

1 Hormones are involved in controlling the menstrual cycle and fertility.

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

auxin	follicle stimulating hormone (FSH)	thalidomide
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A hormone produced by the pituitary gland is _____

(1)

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

luteinising hormone (LH)	oestrogen	statin
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A hormone produced by the ovaries is _____

(1)

(b) (i) Why are fertility drugs given to some women?

(1)

(ii) A doctor injects fertility drugs into a woman. After the injection, the hormones travel to the woman's ovaries.

How do the hormones travel to the ovaries?

Draw a ring around the correct answer.

through the bloodstream **through the neurones** **through the skin**

(1)

(c) Which **two** hormones are used in contraceptive pills?

Tick (✓) **two** boxes.

FSH	<input type="checkbox"/>	oestrogen	<input type="checkbox"/>
LH	<input type="checkbox"/>	progesterone	<input type="checkbox"/>

(2)

(Total 6 marks)

2

The heart is part of the circulatory system.

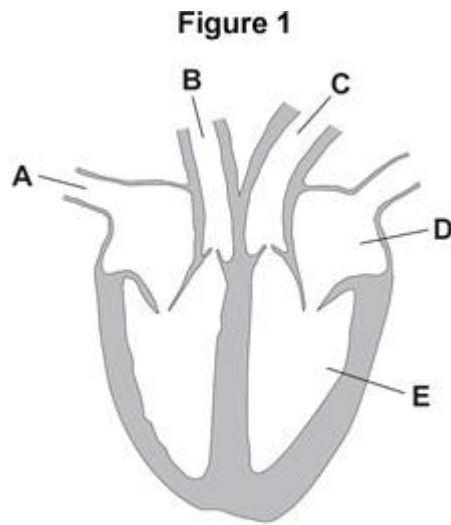
(a) (i) Name **one** substance transported by the blood in the circulatory system.

(1)

(ii) What is the main type of tissue in the heart wall?

(1)

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



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

(1)

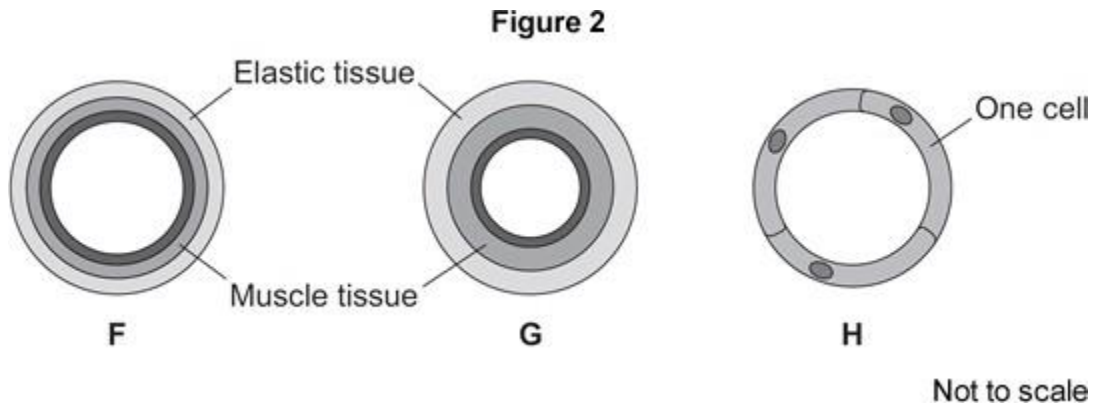
(ii) Name parts **D** and **E** shown in **Figure 1**.

D _____

E _____

(2)

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



(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.

(2)

(Total 9 marks)

3

(a) Which organ of the human body produces egg cells?

Draw a ring around the correct answer.

liver

ovary

testis

(1)

(b) An egg joins with a sperm and develops into an embryo.

How many chromosomes are there in each cell of a human embryo?

Draw a ring around the correct answer.

23

46

48

(1)

- (c) Some women find it difficult to have a baby. A doctor may suggest that these women should use In Vitro Fertilisation (IVF) to help them have a baby.

Table 1 shows how successful IVF was for women of different ages at one clinic.

Table 1

Age of women in years	Percentage of women who had a baby
<35	35
35–37	31
38–39	25
40–42	32
43–44	7
>44	0

- (i) A student thought that the result for women aged 40–42 was anomalous.

Suggest why the student thought this result was anomalous.

(1)

- (ii) Describe the general trend in the results in **Table 1**.

