B5 - Test 1
HOMEOSTASIS & RESPONSE

GCSE
AQA
BIOLOGY

Materials
For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions
- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information
- The marks for the questions are shown in brackets
Humans control their internal environment in many ways.

Look at the diagram below.

(a) Name organ A.

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(b) Organ A stores glucose.

People with Type 1 diabetes cannot effectively control the levels of glucose in their blood.

Name the hormone people with **Type 1 diabetes** have to inject to decrease their blood glucose level.

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(c) Which organ produces urine?

Tick one box.

- Brain
- Lungs
- Kidney
- Thyroid

(1)

(d) Marathon runners often drink sports drinks during a race.

Explain why.

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(2) (Total 5 marks)
The diagram below shows the water balance for a person on a cold day.

The numbers show the volume of water, in cm\(^3\), the person’s body gained and lost.

(a) (i) How much water was lost from the body on the cold day?

Draw a ring around the correct answer.

\[ 1800 \text{ cm}^3 \quad 2400 \text{ cm}^3 \quad 3300 \text{ cm}^3 \]

(ii) The volume of water gained by the body should balance the volume of water lost from the body.

How much water should the person have drunk to keep the balance?

\[
\text{Volume of water} = \text{cm}^3
\]

(b) (i) Name the process by which water is lost from the skin.
(ii) Why does the body need to lose water from the skin?

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(1)

(c) The next day was a hot day. The person gained the same volume of water and did the same activities.

(i) What effect did the increase in temperature have on the volume of water the person lost?

Tick (√) one box.

Less water was lost through the skin. ☐

More water was lost through the skin. ☐

More water was lost in faeces. ☐

(1)

(ii) What effect would the increase in temperature have on the volume of urine the person lost?

Draw a ring around the correct answer.

Decrease ☐ Increase ☐ No change ☐

(1)

(Total 7 marks)
Car drivers need quick reactions to avoid accidents.

A student uses a computer program to measure reaction time.

The computer screen shows a traffic light on red. The traffic light then changes to green.

The diagram below shows the change the person sees on the computer screen.

![Traffic Light Diagram]

When the traffic light changes to green the person has to click the computer mouse as quickly as possible.

The computer program works out the time taken to react to the light changing colour.

(a) Special cells detect the change in colour.

(i) What word is used to describe special cells that detect a change in the environment?

   Draw a ring around the correct answer.

   receptor cells       reflex cells       stimulus cells

   

(ii) Where in the body are the special cells that detect the change in colour of the traffic lights?

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(b) The student used the computer program on one computer to measure the reaction times of people of different ages.

(i) Give one variable the student should control so that a fair comparison can be made between the people of different ages.

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   (1)
The student did each measurement three times to calculate a mean value.

The table shows the results.

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Mean reaction time in milliseconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>242</td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>221</td>
</tr>
<tr>
<td>60</td>
<td>258</td>
</tr>
<tr>
<td>75</td>
<td>364</td>
</tr>
<tr>
<td>90</td>
<td>526</td>
</tr>
</tbody>
</table>

The reaction times for the 30-year-old person were 192, 174 and 180 milliseconds.

Calculate the mean reaction time of the 30-year-old person.

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...................................................................................................................
Mean reaction time = ..................................... milliseconds

(1)

(iii) Which one of the following is an advantage of repeating each test three times and not doing the test just once?

Tick (✔) one box.

- Any anomalies can be identified.  
- The results will be more precise.
- There will be no errors.

(1)
(iv) Some people think that old people should **not** be allowed to drive a car.

Why is it more dangerous for old people to drive cars?

Use information from the table above to support your answer.

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(2) (Total 7 marks)
A scientist measured the volume of sweat lost between 9.00 am and 2.59 pm in one day by one person. The graph below shows the results.

(a) (i) Suggest what happened at 11.00 am.

Tick (✓) one box.

- The person moved into a cold room. [ ]
- The person removed their coat. [ ]
- The person started running a race. [ ]

(ii) Calculate the total volume of sweat lost between 11.00 am and 1.59 pm.

Total volume of sweat lost = ............... cm³
(iii) Suggest one way the person could replace the water that was lost as sweat.
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(b) (i) Sweating helps keep our internal body temperature within a narrow range.

Which organ monitors body temperature?

Tick (✓) one box.

brain

kidney

pancreas

(ii) The organ that monitors internal body temperature receives information about temperature from the skin.

Which structures in the skin send impulses with this information?

