General Certificate of Secondary Education
June 2007

SCIENCE A   **BLY1A**
Unit Biology B1a (Human Biology)

BIOLOGY
Unit Biology B1a (Human Biology)

Monday 25 June 2007   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 'Human Biology' 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.
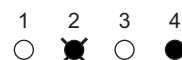- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

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

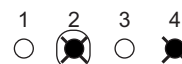- For each answer **completely fill in the circle** as shown:
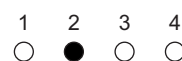
- Do **not** extend beyond the circles.

- 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.

BLY1A

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION ONE
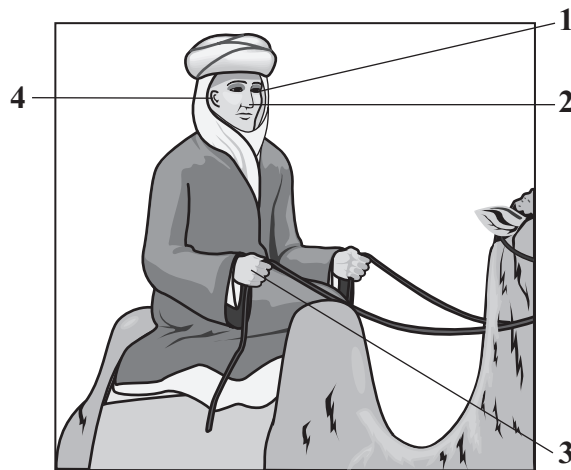
Questions **ONE** to **SIX**.

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 person riding a camel.

The rider uses different receptors when riding.

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

A   contains receptors that help the rider to keep his balance on the camel

B   contains receptors that help the rider to feel the reins

C   contains receptors that help the rider to see the road

D   contains receptors that help the rider to smell the air

QUESTION TWO

Thalidomide is a drug which may be prescribed by doctors.

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

A   leprosy

B   limb abnormalities

C   morning sickness

D   difficulty in sleeping

Thalidomide was first developed to treat . . . **1** . . . .

It was effective in treating . . . **2** . . . in pregnant women.

However, it caused severe . . . **3** . . . so it was banned from use.

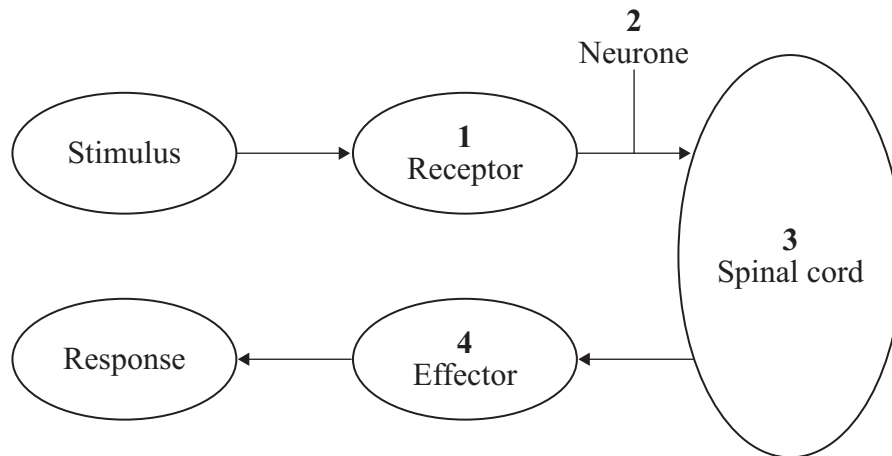Recently it has been used to treat . . . **4** . . . .

Turn over for the next question

Turn over ▶

QUESTION THREE

The diagram shows some of the parts involved in a reflex action.

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

A   brings about a change in the body

B   carries nerve impulse

C   coordinates a response

D   detects changes

QUESTION FOUR

Hormones are involved in the menstrual cycle.

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

A   eggs

B   ovaries

C   pituitary gland

D   womb

FSH is produced by the . . . **1** . . . .

FSH causes . . . **2** . . . to mature.

Oestrogen is produced by the . . . **3** . . . .

In IVF, embryos are inserted into the mother's . . . **4** . . . .

Turn over for the next question

QUESTION FIVE

The table shows the vaccines given to children in the UK.

