

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

ASSESSMENT AND QUALIFICATIONS ALLIANCE

**General Certificate of Secondary Education
Foundation Tier and Higher Tier
June 2010**

Science A

Unit Biology B1a (Human Biology)

Biology

Unit Biology B1a (Human Biology)

BLY1AP

Monday 28 June 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 plus your additional time allowance.

At the top of the page write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

INSTRUCTIONS

- **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:

| | | | |
|-----------------------|----------------------------------|-----------------------|-----------------------|
| 1 | 2 | 3 | 4 |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> |
- Do **NOT** extend beyond the circles.
- If you want to change your answer, **YOU MUST** cross out your original answer, as shown:

| | | | |
|-----------------------|----------------------------------|-----------------------|----------------------------------|
| 1 | 2 | 3 | 4 |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |
- 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:

| | | | |
|-----------------------|----------------------------------|-----------------------|----------------------------------|
| 1 | 2 | 3 | 4 |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |

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.

DO NOT TURN OVER UNTIL TOLD TO DO SO

You must do ONE TIER only, EITHER the Foundation Tier OR the Higher Tier.

The Higher Tier starts on page 23 of this booklet.

FOUNDATION TIER

SECTION ONE

Questions ONE to FIVE.

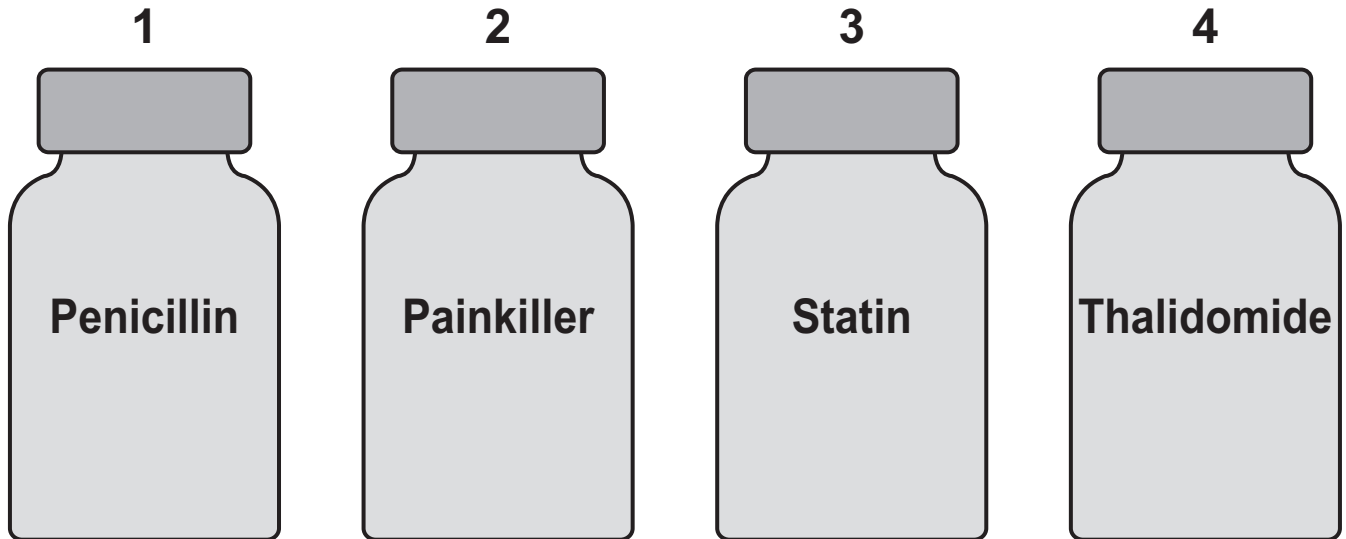
In these questions, match the letters A, B, C and D, with the numbers 1–4.

Use EACH answer only ONCE.

Mark your choices on the answer sheet.

QUESTION ONE

Drugs are used to treat sick people.



Match treatments, A, B, C and D, with the drugs 1–4 in the diagram.

- A** used to treat a headache
- B** used to treat infections
- C** used to treat leprosy
- D** used to treat high cholesterol

[Turn over for the next question]

QUESTION TWO

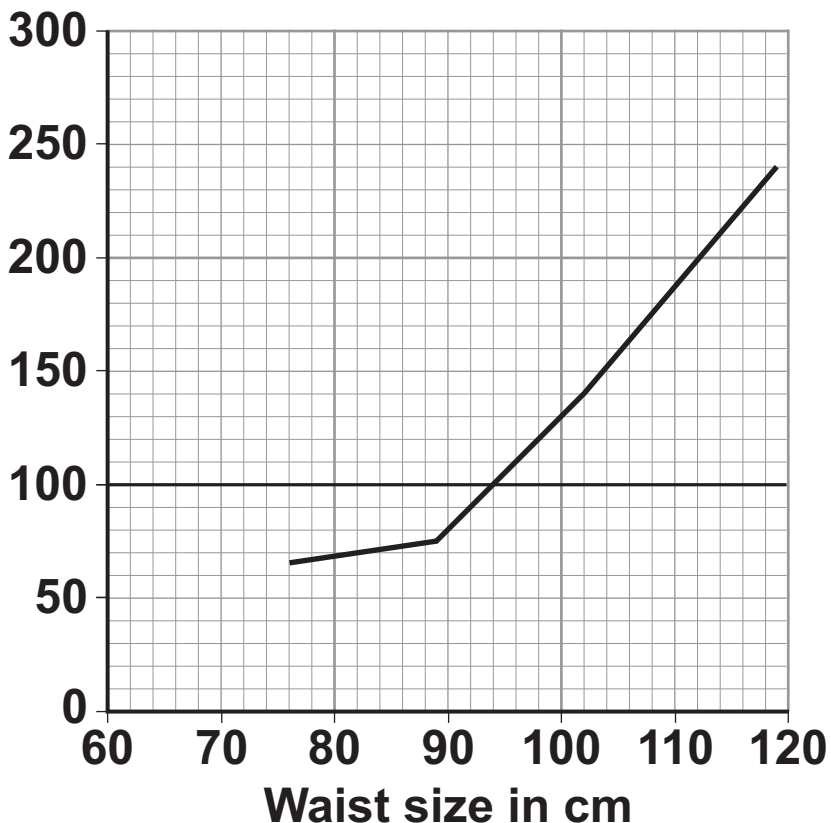
Obesity can increase the risk of dying early.

