

|                     |  |                  |  |
|---------------------|--|------------------|--|
| Surname             |  | Other Names      |  |
| Centre Number       |  | Candidate Number |  |
| Candidate Signature |  |                  |  |

General Certificate of Secondary Education  
Winter 2003



**SCIENCE: DOUBLE AWARD (MODULAR)                      346002**  
**BIOLOGY (MODULAR)**  
**Maintenance of Life (Module 02)**

Thursday 27 November 2003 Morning Session

**In addition to this paper you will require:**

- a black ball-point pen;
- an 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 “Maintenance of Life” 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. Rough work may be done on the question paper.

**Instructions for recording answers**

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

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

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| ○ | ● | ○ | ○ |

- 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 |
| ○ | ⊗ | ○ | ● |

- 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 |
| ○ | ⊗ | ○ | ⊗ |

**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 14 of this booklet.

---

**FOUNDATION TIER**

**SECTION A**

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

In these questions match the words in the list with the numbers.

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

Mark your choices on the answer sheet.

---

**QUESTION ONE**

The diagram shows a cell from the stem of a water plant.

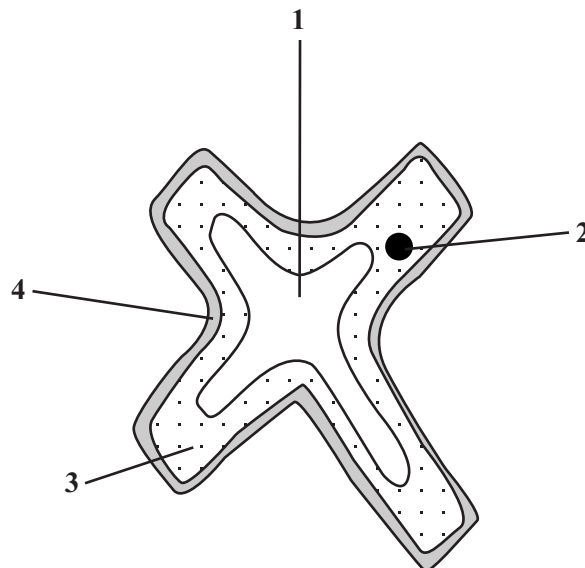
Match words from the list with each of the labels **1–4** on the diagram.

**cell wall**

**cytoplasm**

**nucleus**

**permanent vacuole**



**QUESTION TWO**

The table is about the functions of organs involved in the removal of waste from the body.

Match words from the list with each of the numbers **1–4** in the table.

**bladder**

**kidney**

**lung**

**skin**

| <b>Organ</b> | <b>Function</b>                     |
|--------------|-------------------------------------|
| <b>1</b>     | gets rid of carbon dioxide          |
| <b>2</b>     | produces sweat                      |
| <b>3</b>     | removes excess water from the blood |
| <b>4</b>     | stores urine                        |

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION THREE**

The diagram shows a section through the eye.

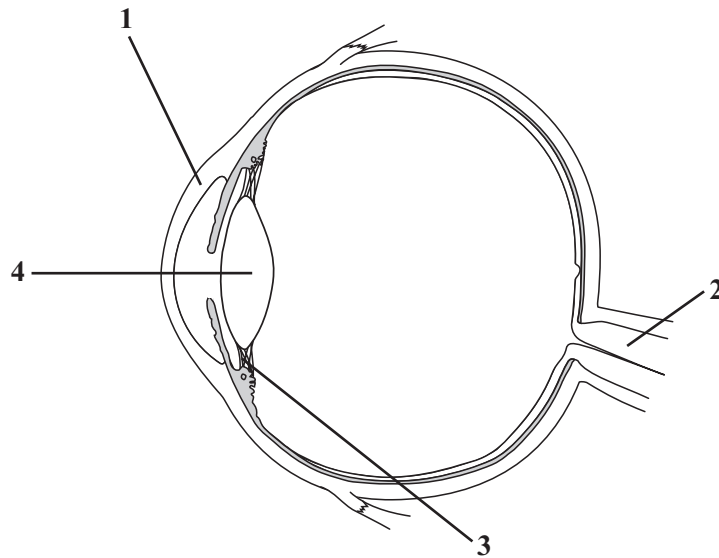
Match words from the list with each of the labels 1–4 on the diagram.