Age when vaccine is given	Vaccine(s) given	How vaccine is given
Two months	diphtheria, tetanus, pertussis, polio and hepatitis type b	one injection
Three months	pneumococcal infection	one injection
	diphtheria, tetanus, pertussis, polio and hepatitis type b	one injection
	meningitis C	one injection
Four months	diphtheria, tetanus, pertussis, polio and hepatitis type b	one injection
	meningitis C	one injection
	pneumococcal infection	one injection
12 months	hepatitis type b and meningitis C	one injection
13 months	measles, mumps and rubella (MMR)	one injection
3 years and 4 months to 5 years	pneumococcal infection	one injection
	diphtheria, tetanus, pertussis and polio	one injection
	measles, mumps, and rubella (MMR)	one injection
13 to 18 years	diphtheria, tetanus and polio	one injection

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

A   hepatitis type b

B   MMR

C   pneumococcal infection

D   tetanus

		How vaccine is used
	1	given only to children over 12 months old
	2	given five times
	3	never mixed with other vaccines before being given
	4	not given as a booster dose to schoolchildren

QUESTION SIX

Read the passage.

In 1847, Dr Ignaz Semmelweiss noticed that women whose babies were delivered by doctors in his hospital had a death rate of 18 % from infections caught in the hospital.

Women whose babies were delivered by midwives in the hospital had a death rate of 2 %.

He also noticed that doctors often came straight from examining dead bodies to the delivery ward.

In a controlled experiment, Semmelweiss made doctors wash their hands in a solution of chloride of lime before delivering the babies. The death rate fell to about 2 % – down to the same level as the mothers whose babies were delivered by midwives.

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

A   a conclusion

B   a hypothesis

C   the independent variable

D   an observation

1   There were fewer deaths from infections on wards where babies were delivered by midwives than on wards where babies were delivered by doctors.

2   Infections were passed from doctors to women.

3   Some doctors washed their hands in a solution of chloride of lime.

4   Hand washing by doctors reduced the number of infections in women.

SECTION TWO

Questions **SEVEN** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SEVEN

The table is from the label on a loaf of sliced bread.

Nutrition information			Guideline daily amounts		
Typical values	**Per 100 g**	**Per slice**	**Women**	**Men**	**Children (5–10 years)**
energy (kJ)	2144	658	8500	10 500	7500
protein (g)	4.0	1.2	75	95	65
carbohydrate (g)	55.1	16.9	230	300	220
fat (g)	22.6	7.0	70	70	50
salt (g)	0.9	0.3	5	6	4
Other information					
Keep an eye on your salt intake					
Generally a low fat diet is good for you					
If possible take 30 minutes of brisk exercise each day					

7A   For which food type is the guideline daily amount the same for men and women?

    1   carbohydrate

    2   fat

    3   protein

    4   salt

7B   A woman ate two slices of bread for breakfast.

What proportion of the daily guideline amount of fat did she eat?

    1 $\frac{1}{14}$

    2 $\frac{1}{10}$

    3 $\frac{1}{7}$

    4 $\frac{1}{5}$

7C **Table 1** shows the amount of energy used for different levels of exercise.

Table 1

Level of exercise	Energy used in kilojoules per hour
light exercise	620
moderate exercise	1200
vigorous exercise	2760

Table 2 shows a person's weekly exercise routine.

Table 2

Day of week	Type of exercise in minutes		
	Light	Moderate	Vigorous
Monday	20	20	20
Tuesday	30	30	20
Wednesday	30	30	20
Thursday	30	30	20
Friday	30	30	20
Saturday	30	30	20
Sunday	30	20	20

What is the total amount of energy used by this person on Tuesday and Wednesday together?

1 3460 kilojoules

2 3660 kilojoules

3 3760 kilojoules

4 4580 kilojoules

Question 7 continues on the next page

Turn over ▶

7D The link between exercise and nutrients in food is . . .

    1   the less exercise you take, the less energy you need.

    2   the less exercise you take, the more carbohydrate you need.

    3   the less exercise you take, the more protein you need.

    4   the more exercise you take, the less salt you need.

QUESTION EIGHT

Most infectious diseases can be prevented by vaccination.

8A What does a vaccine contain?

