

4-5 Homeostasis and response – Trilogy

1.0 Diabetes is a disease in which blood glucose (sugar) concentration may rise more than normal.

1.1 Which organ in the body monitors this rise in blood sugar?

[1 mark]

Tick **one** box.

Adrenal

Pancreas

Pituitary

Thyroid

1.2 One way of treating diabetes is by careful attention to diet.

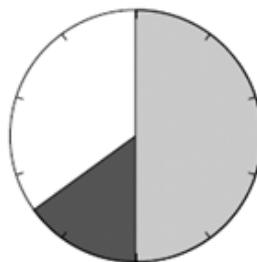
Figure 1 shows the recommended diet for a person with diabetes.

Figure 2 shows a diet for a person without diabetes.

Figure 1



Figure 2



Key

Energy from:

- Carbohydrate
- Protein
- Fat

Give **two** ways in which the recommended diet of a person with diabetes is different from the diet of a person without diabetes.

[2 marks]

Recommendation 1: _____

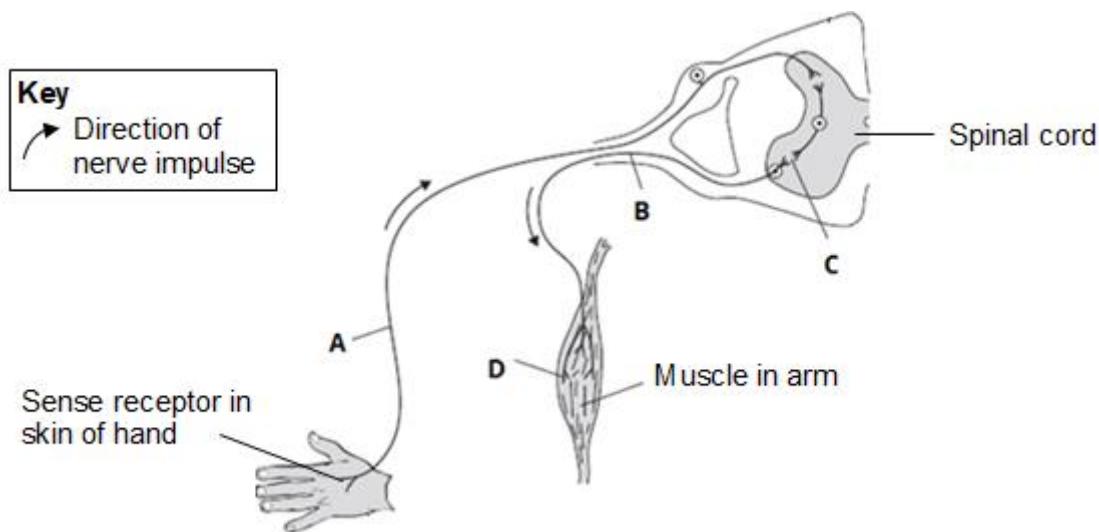
Recommendation 2: _____

1.3 Other than diet, give **one** way in which diabetes may be treated.

[1 mark]

2.0 **Figure 3** shows the neurones and parts of the body involved in a response to touching a hot object.

Figure 3



A neurone is a nerve cell. Neurones carry impulses around the body.

2.1 What is **B**?

[1 mark]

Tick **one** box.

Effector

Motor neurone

Relay neurone

Sensory neurone

2.2 Synapses are one of the structures in a reflex arc.

Which part, **A**, **B**, **C** or **D** is a synapse?

[1 mark]

Tick **one** box.

A

B

C

D

2.3 The hand touches a hot object.

An impulse travels through the nervous system to the muscle (point **D**). The muscle moves the hand away from the hot object.

What does the muscle do to move the hand away from the hot object?

[1 mark]

2.4 The action described in **2.3** is a reflex action.

How can you tell that this action is **not** a conscious action?

[1 mark]

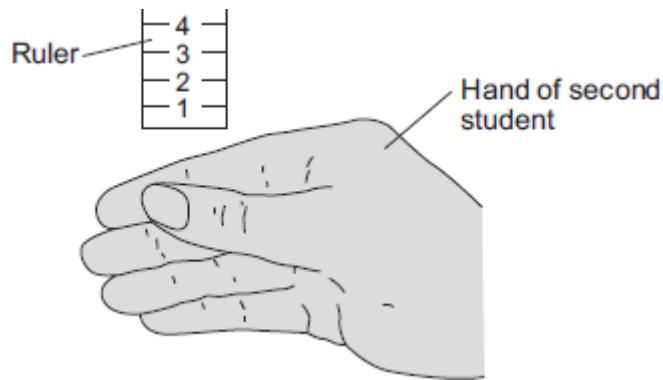
Use information from the diagram.