**cornea**

**lens**

**optic nerve**

**suspensory ligament**



**QUESTION FOUR**

Plant growth is affected by a number of factors.

Match words from the list with each of the numbers **1–4** in the table.

**hormone**

**light**

**nitrate**

**the force of gravity**

| <b>Factor</b> | <b>Importance in plant growth</b>                    |
|---------------|--|
| <b>1</b>      | a mineral salt absorbed by roots and used for growth |
| <b>2</b>      | roots grow in the direction of it                    |
| <b>3</b>      | shoots grow towards it                               |
| <b>4</b>      | stimulates the growth of roots from cuttings         |

**QUESTION FIVE**

The table is about the causes of some problem conditions that can occur in the human body.

Match words from the list with each of the numbers **1–4** in the table.

**low birth mass of babies**

**lung and liver damage**

**slowing down reactions**

**suffering withdrawal symptoms**

| <b>Condition</b> | <b>May be caused by</b>         |
|------------------|---------------------------------|
| <b>1</b>         | breathing in cigarette smoke    |
| <b>2</b>         | drinking alcohol                |
| <b>3</b>         | going without an addictive drug |
| <b>4</b>         | sniffing solvents               |

**Turn over ►**

**SECTION B**Questions **SIX** and **SEVEN**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

---

**QUESTION SIX**

Lights at pedestrian crossings often show a green man and give a bleep sound when it is safe to cross.

Which **two** of the following sense organs are used to detect when it is safe to cross?

ear

eye

nose

skin

tongue

**QUESTION SEVEN**

Plants make food by photosynthesis.

Which **two** of the following are raw materials for photosynthesis?

carbon dioxide

oxygen

nitrate

starch

water

**NO QUESTIONS APPEAR ON THIS PAGE**

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

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**SECTION C**Questions **EIGHT** to **TEN**.

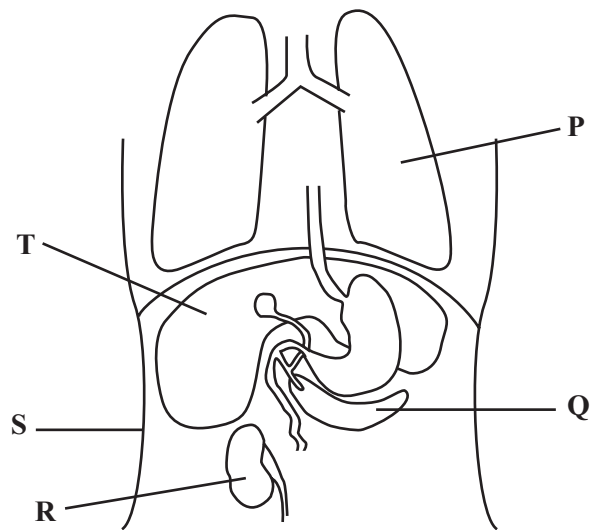
Each of these questions has four parts.

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

---

**QUESTION EIGHT**

The diagram shows some of the organs that regulate the internal environment of the body.

**8.1** Organ **T** . . . . .

- A** breaks down amino acids.
- B** controls sweating.
- C** produces glucagon.
- D** produces urine.

**8.2** Organ **Q** . . . . .

- A** produces amino acids.
- B** produces insulin.
- C** produces urea.
- D** stores sugar.



**8.3** Organ **P** . . . . .

- A** produces urea.
- B** produces sweat.
- C** removes carbon dioxide from the blood.
- D** stores sugar.

**8.4** Ions are lost from the blood through . . . . .

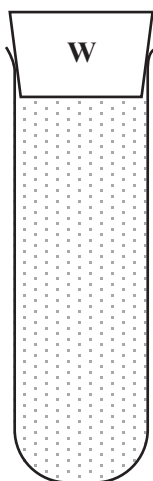
- A** **P** and **Q**.
- B** **P** and **S**.
- C** **R** and **S**.
- D** **R** and **T**.

**TURN OVER FOR THE NEXT QUESTION**

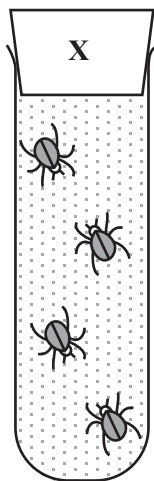
**Turn over ►**

**QUESTION NINE**

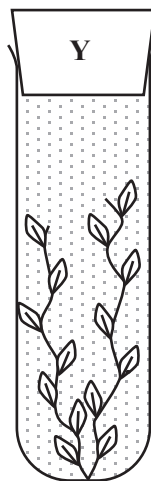
Four test tubes **W**, **X**, **Y** and **Z** were set up as shown in the diagram, and left in bright light for 24 hours.