    1   antibiotics

    2   a mixture of toxins and antitoxins

    3   dead or weakened microbes

    4   white blood cells

8B Following a vaccination, the white cells produce . . .

    1   antibiotics.

    2   antibodies.

    3   statins.

    4   toxins.

The bar chart compares the total yearly cost of medical treatment for a disease in a country before vaccines were used and the total yearly cost when vaccines are used.
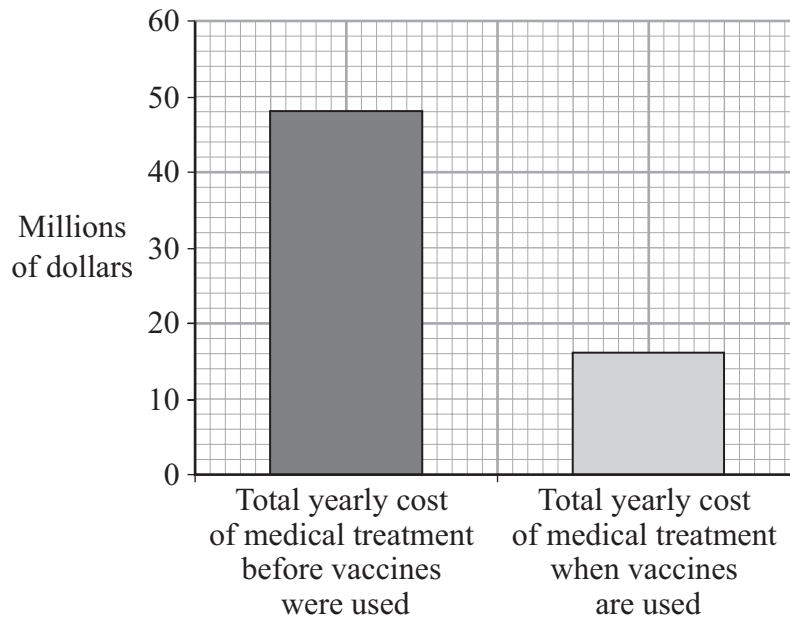
8C How much money is saved by the use of vaccines?

1 14 million dollars

2 16 million dollars

3 32 million dollars

4 48 million dollars

8D What is the most likely reason for the difference in cost?

1 Vaccines cure diseases.

2 Vaccines do not cost much to buy.

3 People who have been vaccinated never become ill.

4 People who have been vaccinated need less treatment in hospital.

Turn over ▶

QUESTION NINE

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

9A Nicotine is used to help people to give up smoking because it . . .

  1 is not carcinogenic.

  2 is **not** the addictive substance in cigarette smoke.

  3 makes smoking a cigarette distasteful.

  4 removes the craving to smoke a cigarette.

Trials were carried out to assess different methods of giving NRT.
1000 people took part in each trial.
The results of these trials are shown in the table.

Method of giving nicotine	Number of trials	Percentage of people who had given up smoking after one year	
		Nicotine replacement therapy	Control group
Chewing gum	39	18.2	10.6
Patches	9	20.5	10.8
Nasal spray	1	21.8	9.9
Inhaler	1	15.2	5.0

9B Which method of giving NRT showed the greatest difference between people given NRT and the control group?

  1 chewing gum

  2 patches

  3 nasal spray

  4 inhaler

9C For which method of giving NRT would the results be most reliable?

    1 chewing gum

    2 patches

    3 nasal spray

    4 inhaler

9D Which would be the best way to display these results?

    1 One bar chart showing the results for each method.

    2 One line graph, with one line showing the results for each method.

    3 Four bar charts, each bar chart showing the results for one method.

    4 Four pie charts, each pie chart showing the results for one method.

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

Read the passage.

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Women whose babies were delivered by midwives in the hospital had a death rate of 2 %.

He also noticed that doctors often came straight from examining dead bodies to the delivery ward.

In a controlled experiment, Semmelweiss made doctors wash their hands in a solution of chloride of lime before delivering the babies. The death rate fell to about 2 % – down to the same level as the mothers whose babies were delivered by midwives.

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

A   a conclusion

B   a hypothesis

C   the independent variable

D   an observation

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2   Infections were passed from doctors to women.

3   Some doctors washed their hands in a solution of chloride of lime.

4   Hand washing by doctors reduced the number of infections in women.

QUESTION TWO

Hormones are involved in the menstrual cycle.