The graph shows the relationship between waist size in men and the risk of dying early.

A risk of 100 or less means that a person is not expected to die early.

A risk higher than 100 means that a person has a higher risk of dying early.

Risk of dying
early in
arbitrary units



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

A 80

B 94

C 130

D 140

| | |
|---|---|
| 1 | the waist size in cm of a man with a risk of 100 |
| 2 | the risk of dying early for a man with a waist size of 102 cm |
| 3 | a waist size in cm of a man with a reduced risk of dying early |
| 4 | the difference in risk between a man with a waist size of 80 cm and a man with a waist size of 112 cm |

[Turn over for the next question]

QUESTION THREE

The human body responds to changes in the environment.

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

A muscles

B stimuli

C receptors

D neurones

Changes in the environment that the body detects are called ... 1

Changes in the environment are detected by special cells called ... 2

Electrical impulses are then sent along ... 3

The response is often brought about by ... 4

QUESTION FOUR

Semmelweiss was a doctor. He did research that saved the lives of thousands of mothers and their babies.

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

- A observation**
- B hypothesis**
- C experiment**
- D result**

| | |
|----------|---|
| 1 | He told the doctors to wash their hands before treating mothers to see if it had any effect. |
| 2 | He noticed that in one ward many mothers were dying. |
| 3 | The death rate amongst mothers fell. |
| 4 | He had an idea that doctors might be carrying disease to the mothers. |

[Turn over for the next question]

QUESTION FIVE

The menstrual cycle is controlled by hormones.

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

A embryo

B ovary

C pituitary gland

D womb

| INFORMATION | |
|--------------------|---|
| 1 | produces eggs |
| 2 | produced when a fertilised egg divides |
| 3 | produces the hormone FSH |
| 4 | its lining is thickened by the action of a hormone |

SECTION TWO

Questions SIX to NINE.

Each of these questions has four parts.

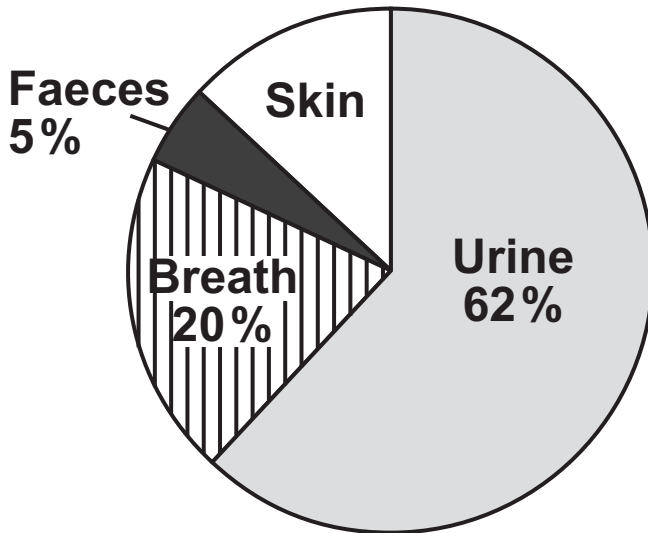
In each part choose only ONE answer.

Mark your choices on the answer sheet.

[Turn over for Question 6]

QUESTION SIX

The pie chart shows the percentages of water lost from different parts of the body on a cold day.



6A What is the percentage of water lost from the skin?

- 1 10%
- 2 13%
- 3 15%
- 4 17%

6B The total volume of water lost from the body was 2000 cm^3 .

How many cm^3 of water would be lost from the body in the breath?

1 20 cm^3

2 100 cm^3

3 400 cm^3

4 500 cm^3

6C More water is lost from the skin on a hot day than on a cold day.

Why is this useful to the body?

1 It gets rid of excess water.

2 It moisturises the skin.

3 It helps to control blood sugar levels.

4 It helps to control body temperature.

[Question 6 continues on the next page]

6D The volume and composition of the urine would be different on a hot day compared with a cold day.

Which row in the table shows these differences?

| | Concentration of ions in urine on a hot day | Volume of urine produced on a hot day |
|----------|--|--|
| 1 | increased | increased |
| 2 | increased | decreased |
| 3 | decreased | increased |
| 4 | decreased | decreased |

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TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

A class of students investigated the reaction time of a student.

- **The students used a computer program to measure reaction time.**
- **A student was told to press the space bar when the screen colour changed to yellow.**
- **The computer program measured the time it took for the student to press the space bar after the screen colour changed to yellow.**
- **The starting screen colour was changed in each test.**
- **The end screen colour was always yellow.**

7A The receptors that detect the colour change on the screen are found in the . . .

- 1 finger.**
- 2 eye.**
- 3 brain.**
- 4 ear.**

7B The independent variable in this experiment was the . . .

- 1 starting colour.**
- 2 end colour.**
- 3 time taken to press the space bar.**
- 4 gender of the student.**

7C The table shows the results for the student.

| Starting colour | End colour | Time taken to press the space bar in seconds |
|------------------------|-------------------|---|
| Red | Yellow | 0·07 |
| Blue | Yellow | 0·04 |
| Green | Yellow | 0·06 |
| Black | Yellow | 0·05 |

To which colour change did the student react the fastest?

- 1 red to yellow**
- 2 blue to yellow**
- 3 green to yellow**
- 4 black to yellow**

7D How could this investigation be made more reliable?

- 1 decrease the number of starting colours**
- 2 increase the number of end colours**
- 3 increase the number of times the student did the test**
- 4 decrease the size of the computer screen**

[Turn over]

QUESTION EIGHT

Our bodies defend themselves against attack by pathogens.

8A Our white cells produce antibodies which destroy . . .