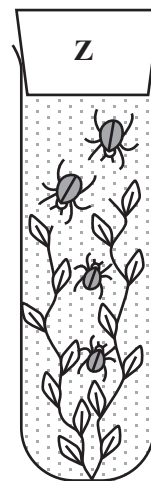
Tube **W**  
contained  
water only



Tube **X**  
contained  
water and  
water beetles



Tube **Y**  
contained  
water and  
pond weed



Tube **Z**  
contained  
water and  
pond weed and  
water beetles

After 24 hours in bright light the concentration of oxygen in the water in each tube was measured.

**9.1** In which tube would you expect the concentration of oxygen to be greatest?

- A **W**
- B **X**
- C **Y**
- D **Z**

**9.2** In two tubes there was no change in the oxygen concentration after the 24 hours.

In which tubes would this be most likely to happen?

- A **W** and **X**
- B **W** and **Z**
- C **X** and **Y**
- D **Y** and **Z**

- 9.3** Which process in some of the tubes produces oxygen?
- A** Osmosis
  - B** Photosynthesis
  - C** Respiration
  - D** Transpiration
- 9.4** What would be the expected result, after 24 hours, of covering Tube **Y** with light-proof paper?
- A** The concentration of carbon dioxide is unchanged
  - B** The concentration of oxygen is higher
  - C** The concentration of oxygen is lower
  - D** The concentration of oxygen is unchanged

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION TEN**

Leaves were taken from four different plants and the number of stomata counted.  
The results are shown in the table.

| Plant | Mean number of stomata per cm <sup>2</sup> |                       |
|-------|--|-----------------------|
|       | Upper surface of leaf                      | Lower surface of leaf |
| J     | 4000                                       | 28 000                |
| K     | 0  | 800                   |
| L     | 8500                                       | 15 000                |
| M     | 8000                                       | 26 000                |

**10.1** In total, which plant has most stomata per cm<sup>2</sup> of leaf?

- A J
- B K
- C L
- D M

**10.2** Which plant is most likely to live in a very dry region?

- A J
- B K
- C L
- D M

**10.3** Transpiration occurs through the stomata.

Which substance passes out of the leaf during transpiration?

- A Carbon dioxide
- B Chlorophyll
- C Oxygen
- D Water vapour

**10.4** Leaf **J** has far more stomata on the lower surface of the leaf than on the upper surface.

What is the most likely advantage to the plant of this?

- A Less water is lost from the leaf as the stomata on the lower surface are sheltered from wind and direct heat of the sun
- B Nitrates can be more easily absorbed through the greater number of stomata on the lower surface
- C Osmosis takes place more rapidly through stomata exposed to direct sunlight
- D Wilting can take place more rapidly because the stomata on the lower surface do not have guard cells

**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 A**

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

In these questions match the words in the list with the numbers.

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

Mark your choices on the answer sheet.

---

**QUESTION ONE**

The table is about the causes of some problem conditions that can occur in the human body.

Match words from the list with each of the numbers **1–4** in the table.

**low birth mass of babies**

**lung and liver damage**

**slowing down reactions**

**suffering withdrawal symptoms**

| <b>Condition</b> | <b>May be caused by</b>         |
|------------------|---------------------------------|
| <b>1</b>         | breathing in cigarette smoke    |
| <b>2</b>         | drinking alcohol                |
| <b>3</b>         | going without an addictive drug |
| <b>4</b>         | sniffing solvents               |

**QUESTION TWO**

The eye can see near and distant objects.

Match words from the list with each of the numbers **1–4** in the sentences.

**change shape**

**focus**

**relax**

**tighten**

When you want to see a distant object clearly, your eye must . . . . . **1** . . . . .

To do this the ciliary muscles . . . . . **2** . . . . .

This makes your suspensory ligaments . . . . . **3** . . . . . making the lens . . . . . **4** . . . . .

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**SECTION B**

Questions **THREE** and **FOUR**.

In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

---

**QUESTION THREE**

Plants make food by photosynthesis.