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

A   FSH

B   FSH and LH

C   LH

D   oestrogen

	Function
1	stimulates egg release only
2	stimulates and inhibits production of hormones by the pituitary gland
3	stimulates the ovary to produce hormones and stimulates eggs to mature in the ovaries
4	the usual hormone treatment used in IVF treatment

Turn over for the next question

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

Most infectious diseases can be prevented by vaccination.

3A What does a vaccine contain?

  1   antibiotics

  2   a mixture of toxins and antitoxins

  3   dead or weakened microbes

  4   white blood cells

3B Following a vaccination, the white cells produce . . .

  1   antibiotics.

  2   antibodies.

  3   statins.

  4   toxins.

The bar chart compares the total yearly cost of medical treatment for a disease in a country before vaccines were used and the total yearly cost when vaccines are used.
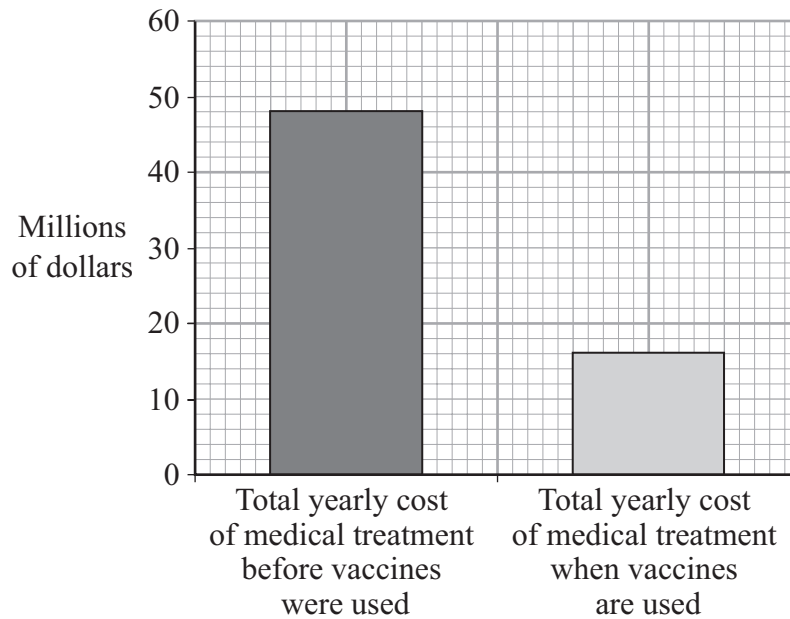
3C How much money is saved by the use of vaccines?

1 14 million dollars

2 16 million dollars

3 32 million dollars

4 48 million dollars

3D What is the most likely reason for the difference in cost?

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2 Vaccines do not cost much to buy.

3 People who have been vaccinated never become ill.

4 People who have been vaccinated need less treatment in hospital.

Turn over ▶

QUESTION FOUR

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

4A   Nicotine is used to help people to give up smoking because it . . .

    1   is not carcinogenic.

    2   is **not** the addictive substance in cigarette smoke.

    3   makes smoking a cigarette distasteful.

    4   removes the craving to smoke a cigarette.

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Inhaler	1	15.2	5.0

4B   Which method of giving NRT showed the greatest difference between people given NRT and the control group?

    1   chewing gum

    2   patches

    3   nasal spray

    4   inhaler

4C For which method of giving NRT would the results be most reliable?

1 chewing gum

2 patches

3 nasal spray

4 inhaler

4D Which would be the best way to display these results?

1 One bar chart showing the results for each method.

2 One line graph, with one line showing the results for each method.

3 Four bar charts, each bar chart showing the results for one method.

4 Four pie charts, each pie chart showing the results for one method.

Turn over for the next question

Turn over ▶

QUESTION FIVE

This question is about disease.

5A Many processed meals contain a large amount of salt.

Too much salt in the diet can . . .

  1 alter the balance between HDLs and LDLs.

  2 clog up the arteries.

  3 lead to arthritis.

  4 lead to high blood pressure.

5B Which of the following is linked to lack of food?

  1 limb abnormalities

  2 diabetes

  3 low cholesterol levels

  4 reduced resistance to infection

5C The Body Mass Index (BMI) is used to classify people into different obesity groups.