- 1 all types of bacteria and all types of viruses.**
- 2 all types of bacteria but no viruses.**
- 3 all types of viruses but no bacteria.**
- 4 some types of bacteria and some types of viruses.**

8B Our white cells also produce antitoxins which . . .

- 1 counteract poisons produced by pathogens.**
- 2 destroy both bacteria and viruses.**
- 3 destroy bacteria but not viruses.**
- 4 ingest pathogens.**

8C Antibiotics destroy . . .

- 1 all types of bacteria and all types of viruses.**
- 2 some types of bacteria and some types of viruses.**
- 3 some types of bacteria but no viruses.**
- 4 some types of viruses but no bacteria.**

8D Vaccines . . .

- 1 can be made from dead pathogens.**
- 2 can give protection against bacteria but not viruses.**
- 3 can give protection against viruses but not bacteria.**
- 4 destroy pathogens.**

[Turn over for the next question]

QUESTION NINE

If you take in less energy than you use, you will lose weight.

A popular diet book claims that a low carbohydrate diet results in quicker weight loss and a more healthy body than a low fat diet.

Scientists carried out an investigation to see if this claim is true.

- **They used 120 overweight volunteers divided into two equal groups.**
- **Both groups were allowed 2000 kilocalories per day.**
- **GROUP 1 was given a diet containing less than 20 g of carbohydrate per day.**
- **GROUP 2 was given a low-fat diet containing less than 30% of energy from fat and less than 300 mg of cholesterol per day.**
- **Both groups were given the same exercise programmes which they did at home.**
- **Both groups attended a weekly information meeting.**

9A In what way did the scientists plan a controlled investigation?

- 1 **All volunteers were allowed the same amount of fat per day.**
- 2 **All volunteers had the same starting weight.**
- 3 **All volunteers were given a low-cholesterol diet.**
- 4 **All volunteers were allowed the same amount of energy per day.**

The results after 24 weeks are shown in the table.

| | Group 1 Low carbohydrate diet | Group 2 Low fat diet |
|---|--|---------------------------------|
| Proportion of volunteers who completed the trial | 76% | 57% |
| Mean change in body mass | -12.9% | -6.7% |
| Mean change in body fat mass | -9.4 kg | -4.8 kg |
| Mean change in blood HDL concentration | + 55 mg per litre | - 16 mg per litre |
| Mean change in blood LDL concentration | + 16 mg per litre | -74 mg per litre |

9B The investigation would have been more reliable if all the volunteers . . .

- 1** had been allowed more energy per day.
- 2** had done the exercise programme under supervision.
- 3** had lost the same amount of mass.
- 4** had been given the same amount of cholesterol per day.

[Question 9 continues on the next page]

9C The difference in the mean change in blood HDL concentration between **GROUP 1** and **GROUP 2** was . . .

- 1** 16 mg per litre.
- 2** 39 mg per litre.
- 3** 55 mg per litre.
- 4** 71 mg per litre.

9D The data supports the popular diet book's claim because . . .

- 1** people on the low carbohydrate diet had an increased blood LDL concentration.
- 2** people on the low fat diet had a bigger decrease in blood HDL concentration.
- 3** people on the low fat diet lost less body mass, on average.
- 4** more people on the low carbohydrate diet completed the trial.

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.

[Turn over for Question 1]

QUESTION ONE

The menstrual cycle is controlled by hormones.

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

A embryo

B ovary

C pituitary gland

D womb

| INFORMATION | |
|--------------------|---|
| 1 | produces eggs |
| 2 | produced when a fertilised egg divides |
| 3 | produces the hormone FSH |
| 4 | its lining is thickened by the action of a hormone |

QUESTION TWO

Drugs affect our body chemistry.

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

- A** illegal and addictive
- B** legal and addictive
- C** medicinal
- D** illegal and non-addictive

| | |
|----------|-----------------|
| 1 | Cannabis |
| 2 | Nicotine |
| 3 | Heroin |
| 4 | Statin |

[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

Our bodies defend themselves against attack by pathogens.

3A Our white cells produce antibodies which destroy . . .

- 1 all types of bacteria and all types of viruses.**
- 2 all types of bacteria but no viruses.**
- 3 all types of viruses but no bacteria.**
- 4 some types of bacteria and some types of viruses.**

3B Our white cells also produce antitoxins which . . .

- 1 counteract poisons produced by pathogens.**
- 2 destroy both bacteria and viruses.**
- 3 destroy bacteria but not viruses.**
- 4 ingest pathogens.**

3C Antibiotics destroy . . .

- 1 all types of bacteria and all types of viruses.**
- 2 some types of bacteria and some types of viruses.**
- 3 some types of bacteria but no viruses.**
- 4 some types of viruses but no bacteria.**

3D Vaccines . . .

- 1 can be made from dead pathogens.**
- 2 can give protection against bacteria but not viruses.**
- 3 can give protection against viruses but not bacteria.**
- 4 destroy pathogens.**

[Turn over for the next question]

QUESTION FOUR

If you take in less energy than you use, you will lose weight.

A popular diet book claims that a low carbohydrate diet results in quicker weight loss and a more healthy body than a low fat diet.

Scientists carried out an investigation to see if this claim is true.

- They used 120 overweight volunteers divided into two equal groups.
- Both groups were allowed 2000 kilocalories per day.
- GROUP 1 was given a diet containing less than 20 g of carbohydrate per day.
- GROUP 2 was given a low-fat diet containing less than 30% of energy from fat and less than 300 mg of cholesterol per day.
- Both groups were given the same exercise programmes which they did at home.
- Both groups attended a weekly information meeting.

4A In what way did the scientists plan a controlled investigation?

- 1 All volunteers were allowed the same amount of fat per day.
- 2 All volunteers had the same starting weight.
- 3 All volunteers were given a low-cholesterol diet.
- 4 All volunteers were allowed the same amount of energy per day.