Which **two** of the following are raw materials for photosynthesis?

**carbon dioxide**

**oxygen**

**nitrate**

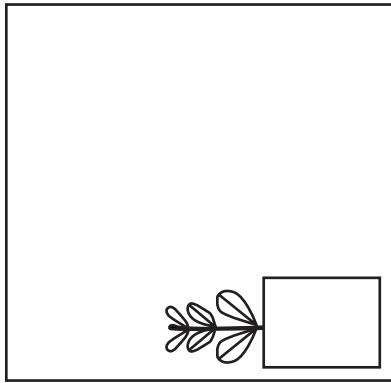
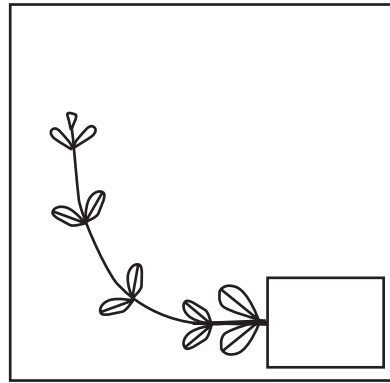
**starch**

**water**



**QUESTION FOUR**

A potted plant was placed on its side in a light-proof box, as shown in diagram **1**.  
Diagram **2** shows the plant 5 days later.

**1****2**

Which **two** of the following give the best explanations for the changes?

**the shoot can grow in the dark**

**the shoot has grown against the direction of the force of gravity**

**the shoot has grown towards light**

**the shoot needs hormones to grow**

**the shoot needs light for photosynthesis**

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

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**SECTION C**Questions **FIVE** to **TEN**.

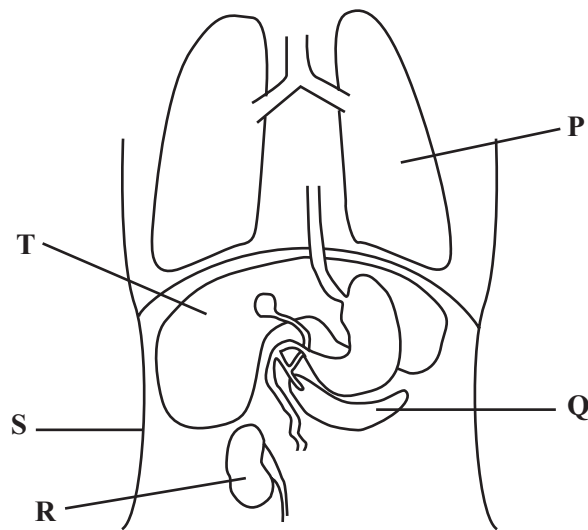
Each of these questions has four parts.

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

---

**QUESTION FIVE**

The diagram shows some of the organs that regulate the internal environment of the body.

5.1 Organ **T** . . . . .

- A breaks down amino acids.
- B controls sweating.
- C produces glucagon.
- D produces urine.

5.2 Organ **Q** . . . . .

- A produces amino acids.
- B produces insulin.
- C produces urea.
- D stores sugar.

**5.3** Organ **P** . . . . .

- A** produces urea.
- B** produces sweat.
- C** removes carbon dioxide from the blood.
- D** stores sugar.

**5.4** Ions are lost from the blood through . . . . .

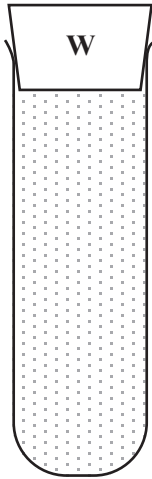
- A** **P** and **Q**.
- B** **P** and **S**.
- C** **R** and **S**.
- D** **R** and **T**.

**TURN OVER FOR THE NEXT QUESTION**

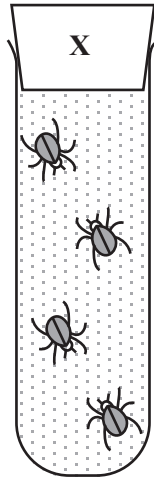
**Turn over ►**

**QUESTION SIX**

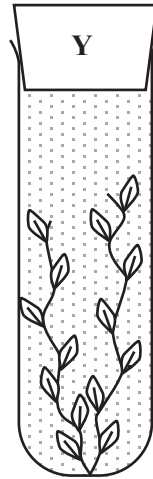
Four test tubes **W**, **X**, **Y** and **Z** were set up as shown in the diagram, and left in bright light for 24 hours.