The BMI is calculated by the formula: $\dfrac{\text{mass}}{\text{height}^2}$

People with a BMI between 30 and 35 inclusive are considered to be obese.

People with a BMI between 36 and 40 inclusive are considered to be very obese.

People with a BMI over 40 are considered to be severely obese.

The chart shows the relationship between mass, height and BMI.

		Mass in kilograms												
		50	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**
Height in metres	**1.35**	29	31	34	36	39	41	43	46	48	51	53	56	58	60
	1.40	27	29	31	34	36	38	49	43	45	47	49	52	54	56
	1.45	25	27	29	31	34	36	38	40	42	44	46	48	50	52
	1.50	23	25	27	29	31	33	35	37	39	41	43	45	47	49
	1.55	22	24	26	27	29	31	33	35	37	38	40	42	44	46
	1.60	21	22	24	26	28	29	31	33	34	36	38	40	41	43
	1.65	19	21	23	24	26	27	29	31	33	34	36	37	39	40
	1.70	18	20	21	23	24	26	27	29	30	32	34	35	37	38
	1.75	17	19	20	22	23	24	26	27	29	30	32	33	35	36
	1.80	16	18	19	20	22	23	24	26	27	28	30	31	33	34
	1.85	15	17	18	19	21	22	23	24	26	27	28	30	31	32
	1.90	15	16	17	18	20	21	22	23	24	26	27	28	29	30
	1.95	14	15	16	17	19	20	21	22	23	24	25	27	28	29
	2.00	13	14	15	17	18	19	20	21	22	23	24	25	26	28

The number of values in the chart which show a person to be very obese is . . .
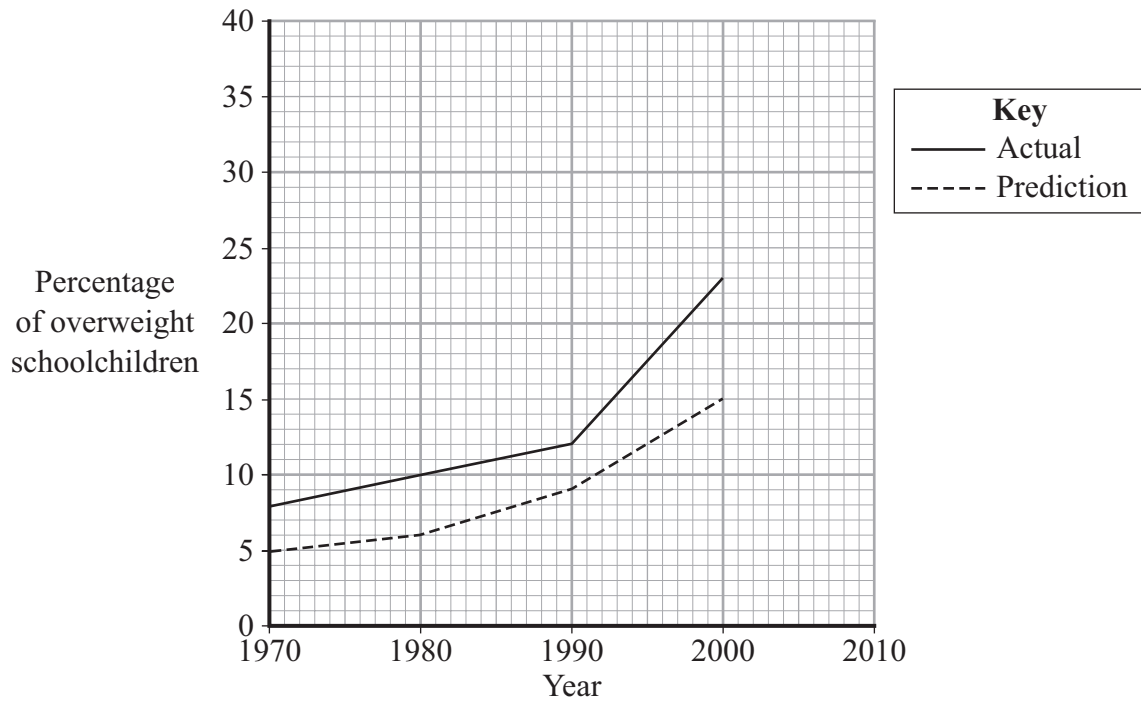
1 22

2 23

3 26

4 27

5D The graph shows the percentage of schoolchildren who were predicted to be overweight from 1970 to 2000, and the actual percentage of schoolchildren who were overweight from 1970 to 2000.