The results after 24 weeks are shown in the table.

| | Group 1 Low carbohydrate diet | Group 2 Low fat diet |
|---|--|---------------------------------|
| Proportion of volunteers who completed the trial | 76% | 57% |
| Mean change in body mass | -12.9% | -6.7% |
| Mean change in body fat mass | -9.4 kg | -4.8 kg |
| Mean change in blood HDL concentration | + 55 mg per litre | - 16 mg per litre |
| Mean change in blood LDL concentration | + 16 mg per litre | -74 mg per litre |

4B The investigation would have been more reliable if all the volunteers . . .

- 1** had been allowed more energy per day.
- 2** had done the exercise programme under supervision.
- 3** had lost the same amount of mass.
- 4** had been given the same amount of cholesterol per day.

[Question 4 continues on the next page]

4C The difference in the mean change in blood HDL concentration between **GROUP 1** and **GROUP 2** was . . .

- 1** 16 mg per litre.
- 2** 39 mg per litre.
- 3** 55 mg per litre.
- 4** 71 mg per litre.

4D The data supports the popular diet book's claim because . . .

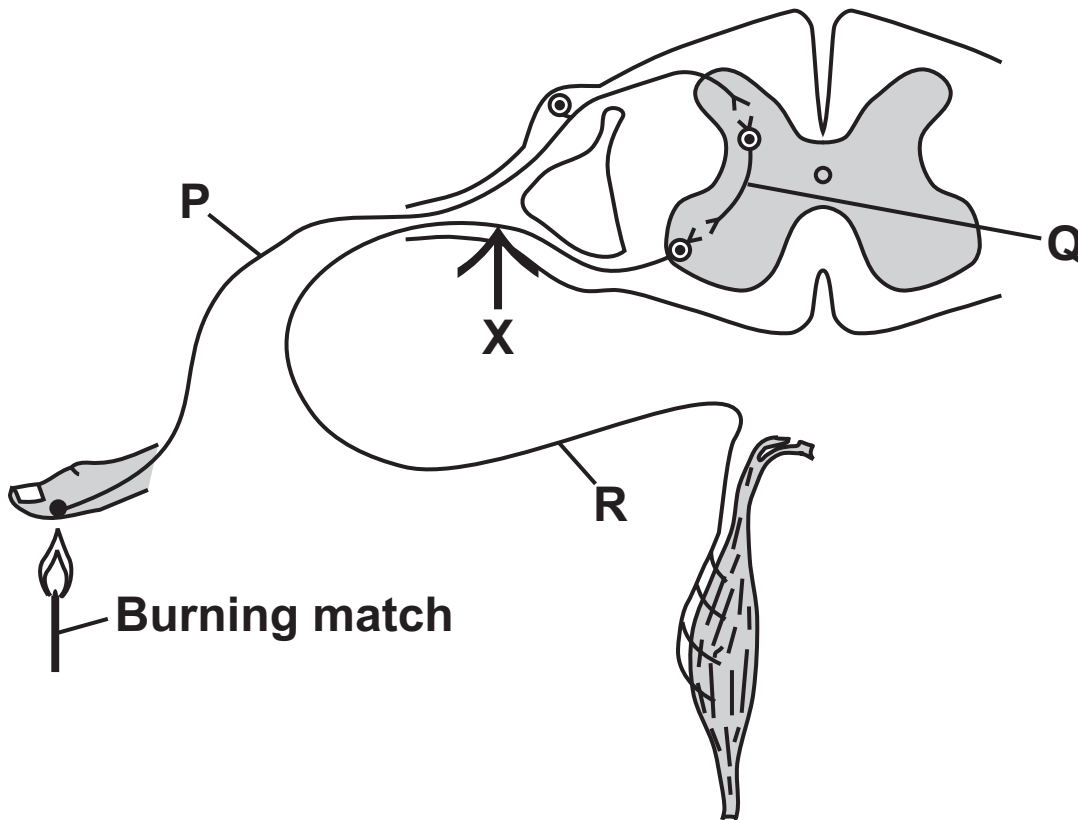
- 1** people on the low carbohydrate diet had an increased blood LDL concentration.
- 2** people on the low fat diet had a bigger decrease in blood HDL concentration.
- 3** people on the low fat diet lost less body mass, on average.
- 4** more people on the low carbohydrate diet completed the trial.

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TURN OVER FOR THE NEXT QUESTION

QUESTION FIVE

The diagram shows the structures involved in a reflex action.



5A What types of neurone are P and Q?

| | P | Q |
|---|---------|---------|
| 1 | relay | sensory |
| 2 | motor | sensory |
| 3 | sensory | relay |
| 4 | sensory | motor |

5B Which row in the table below shows how information passes between neurone P and neurone Q, and between neurone Q and neurone R?

| | Between neurone P and neurone Q | Between neurone Q and neurone R |
|----------|---------------------------------|---------------------------------|
| 1 | chemical | impulse |
| 2 | impulse | impulse |
| 3 | chemical | chemical |
| 4 | impulse | chemical |