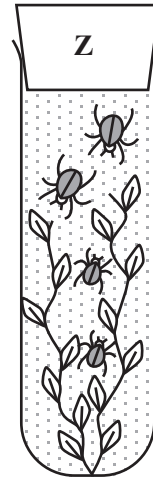
Tube **W**  
contained  
water only



Tube **X**  
contained  
water and  
water beetles



Tube **Y**  
contained  
water and  
pond weed



Tube **Z**  
contained  
water and  
pond weed and  
water beetles

After 24 hours in bright light the concentration of oxygen in the water in each tube was measured.

**6.1** In which tube would you expect the concentration of oxygen to be greatest?

- A **W**
- B **X**
- C **Y**
- D **Z**

**6.2** In two tubes there was no change in the oxygen concentration after the 24 hours.

In which tubes would this be most likely to happen?

- A **W** and **X**
- B **W** and **Z**
- C **X** and **Y**
- D **Y** and **Z**

- 6.3** Which process in some of the tubes produces oxygen?
- A** Osmosis
  - B** Photosynthesis
  - C** Respiration
  - D** Transpiration
- 6.4** What would be the expected result, after 24 hours, of covering Tube Y with light-proof paper?
- A** The concentration of carbon dioxide is unchanged
  - B** The concentration of oxygen is higher
  - C** The concentration of oxygen is lower
  - D** The concentration of oxygen is unchanged

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION SEVEN**

Leaves were taken from four different plants and the number of stomata counted.  
The results are shown in the table.

| <b>Plant</b> | <b>Mean number of stomata per cm<sup>2</sup></b> |                              |
|--------------|--|------------------------------|
|              | <b>Upper surface of leaf</b>                     | <b>Lower surface of leaf</b> |
| <b>J</b>     | 4000   | 28 000                       |
| <b>K</b>     | 0  | 800                          |
| <b>L</b>     | 8500   | 15 000                       |
| <b>M</b>     | 8000   | 26 000                       |

**7.1** In total, which plant has most stomata per cm<sup>2</sup> of leaf?

- A J**
- B K**
- C L**
- D M**

**7.2** Which plant is most likely to live in a very dry region?

- A J**
- B K**
- C L**
- D M**

**7.3** Transpiration occurs through the stomata.

Which substance passes out of the leaf during transpiration?

- A Carbon dioxide
- B Chlorophyll
- C Oxygen
- D Water vapour

**7.4** Leaf **J** has far more stomata on the lower surface of the leaf than on the upper surface.

What is the most likely advantage to the plant of this?

- A Less water is lost from the leaf as the stomata on the lower surface are sheltered from wind and direct heat of the sun
- B Nitrates can be more easily absorbed through the greater number of stomata on the lower surface
- C Osmosis takes place more rapidly through stomata exposed to direct sunlight
- D Wilting can take place more rapidly because the stomata on the lower surface do not have guard cells

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION EIGHT**

The table shows the amounts of substances filtered from the blood by the kidneys, and the amounts appearing in the urine, over a 24 hour period.

| Substance | Amount of substance                         |                      |
|-----------|---|----------------------|
|           | In filtrate produced by kidneys in 24 hours | In urine in 24 hours |
| Water     | 180 000 cm <sup>3</sup>                     | 1500 cm <sup>3</sup> |
| Ions      | 1500 g                                      | 12 g                 |
| Glucose   | 200 g                                       | 0 g                  |
| Urea      | 55 g  | 30 g                 |

- 8.1** Which of the substances was completely re-absorbed from the filtrate by the kidneys?
- A Glucose
  - B Ions
  - C Urea
  - D Water
- 8.2** Only 12 g of the ions in the filtrate appear in the urine. What percentage of the ions was re-absorbed?
- A 0.8%
  - B 12.5%
  - C 80.0%
  - D 99.2%
- 8.3** Urea is produced . . . . .
- A in the kidneys from excess amino acids.
  - B in the kidneys from excess lipids.
  - C in the liver from excess amino acids.
  - D in the liver from excess lipids.



**8.4** On a hot day the volume of urine released in 24 hours is much less than  $1500\text{cm}^3$ .

What causes this reduction in urine volume?