If the trends from 1990 to 2000 continue, what will be the difference between the actual percentage and the predicted percentage of schoolchildren who will be overweight in 2010?

1   11

2   13

3   24

4   26

**Turn over for the next question**

QUESTION SIX

6A   What is a reflex action?

    1   a stimulus that causes a rapid response

    2   a stimulus that can be controlled

    3   a deliberate response to a stimulus

    4   an automatic rapid response to a stimulus

6B   The function of a synapse is to . . .

    1   detect changes in pressure.

    2   detect changes in temperature.

    3   produce nerve impulses along a sensory neurone.

    4   transfer impulses from one neurone to another.

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

Burning match
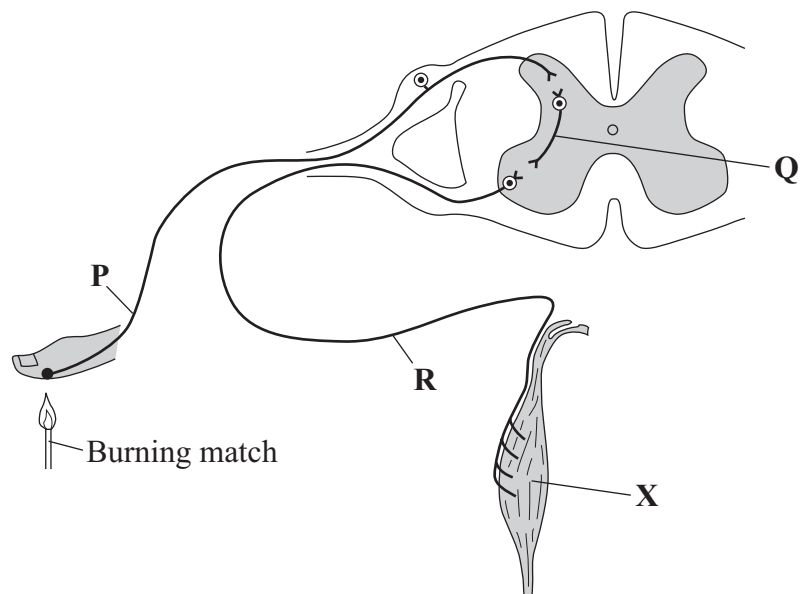
6C Which line, **1, 2, 3** or **4,** in the table correctly identifies the neurones in this reflex pathway?

	Sensory neurone	Relay neurone	Motor neurone
1	Q	R	P
2	P	Q	R
3	P	R	Q
4	R	Q	P

6D Structure **X** is . . .

1 a gland

2 an effector

3 a bone

4 a receptor

QUESTION SEVEN

7A Cholesterol is carried around the body by . . .

  1 blood cells.

  2 LDL.

  3 mono-unsaturated fats.

  4 polyunsaturated fats.

The bacterium *Lactobacillus acidophilus* is thought to reduce the amount of saturated fat absorbed by the intestine. The bacterium is found in yoghurt.

40 people took part in a trial to see if the bacterium could reduce blood cholesterol levels. The people were divided into two groups. Both groups followed their normal diet.

Group A was given yoghurt containing the *Lactobacillus acidophilus*.

Group B was given a placebo as a control.

The trial lasted four weeks.

The results are shown in the table.

	Group A Normal diet plus yoghurt containing *Lactobacillus acidophilus*	Group B Normal diet with placebo
	Percentage change	Percentage change
Total cholesterol	+2.3	+1.4
LDL cholesterol	−0.2	+1.8
HDL cholesterol	+2.5	−0.4
Change in body mass	+0.3	−0.5

7B In the trial, the placebo given to **Group B** would have been . . .

  1 yoghurt without *Lactobacillus acidophilus*.

  2 no yoghurt.

  3 yoghurt containing a different bacterium.

  4 *Lactobacillus acidophilus* only.

7C Which of the following is true?