Tick (✓) one box.

capillaries

glands

receptors

(c) How does sweating help to control body temperature?
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(Total 6 marks)

The heart is part of the circulatory system.

(a) (i) Name one substance transported by the blood in the circulatory system.
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(1)
(ii) What is the main type of tissue in the heart wall?

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(1)

(b) **Figure 1** shows the human heart.

![Figure 1](image_url)

(i) Which blood vessel, A, B or C, takes blood to the lungs?

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(1)

(ii) Name parts D and E shown in **Figure 1**.

D ........................................................................................................................................

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E ........................................................................................................................................

(2)

(c) **Figure 2** shows three types of blood vessel, F, G and H.

![Figure 2](image_url)

(c) **Figure 2** shows three types of blood vessel, F, G and H.

F Elastic tissue

G Muscle tissue

H One cell

Not to scale
(i) What type of blood vessel is F?

Tick (✔) one box.

- an artery
- a capillary
- a vein

(1)

(ii) A man needs to have a stent fitted to prevent a heart attack.

In which type of blood vessel would the stent be placed?

Tick (✔) one box.

- an artery
- a capillary
- a vein

(1)

(iii) Explain how a stent helps to prevent a heart attack.

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(2)

(Total 9 marks)
Human body temperature must be kept within narrow limits.

The image shows a cyclist in a race.

(a) Use the correct answer from the box to complete each sentence.

<table>
<thead>
<tr>
<th>blood</th>
<th>brain</th>
<th>kidney</th>
<th>sweat</th>
<th>urine</th>
</tr>
</thead>
</table>

The cyclist’s body temperature is monitored by a centre in the ...................... .

This centre is sensitive to the temperature of the cyclist’s ...................... .

If the cyclist’s body temperature increases, his body increases

the production of ................................. .

(b) (i) Cyclists drink sports drinks after a race.

The table below shows the ratio of glucose to ions in three sports drinks, A, B, and C.

<table>
<thead>
<tr>
<th>Sports drink</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio of glucose (g per dm³) to ions (mg per dm³)</td>
<td>15:14</td>
<td>12:1</td>
<td>2:7</td>
</tr>
</tbody>
</table>

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

Which sports drink, A, B or C, would replace water fastest in an athlete?  

(1)
A person’s kidneys stop working. The person may be treated using a dialysis machine.

Some students made a model of a dialysis machine.

**Figure 1** shows the students’ model.

![Dialysis machine model](image)

The fake blood contained:

- water
- sodium ions
- urea
- glucose
- protein.

(a) (i) Suggest why the students kept the water in the beaker at 37 °C.

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(1)
(ii) The dialysis tubing separates the fake blood from the water in the test tube.

Figure 2 shows the fake blood, the dialysis tubing and the water in the test tube.

![Figure 2](image)

After 1 hour, the students tested the water in the test tube to see which substances had filtered through from the fake blood.

Name one substance that the students would find in the water in the test tube after 1 hour.

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(1)

(iii) Give a reason for your answer to part (a)(ii).

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(1)

(iv) In hospitals, dialysis machines use dialysis fluid, not pure water.

Dialysis fluid contains the same concentration of useful substances as the blood.

Which substance is at the same concentration in dialysis fluid as in blood?
(b) When the kidneys stop working, the person can be treated by a continuous process called CPD.

In CPD:
- dialysis fluid is put into the abdomen
- the fluid is changed four times a day at home
- changing the fluid takes about 45 minutes.

Suggest two advantages of having CPD instead of treatment on a dialysis machine.
1 ......................................................................................................................................................
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2 ......................................................................................................................................................
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(Total 6 marks)

Diabetes is a disease in which the concentration of glucose in a person’s blood may rise to fatally high levels.
Insulin controls the concentration of glucose in the blood.

(a) Where is insulin produced?

Draw a ring around one answer.

gall bladder   liver   pancreas

(1)
(b) People with diabetes may control their blood glucose by injecting insulin.

(i) If insulin is taken by mouth, it is digested in the stomach.

What type of substance is insulin?

Draw a ring around one answer.

| carbohydrate | fat | protein |

(ii) Apart from using insulin, give one other way people with diabetes may reduce their blood glucose.

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(1)
(c) The bar chart shows the number of people with diabetes in different age groups in the UK.

(i) Describe how the number of males with diabetes changes between the ages of 0 – 44 years and 75 years and over.

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(ii) Compare the number of males and females with diabetes:

between the ages of 0 and 64 years

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over the age of 65 years.

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(2)
(Total 8 marks)