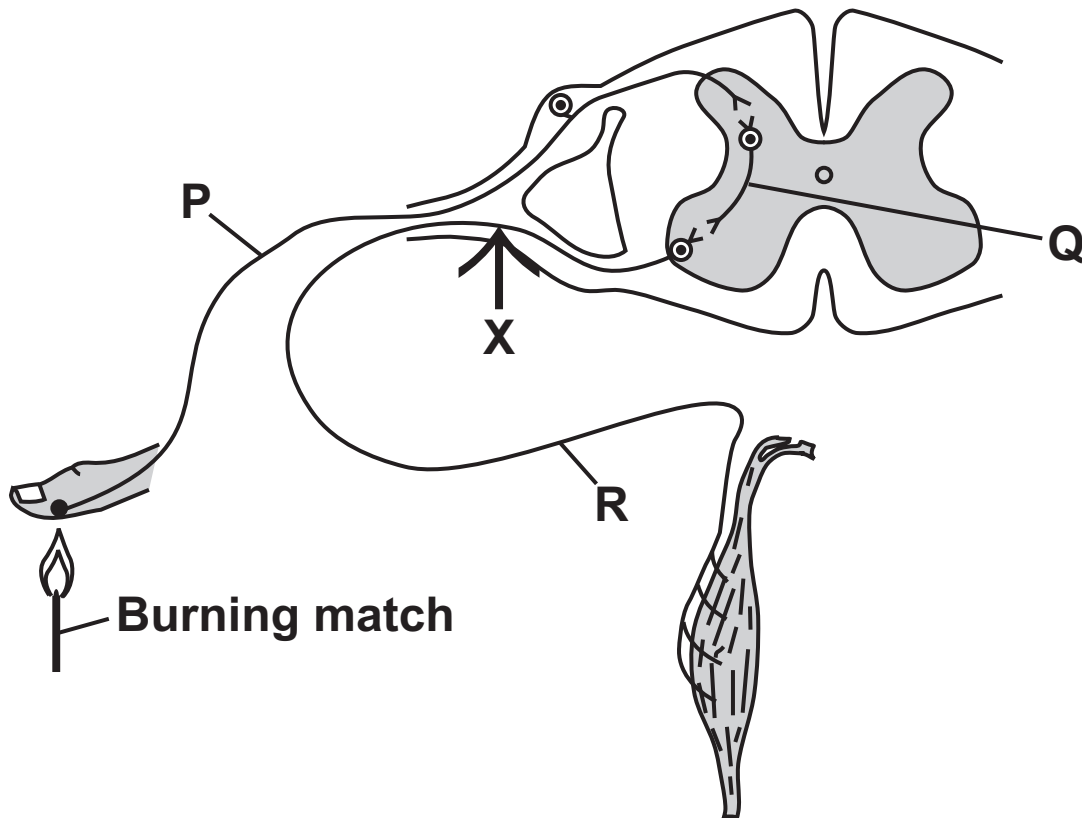
5C In one person, the distance travelled by an impulse was found to be 1.5 m. The time taken for the impulse to travel this distance was 0.015 s. However, the time taken for a response to occur was 0.021 s.

What is the main reason for this difference?

- 1** It takes extra time for the brain to respond.
- 2** It takes extra time for information to cross synapses.
- 3** Information travels more slowly in the spinal cord.
- 4** Reflex actions can be slowed down by low body temperature.

[Question 5 continues on the next page]

The diagram is repeated from page 32.



5D In an accident, neurone R is cut at the point labelled X on the diagram.

How would this affect the person shown in the diagram?

- 1 The stimulus could be detected but the effector would not work.
- 2 The effector would work but the person could not detect the stimulus.
- 3 The effector would not work and the stimulus could not be detected.
- 4 The stimulus could be detected and the effector would work.

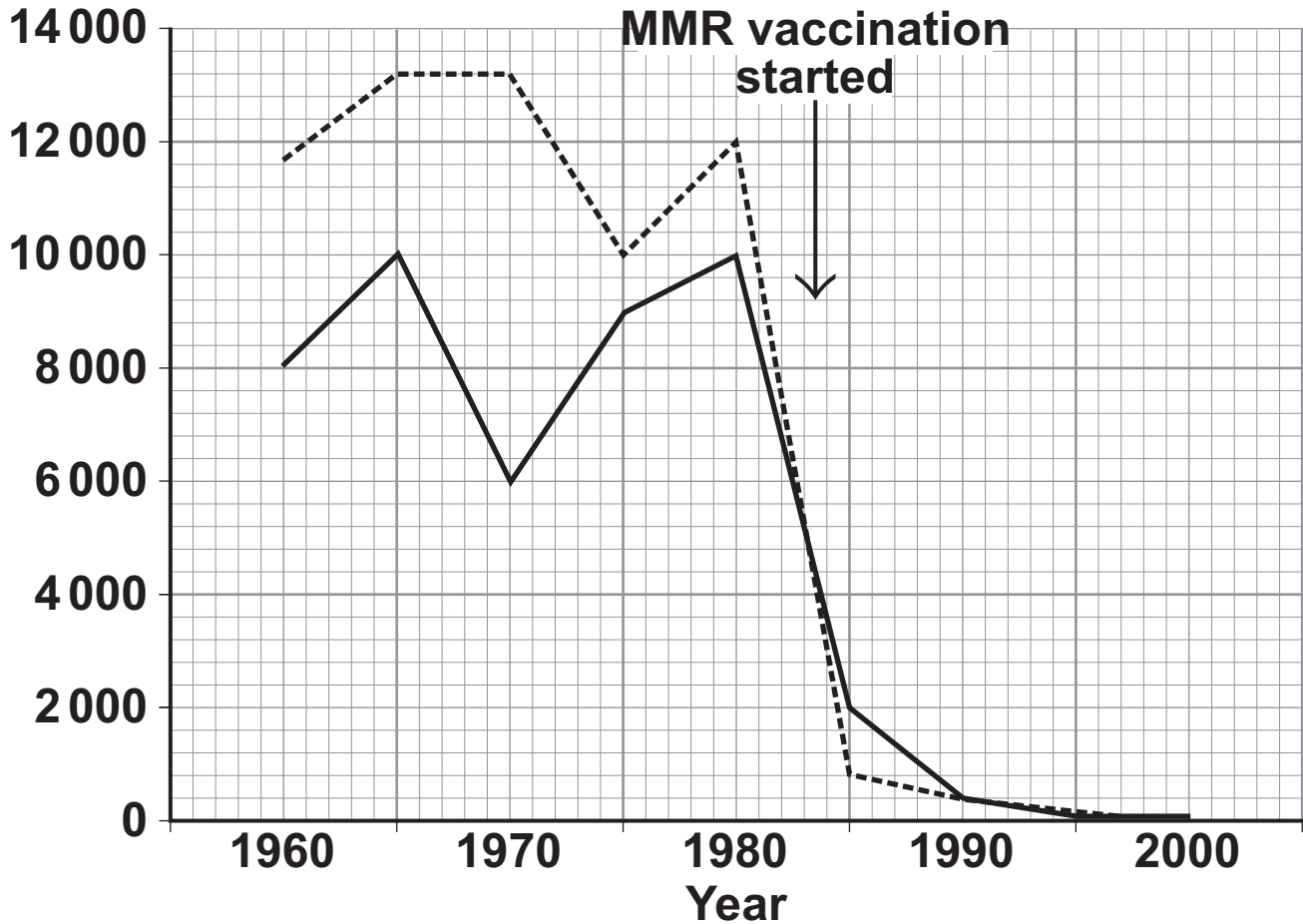
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TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

The graph shows the effect of MMR vaccination on the number of cases of mumps and rubella in Finland.