1 In **Group A**, the change in the total cholesterol level was 0.7 percentage points greater than in **Group B**.

2 In **Group A**, the change in the LDL cholesterol level was 1.6 percentage points less than in **Group B**.

3 In **Group A**, the difference between the percentage change in LDL cholesterol and the percentage change in HDL cholesterol was 2.7.

4 The difference in the percentage change in body mass between the two groups was 0.2.

7D Scientists concluded that *Lactobacillus acidophilus* in the diet . . .

1 changes the ratio of LDLs to HDLs.

2 causes weight loss.

3 reduces the level of HDLs in the blood.

4 lowers the total blood cholesterol level.

Turn over for the next question

Turn over ▶

QUESTION EIGHT

This question is about drink driving.

8A   Which organs may be damaged by drinking alcohol?

1   both brain and stomach

2   both heart and stomach

3   both liver and brain

4   both liver and intestines

8B   Which of the following effects of alcohol is most likely to lead to an accident when driving a car?

1   It changes the chemical reactions in the body.

2   It causes withdrawal symptoms.

3   It decreases reaction time.

4   It leads to lack of self-control.

The graph shows the number of deaths in road accidents caused by drinking alcohol from 1984 to 2001 in one American state.
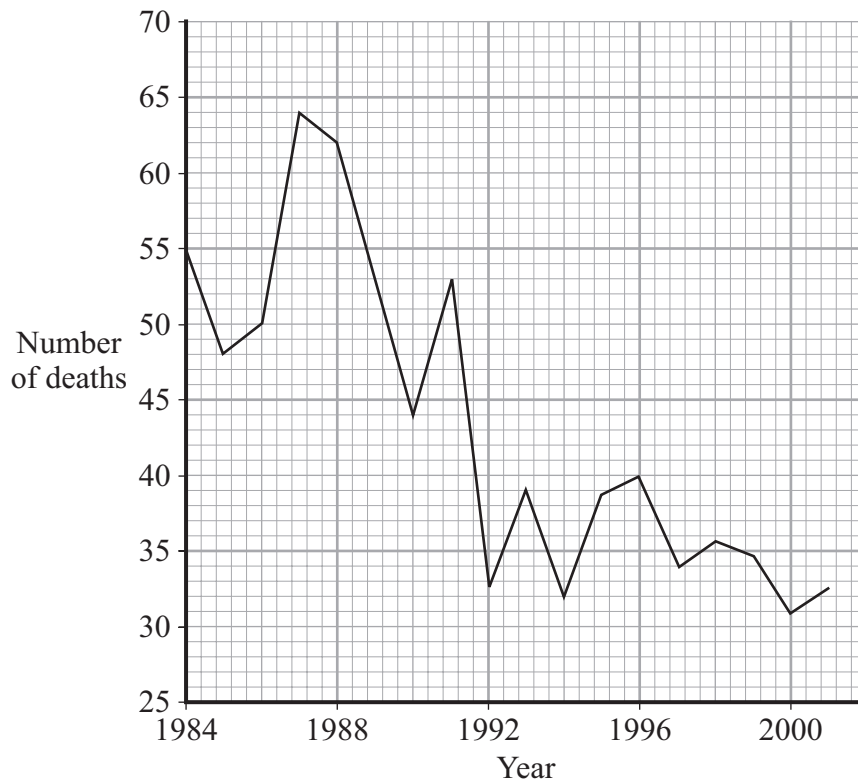
8C Between 1985 and 1987, the number of deaths increased by . . .

1 $\frac{1}{5}$

2 $\frac{1}{4}$

3 $\frac{1}{3}$

4 $\frac{2}{5}$

8D In 1991, the legal limit of alcohol in the blood allowed when driving was lowered from 0.1 % to 0.08 %.

What was the average (mean) reduction in number of deaths per year between 1991 and 2000?

1 2.2

2 2.4

3 3.1

4 5.3

Turn over ▶

QUESTION NINE

9A When an embryo becomes implanted in the wall of the womb, an organ called a placenta develops. In addition to absorbing nutrients from a mother's blood, the placenta secretes a hormone called human chorionic gonadotrophin (HCG).