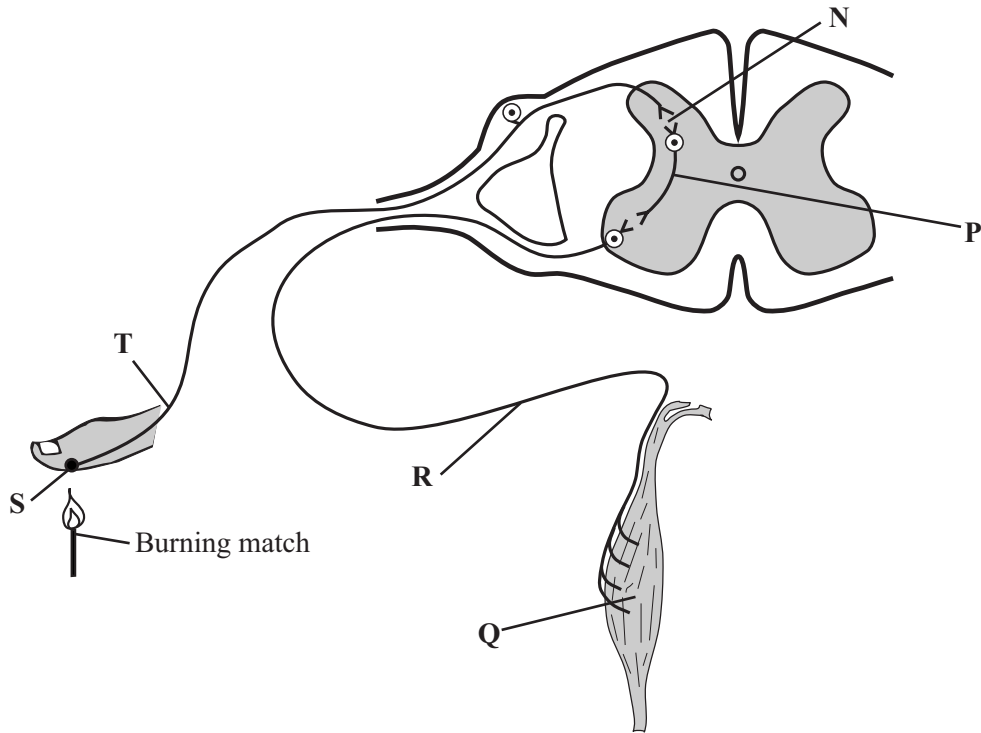
- A** The release of ADH from the pancreas causes less water to be re-absorbed into the blood
- B** The release of ADH from the pancreas causes more water to be re-absorbed into the blood
- C** The release of ADH from the pituitary gland causes less water to be re-absorbed into the blood
- D** The release of ADH from the pituitary gland causes more water to be re-absorbed into the blood

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION NINE**

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



**9.1** In this reflex action the sensory neurone is found at . . . . .

- A P
- B R
- C S
- D T

**9.2** In this reflex action the relay neurone is found at . . . . .

- A P
- B Q
- C R
- D T

**9.3** In this reflex action a synapse is found at . . . . .

- A N
- B P
- C Q
- D S

**9.4** Which of the following describes the path taken by an impulse in this reflex action?

- A effector → motor neurone → relay neurone → sensory neurone
- B receptor → sensory neurone → relay neurone → motor neurone
- C sensory neurone → motor neurone → relay neurone → synapse
- D synapse → effector → relay neurone → sensory neurone

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION TEN**

The core body temperature in humans is kept at around 37 °C.

**10.1** The core body temperature is kept at around 37 °C because . . . . .

- A enzymes work best at this temperature.
- B it provides enough energy for sweating to occur.
- C muscles contract more powerfully when warm.
- D the body needs to be as hot as possible.

**10.2** When core body temperature rises too high . . . . .

- A capillaries dilate.
- B more blood passes through the skin capillaries.
- C muscles contract more powerfully.
- D sweating gradually reduces.

**10.3** A fall in core body temperature is detected by receptors in the . . . . .

- A brain.
- B pancreas.
- C pituitary gland.
- D skin.

**10.4** A fall in core body temperature may lead to shivering.

What is the advantage of shivering?

- A Blood is pushed more rapidly through the blood vessels of the skin
- B The rate of respiration in muscles beneath the skin increases
- C Sweat glands are stimulated to release sweat
- D Water is shaken from the surface of the skin

**END OF TEST**