Number
of cases



KEY

- Mumps
- Rubella

6A By how many did the number of cases of rubella decrease between 1980 and 1990?

1 400

2 800

3 9600

4 12000

6B Rubella is caused by a virus. There were no cases of rubella in Finland after 1997.

What was the most probable reason for this?

1 There had been a large decrease in the number of cases of mumps by 1997.

2 An antibiotic cure for rubella was introduced in 1997.

3 The rubella pathogen mutated in 1997.

4 Most of the children in Finland had been vaccinated by 1997.

[Question 6 continues on the next page]

Finland has a population of 4.4 million.

The table shows the occurrence of some side-effects linked to MMR vaccination in Finland by 1997.

| Side-effect | Total number of side-effects linked to MMR vaccination by 1997 | Number of side-effects per 100 000 people given MMR vaccine by 1997 |
|-----------------|--|---|
| Anaphylaxis | 14 | 0.42 |
| Asthma | 5 | 0.15 |
| Autism | 0 | 0 |
| Epilepsy | 1 | 0.03 |
| Febrile seizure | 28 | 0.84 |
| Urticaria | 25 | 0.75 |

6C Using the data for anaphylaxis, how many people in Finland had been given the MMR vaccine by 1997?

- 1 588 000
- 2 1 385 000
- 3 3.3 million
- 4 4.4 million

6D Look at the data in the graph and the table.

What advice should a doctor in Finland give to a mother who is worried about her child being given the MMR vaccine?

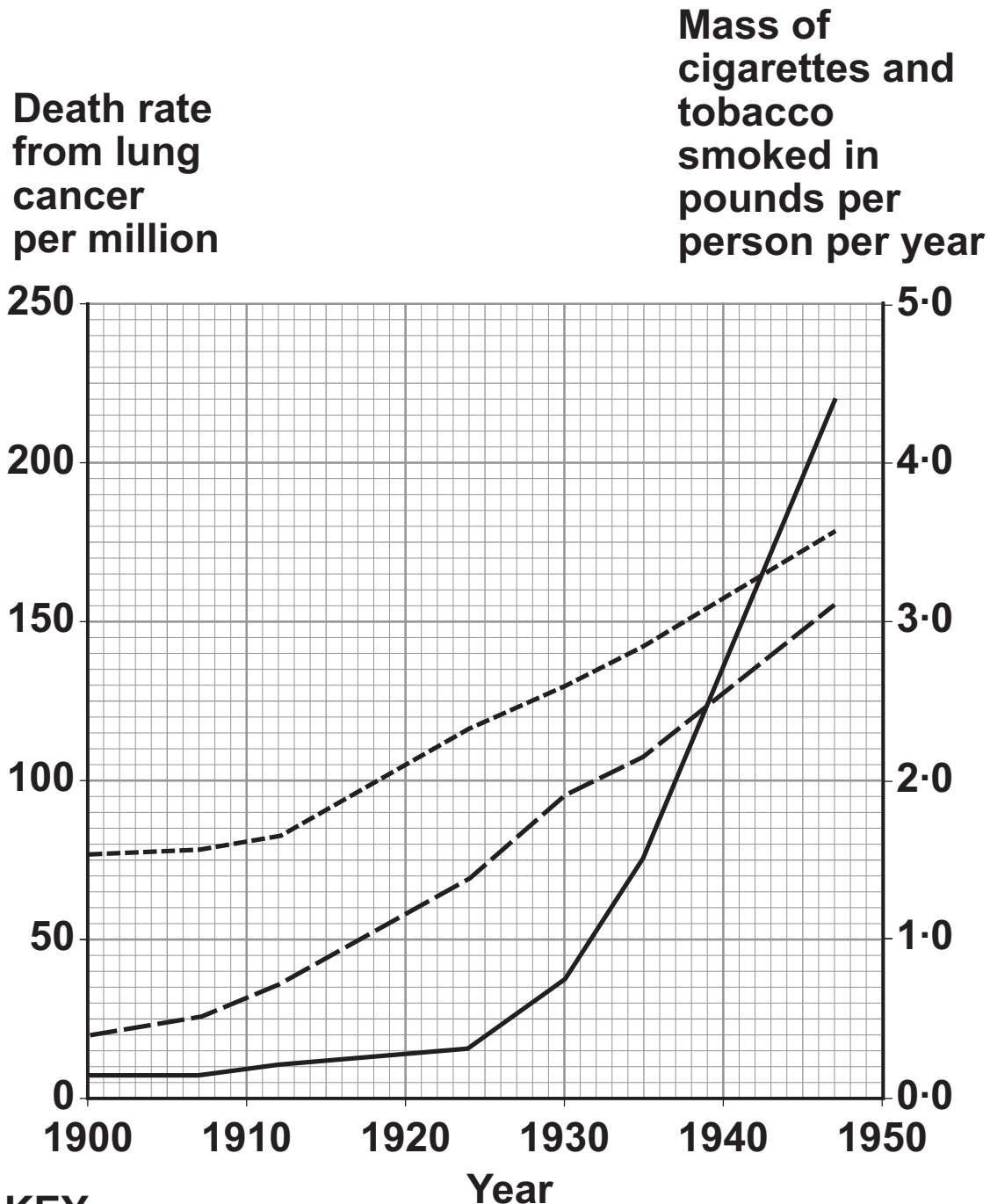
- 1 There is no danger from being given the vaccine.**
- 2 There is a slight risk of autism.**
- 3 The risk of any side-effect is very low.**
- 4 There is no need to have your child vaccinated with the MMR vaccine.**

[Turn over for the next question]

QUESTION SEVEN

In the 1950s, Richard Doll used surveys to investigate the causes of lung cancer.