The graph shows the changes in the concentration of HCG in a mother's blood during the first 20 weeks after implantation.
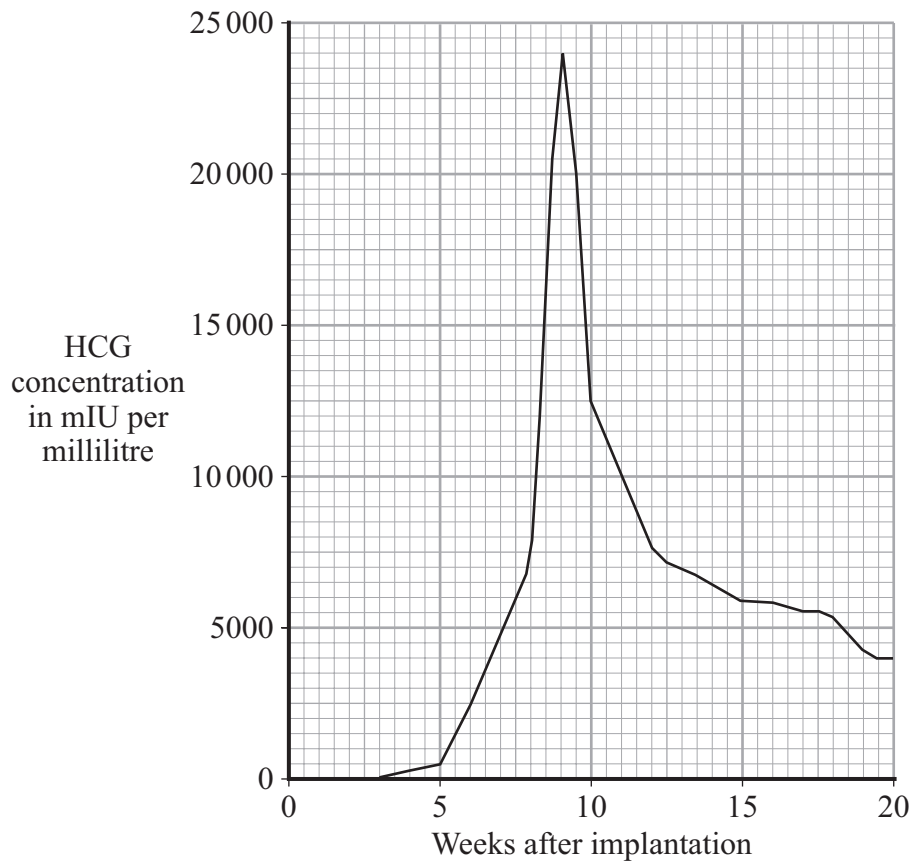
What is the rate of increase in the concentration of HCG from week 5 to week 9?

1 3833.3 mIU per millilitre per week

2 4800.0 mIU per millilitre per week

3 5875.0 mIU per millilitre per week

4 5937.5 mIU per millilitre per week

The table shows the concentration of HCG in the blood of pregnant women between day 14 and day 24 after implantation. The concentration of HCG in the blood is used by doctors as a test for pregnancy.

Days after implantation	Average blood HCG concentration in mIU per millilitre	Highest blood HCG concentration in mIU per millilitre	Lowest blood HCG concentration in mIU per millilitre	Number of women tested
14	48	119	17	12
15	59	147	17	18
16	95	223	33	23
17	132	429	17	21
18	292	758	70	19
19	303	514	111	23
20	522	1690	135	13
21	1061	4130	324	12
22	1287	3279	185	22
23	2034	4660	506	13
24	2637	10000	540	16

9B The greatest difference between the average blood HCG concentration occurred between . . .

1 day 17 and day 18.

2 day 19 and day 20.

3 day 21 and day 22.

4 day 22 and day 23.

Question 9 continues on the next page

9C What is the advantage to doctors of giving the range in the data?

1 Doctors can be reasonably sure that the results of the pregnancy tests are positive if the results are within the range of the data.

2 Doctors know that a reading below 48 at day 14 indicates a negative result of a pregnancy test.

3 Figures outside the range of the data can indicate possible defects in the embryo.

4 When carrying out a pregnancy test, results outside the range of the data can be ignored.

9D What is the most probable reason for the wide range of blood HCG concentrations at a particular time after implantation?

1 There are genetic variations in the people tested.

2 Some of the results are anomalous.

3 The instruments were not used correctly.

4 The instruments used are not sensitive enough.

END OF TEST