2.5 Some students investigated the effect of caffeine on a person's reaction time.

The students used the following steps.

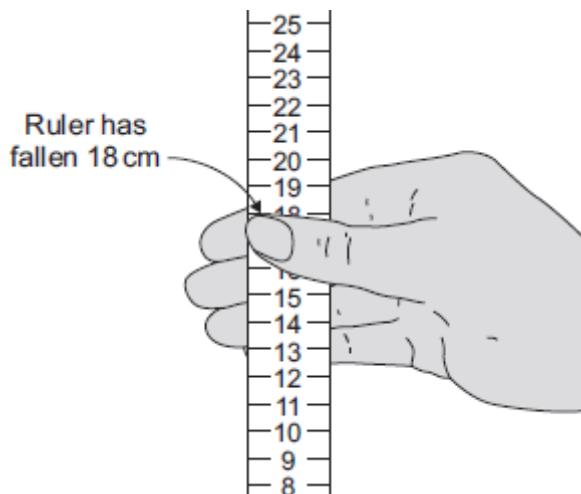
1. One student held a ruler just above a second student's hand, as shown in **Figure 4**.

Figure 4



2. The student let go of the ruler. The second student caught it as soon as possible, as shown in **Figure 5**.

Figure 5



3. The students repeated this experiment seven more times.
4. The student catching the ruler then drank a cup of strong coffee.
Coffee contains caffeine.
5. Fifteen minutes after drinking the coffee the students repeated steps 1 to 3.

Table 1 and **Table 2** show the students' results.

Table 1

| Distance ruler fell before it was caught in cm |
|--|
| Before drinking coffee |
| 17 |
| 21 |
| 24 |
| 16 |
| 20 |
| 16 |
| 13 |
| 21 |
| Mean = 18.5 |

Table 2

| Distance ruler fell before it was caught in cm |
|--|
| After drinking coffee |
| 8 |
| 13 |
| 11 |
| 16 |
| 9 |
| 14 |
| 13 |
| 13 |
| Mean = 12.2 |

What is the mode for the results after drinking coffee?

[1 mark]

2.6 The students used the reading on the ruler as a measure of the reaction time.

What can you conclude about the effect of caffeine on reaction time?

[1 mark]

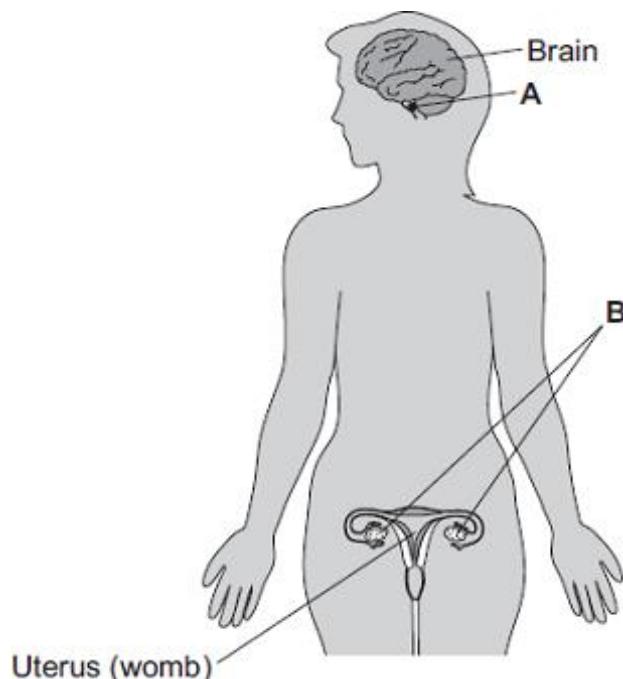
2.7 Which of the statements below show that the experiment was repeatable, and which show that it was reproducible?

[2 marks]

| | Repeatable | Reproducible |
|---|------------|--------------|
| The same student repeated the experiment | | |
| The same student got similar results each time | | |
| A different student repeated the experiment | | |
| A different student got similar results each time | | |

3.0 Figure 6 shows the position of two glands, **A** and **B**, in a woman.

Figure 6



3.1 Name glands **A** and **B**.

[2 marks]

A _____

B _____

3.2 Gland **A** produces the hormone Follicle Stimulating Hormone (FSH).

FSH controls changes in gland **B**.

Describe how FSH moves from gland **A** to gland **B**.

[1 mark]

3.3 Oestrogen is a reproductive hormone.

Which gland secretes oestrogen?

[1 mark]

3.4 A woman is not able to become pregnant.

The woman does not produce mature eggs. The doctor treats the woman by giving her injections of hormones.

Which **two** hormones will help the woman produce and release mature eggs?

[2 marks]

Tick **two** boxes.