The graph shows one set of data that he produced.



KEY

- Death rate from lung cancer
- - - - Consumption of tobacco
- · - · Consumption of tobacco as cigarettes

7A By how much did the consumption of tobacco as cigarettes increase between 1900 and 1947?

- 1 2·7 pounds per person per year
- 2 3·0 pounds per person per year
- 3 3·5 pounds per person per year
- 4 5·4 pounds per person per year

7B The death rate from lung cancer between 1900 and 1947 . . .

- 1 increased at a constant rate.
- 2 increased slowly at first, then more rapidly.
- 3 increased rapidly at first, then more slowly.
- 4 increased rapidly, then levelled off.

[Question 7 continues on the next page]

Doll interviewed hospital patients about their smoking habits.

The table shows some of the results.

| Numbers of cigarettes smoked each day | 0 | 1–4 | 5–14 | 15–24 | 25 or more |
|--|----------|------------|-------------|--------------|-------------------|
| Number of lung cancer patients | 2 | 12 | 36 | 27 | 21 |
| Number of patients with diseases other than lung cancer | 9 | 9 | 30 | 19 | 11 |

7C This data shows that . . .

- 1 there is a possible link between smoking and lung cancer.**
- 2 there is no link between smoking and lung cancer.**
- 3 smoking causes lung cancer.**
- 4 smoking causes a wide range of diseases.**

7D It took many years for Doll's work to be widely accepted by other doctors.

The main reason for this was that . . .

- 1 his work mainly involved collecting statistics.**
- 2 large amounts of money were spent on tobacco advertising.**
- 3 interviews about smoking habits produce very unreliable data.**
- 4 many doctors were smokers.**

[Turn over for the next question]

QUESTION EIGHT

Some crocodiles live in lakes in Africa. These lakes may contain rotting meat and vegetation.

- Crocodiles often get cuts but these rarely become infected.
- However, local people notice that when they bathe in the same lakes, THEIR cuts often become infected.

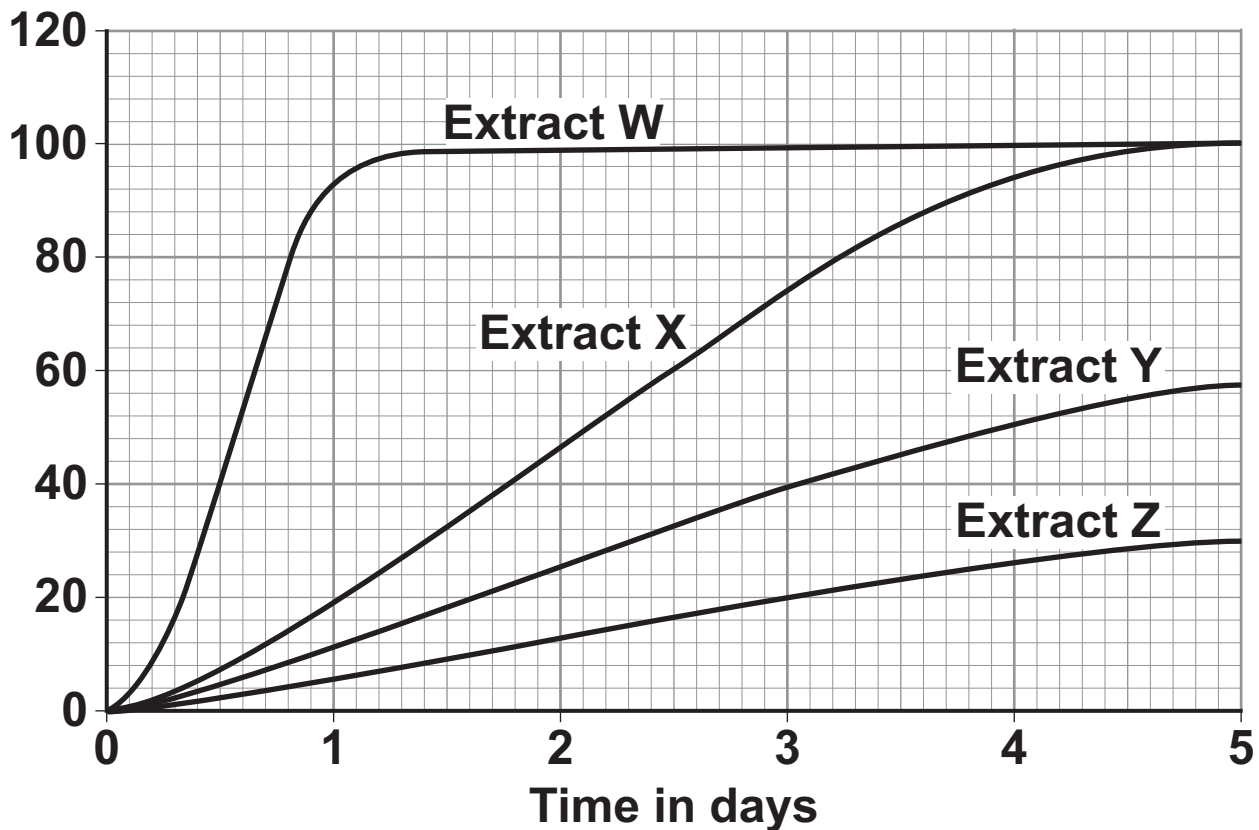
8A Which row in the table correctly identifies the two statements?

| | Cuts on crocodiles rarely become infected | Cuts on local people often become infected |
|---|---|--|
| 1 | Theory | Hypothesis |
| 2 | Hypothesis | Theory |
| 3 | Observation | Observation |
| 4 | Hypothesis | Observation |

- A researcher took a sample of crocodile blood and made four extracts, W, X, Y and Z, from it.
- He added these extracts to MRSA bacteria in tubes of nutrient solution.
- The tubes were kept in a warm place for five days.
- As bacteria grew, the nutrient solution became cloudy.

The graph shows how the cloudiness of the nutrient solutions changed over the five days.

Cloudiness
in arbitrary
units



8B The researcher decided to purify one of the extracts to isolate the bacteria-killing chemical.

