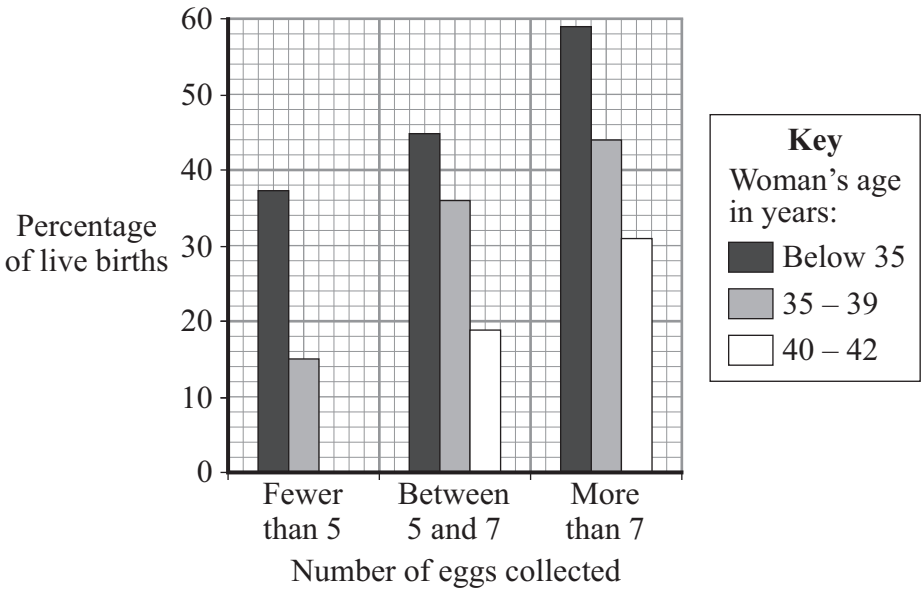
1 FSH only.

2 FSH and LH.

3 oestrogen.

4 LH and oestrogen.

The bar chart shows how a woman's age and the number of eggs collected from her affect the percentage of live births.



7B The highest IVF success rate occurs with women aged . . .

1 below 35.

2 35–39.

3 40–42.

4 over 42.

7C Which conclusion can be drawn from the data in the bar chart?

1 The number of eggs collected is directly proportional to the age of the woman.

2 Collecting more than seven eggs for fertilisation is certain to lead to a successful pregnancy.

3 Women aged over 42 cannot become pregnant by IVF treatment.

4 At least five eggs must be collected from a woman between 40 and 42 years old for her to have a chance of a live birth.

7D An IVF procedure may result in the production of 'spare' fertilised eggs.

Which one of the following can be decided using only scientific considerations?

1 whether spare eggs should be sold to another clinic

2 whether to destroy the spare eggs

3 how best to store the spare eggs if required

4 whether to give the spare eggs to another woman needing IVF treatment

Turn over for the next question

QUESTION EIGHT

There are different opinions about the link between smoking cannabis and the use of hard drugs.

8A Cannabis is the most commonly used illegal drug.

It was a class C drug, but it has been reclassified up to the more dangerous class B.

What is the main reason for this?

1 Users could be imprisoned for a longer period of time.

2 Its effects on the liver are worse than initially thought.

3 The government will make more money from fines.

4 There is evidence that it is linked to mental illness.

Scientists investigated the link between smoking cannabis and heroin addiction.

- THC is the active chemical in cannabis.
- Six 'teenage' rats were given a small dose of THC every 3 days between the ages of 28 and 49 days. The rat ages are the equivalent of humans aged 12 to 28 years.
- The amount of THC given was roughly equivalent to a human smoking one cannabis 'joint' every three days.
- A control group of six 'teenage' rats did not receive THC.
- After 56 days, the now adult rats were allowed to self-administer heroin frequently. After a short while, they stabilised their daily intake at a certain level. The rats that had been on THC as 'teenagers' stabilised their heroin intake at a much higher level than the others. The THC 'teenagers' appeared to be less sensitive to the effects of heroin.

8B Which row in the table shows two features of the design which made the investigation more valid?

	Design features	
1	use of teenage rats	use of an appropriate sample size
2	THC dose typical of human cannabis use	use of a control group
3	rats allowed to choose how much heroin to take	rats are suitable animals to use as substitutes for humans
4	heroin administration was similar to that in humans	heroin was provided only for adult rats

8C In what way could the design of the investigation be improved?

1 carry out the investigation using humans instead of rats

2 give the rats a larger dose of THC every day

3 use groups with a larger number of rats

4 use 'adult' rats instead of 'teenage' rats

8D Which conclusion can be drawn from this investigation?

1 All humans who use cannabis as teenagers are likely to become addicted to heroin as adults.

2 Only the rats given THC became addicted to heroin.

3 Rats that were not given THC did not like the effects of heroin.

4 There is evidence, but no proof, for a link between THC and heroin use in humans.

Turn over for the next question

QUESTION NINE

Some diseases are caused by viruses. Each type of virus only infects and causes the disease in one species of organism. One of the reasons for this is that a protein on the virus surface only matches with the cells of one particular species of organism.

9A Why does the flu virus make us feel ill?

1 The virus itself produces a toxin.

2 The virus damages the cells in which it reproduces.

3 The large number of viruses increases our temperature.

4 Viruses reproduce rapidly as soon as they are breathed in.

9B Bird flu is caused by a virus.

What might happen to the existing form of bird flu virus that would allow it to infect humans and cause flu in Britain?

1 an increase in the number of birds with the bird flu virus

2 a new strain of bird flu entering Britain

3 a change in the antibody which the bird flu virus carries

4 a change in the protein on the virus surface

Humans produce antibodies against viruses.

A scientist investigated the effect of a virus infection on the antibody concentration in a person's blood.

The person was infected by day 3.

Time in days	**1**	**4**	**7**	**10**	**13**	**16**	**19**	**22**	**25**
Antibody concentration in mg per 100 cm^3 of blood	5.1	6.0	10.4	35.9	55.9	50.2	48.8	32.7	10.0

9C Which conclusion can be drawn from the data?

1 This virus did not reproduce until the 10th day.

2 Antibody production by the body continues to rise until the patient recovers.

3 The patient had recovered by the 25th day.

4 Antibody production by the body rises to a peak after an infection and then declines.

9D Another scientist repeated the investigation but could not measure the antibody concentration directly. Instead, he made measurements using a blood cell counter. He counted the white blood cells using a microscope with an automatic cell counter. A colleague said that he would not trust this data as much as measuring the antibody concentration with a machine.

Which of the reasons below best accounts for his colleague's attitude?

1 There is no relationship between the number of white cells and the concentration of antibodies.

2 Counting white cells is a less sensitive method than measuring antibody concentration with a machine.

3 The antibody measuring machine is more expensive to buy and run.

4 Reading the cell counter is less accurate than reading the scale on the antibody machine.

END OF TEST

There are no questions printed on this page

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Question 6F Jupiter Images
Question 2H Jupiter Images