Follicle Stimulating Hormone (FSH)

Luteinising Hormone (LH)

Oestrogen

Progesterone

Testosterone

3.5 Hormones control some actions in the body. The nervous system controls some actions as well. Reflex actions are part of the nervous system.

Give **two** ways in which a hormone-controlled action is different from a reflex action.

[2 marks]

1 _____

2 _____

3.6 There are different types of contraception that are used to prevent pregnancy.

Explain how hormonal and non-hormonal methods of contraception prevent pregnancy occurring.

[2 marks]

Hormonal methods _____

Non-hormonal methods _____

3.7 A new fertility treatment that could allow women to have IVF in their lunch hour has been developed.

Figure 7 shows the *Invocell* device.

Figure 7



Invocell is a sealed capsule that allows fertilisation to take place inside the woman's body, in the vagina.

- Eggs are removed from the ovaries while the woman is under sedation.
- The eggs and sperm are put into the *Invocell* capsule.
- The capsule is placed inside her vagina.
- After three days the capsule is removed and the best embryo is transferred to the woman's womb.

This IVF treatment can be performed in a doctor's surgery because at no time are eggs, sperm or embryo stored outside the body. No costs are involved for laboratory incubation.

Evaluate the use of the *Invocell* technique compared with standard IVF treatment.

[4 marks]

4.1 Blood glucose concentration is monitored and controlled by the pancreas.

Explain what would happen to maintain blood glucose concentration if somebody ate some glucose tablets.

[4 marks]

MARK SCHEME

| Qu No. | | Extra Information | Marks |
|--------|---|---|-------|
| 1.1 | pancreas | | 1 |
| 1.2 | (person with diabetes), should get more energy from fats should get less energy from carbohydrates | allow converse if clearly describing person without diabetes allow eat more fats allow eat less carbohydrates | 1 |
| 1.3 | any one from: • exercise • (injecting) insulin • pancreas transplant • artificial pancreas | | 1 |

| Qu No. | | Extra Information | Marks | | |
|--------|--|------------------------------------|--------------|-----------------------------|---|
| 2.1 | motor neurone | | 1 | | |
| 2.2 | C | | 1 | | |
| 2.3 | contract | | 1 | | |
| 2.4 | not connected to the brain or coordinated <u>only</u> by the spinal cord | | 1 | | |
| 2.5 | 13 | | 1 | | |
| 2.6 | caffeine decreases reaction time | allow caffeine speeds up reactions | 1 | | |
| 2.7 | The same student repeated the experiment | Repeatable | Reproducible | one mark per correct column | 2 |
| | The same student got similar results each time | ✓ | | | |
| | A different student repeated the experiment | | ✓ | | |
| | A different student got similar results each time | | ✓ | | |

| Qu No. | | Extra Information | Marks |
|--|---|---|--------|
| 3.1 | (A) pituitary (B) ovary / ovaries | | 1 1 |
| 3.2 | in blood (stream) or in (blood) plasma | ignore dissolved | 1 |
| 3.3 | ovary / ovaries | | 1 |
| 3.4 | Follicle Stimulating hormone FSH Luteinising hormone / LH | in either order | 1 1 |
| 3.5 | (hormone controlled action is a) slower action lasts longer | allow converse if clearly describing nervous action | 1 1 |
| 3.6 | (hormonal methods) some release hormones / oestrogen / progesterone to stop eggs being matured and/or released (such as the contraceptive pill or implant) (non-hormonal methods) stop sperm reaching the egg (such as condoms, spermicidal cream, abstinence or sterilization) or stop the fertilized egg implanting in the womb (such as some IUDs) | | 1 1 |
| 3.7 | | | |
| Level 2: | A coherent evaluation is provided which considers a range of points both advantages and disadvantages of <i>Invocell</i> . If a conclusion is given, it is consistent with the reasoning | | 3–4 |
| Level 1: | Discrete relevant point made. The logic may be unclear and the conclusion, if present, may not be consistent with the reasoning. | | 1–2 |
| | No relevant content | | 0 |
| Indicative content | | | |
| advantages of <i>Invocell</i> | | | |
| <ul style="list-style-type: none"> • low(er) cost • quick(er) • laboratory / incubator / equipment not needed • more convenient | | | |
| disadvantages of <i>Invocell</i> | | | |
| <ul style="list-style-type: none"> • embryo development cannot be monitored • cannot be used where male is infertile • (risk of) infection or pain in vagina • argued conclusion | | | |

| Qu No. | | Extra Information | Marks |
|--------|--|---|------------------|
| 4.1 | glucose levels in blood will rise pancreas releases insulin glucose is converted to glycogen (in liver) glucose level falls or returns to normal | do not allow liver releasing insulin allow glucose is taken up by cells | 1 1 1 1 |