Which extract would he most likely choose to purify?

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

[Question 8 continues on the next page]

8C After several pure chemicals had been isolated from one extract, the chemicals were trialled.

The table shows four stages in the trialling of a new chemical.

| Stage | Trialled on |
|--------------|---|
| P | human volunteers who do not have disease |
| Q | cell cultures |
| R | animals |
| S | humans who do have disease |

Which is the correct sequence for these stages?

- 1 R → S → Q → P**
- 2 Q → P → S → R**
- 3 Q → R → P → S**
- 4 S → P → R → Q**

8D Volunteers in trials of new chemicals . . .

- 1 should always be paid for taking part.**
- 2 should always be told about the risks of side-effects.**
- 3 should be able to choose whether to take the new chemical or a placebo.**
- 4 should be told whether they have been given the placebo or the new chemical.**

[Turn over for the next question]

QUESTION NINE

IVF (in vitro fertilisation) treatment helps women to become pregnant.

9A The hormone which stimulates the monthly release of the egg is secreted by the . . .

- 1 ovary.**
- 2 brain.**
- 3 pituitary gland.**
- 4 womb.**

9B Which hormone treatment is usually used in IVF?

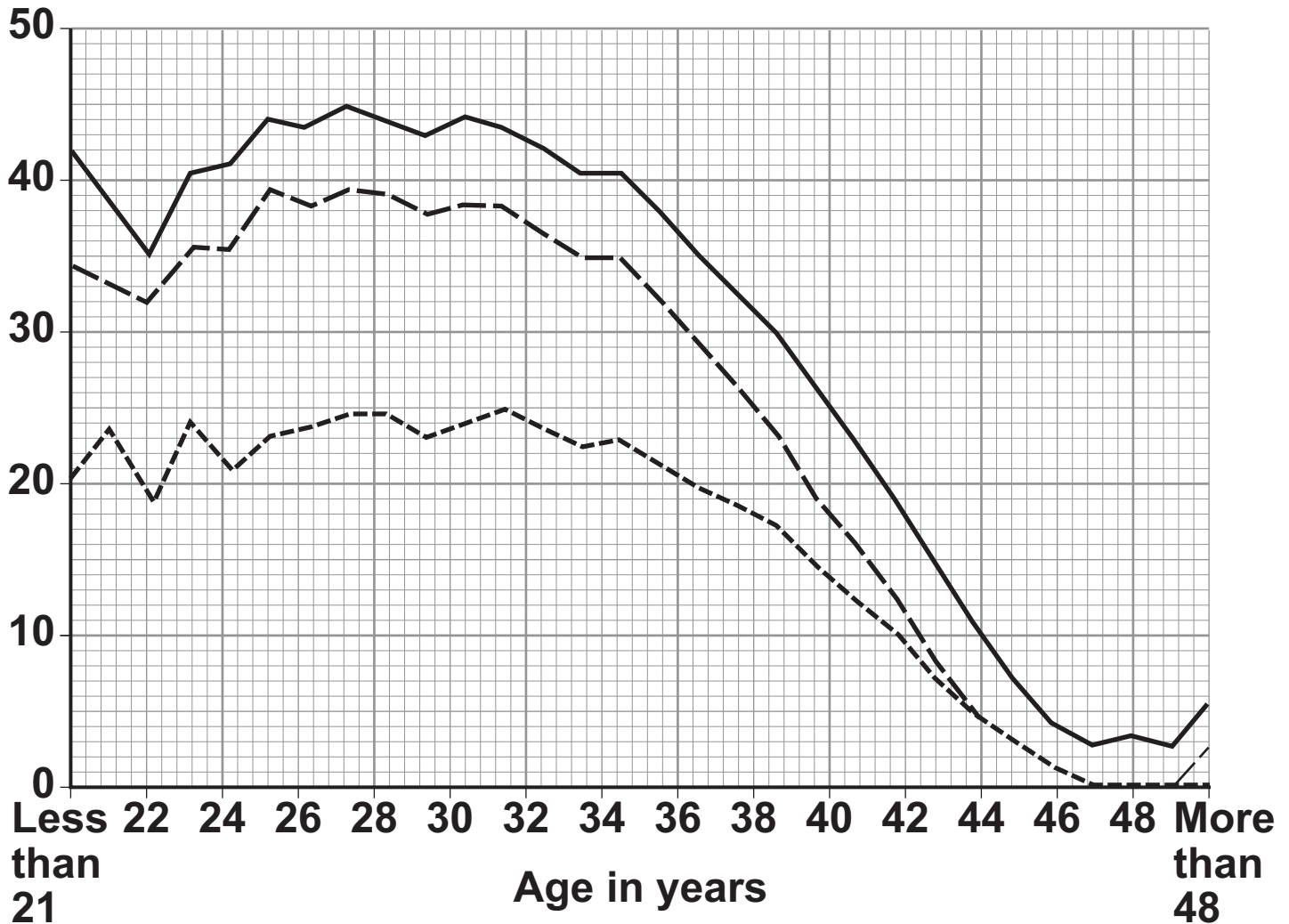
- 1 oestrogen only**
- 2 FSH followed by LH**
- 3 FSH only**
- 4 LH followed by FSH**

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QUESTION 9 CONTINUES ON THE NEXT PAGE

The graph shows the percentage success rates of IVF treatments for women of different ages.

Percentage success rate of IVF treatment



KEY

- Pregnancy success rate
- - - Multiple birth success rate
- . - . Single birth success rate

9C Which conclusion can be drawn from this data?

- 1 Only single babies were born to women over 45.**
- 2 IVF should not be given to women over 45.**
- 3 The pregnancy success rate falls significantly after the age of 34.**
- 4 The pregnancy success rate is independent of the age of the woman.**

9D Which pattern is shown by the data?

- 1 The single birth success rate is always less than the multiple birth success rate.**
- 2 The multiple birth success rate is never less than 20%.**
- 3 Women of all ages produce multiple births.**
- 4 After the age of 34 the proportion of multiple births compared with single births decreases with the age of the mother.**

END OF TEST

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