You should ignore the anomalous result.

(1)

- (d) Some babies are born with a faulty chromosome.

Scientists investigated whether the chance of having a baby with a faulty chromosome is also related to the age of the woman.

Table 2 shows the scientists' results.

Table 2

Age of women in years	Number of women per 1000 who had a baby with a faulty chromosome
25	2.0
30	2.6
35	6.1
40	19.6
45	66.0

- (i) A 45-year-old woman is more likely than a 25-year-old woman to have a baby with a faulty chromosome.

How many times more likely?

Answer = _____ times

(2)

- (ii) Suggest **two** reasons why many fertility clinics will **not** accept women over 40 years of age for IVF treatment.

Use information from **Table 1** and **Table 2** in your answer.

1. _____

2. _____

(2)

(Total 8 marks)

4 Humans use the nervous system to react to changes in the environment.

(a) (i) Which word means a change in the environment?

Draw a ring around the correct answer.

neurone

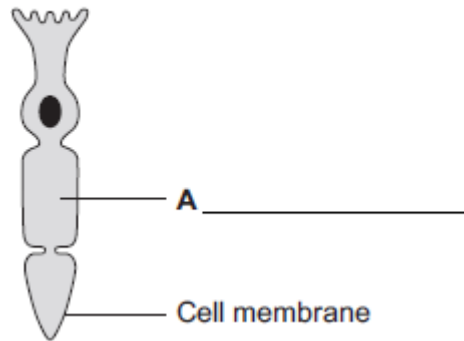
reflex

stimulus

(1)

(ii) **Figure 1** shows a light receptor cell.

Figure 1



Use the correct answer from the box to label part **A** on **Figure 1**.

chloroplast	cytoplasm	vacuole
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(1)

(b) **Figure 2** shows a boy riding a bicycle on a sunny day.

Figure 2



© Stockbyte/Thinkstock

(i) Receptors in the boy's body detect changes in the environment.

Complete the table to show which organ of the body contains the receptors for each change in the environment.

Change in the environment	Organ that contains the receptors
Sound of traffic from behind him	
Flashing blue lights of a police car	
Cooler air temperature in the shadows	

(3)

(ii) The boy's response to danger is to pull on the bicycle brakes.

Which type of effector causes this response?

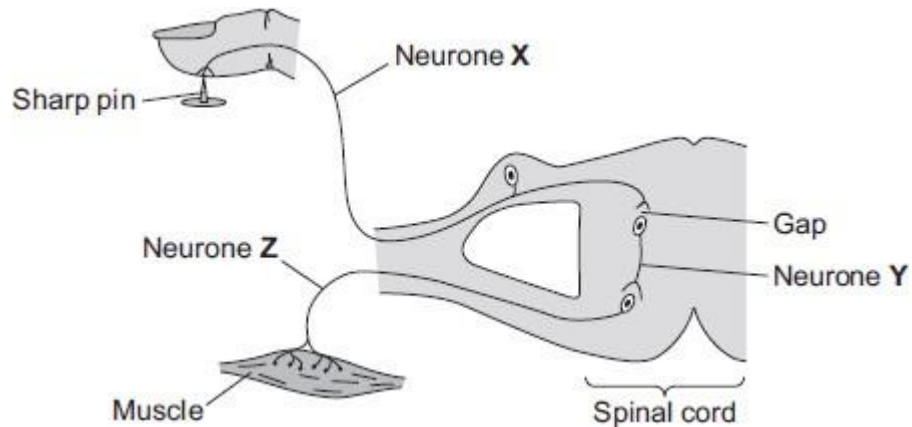
Tick (✓) **one** box.

- A gland
- A muscle
- A synapse

(1)
(Total 6 marks)

5

The diagram below shows the pathway for a simple reflex action.



(a) What type of neurone is neurone X?

Draw a ring around the correct answer.

motor neurone

relay neurone

sensory neurone

(1)

(b) There is a gap between neurone X and neurone Y.

(i) What word is used to describe a gap between two neurones?

Draw a ring around the correct answer.

effector

receptor

synapse

(1)

(ii) Draw a ring around the correct answer to complete the sentence.

Information passes across the gap as

- a chemical.
- an electrical impulse.
- pressure.

(1)

(c) Describe what happens to the muscle when it receives an impulse from neurone **Z**. How does this reflex action help the body?

What happens to the muscle _____

How this helps the body _____

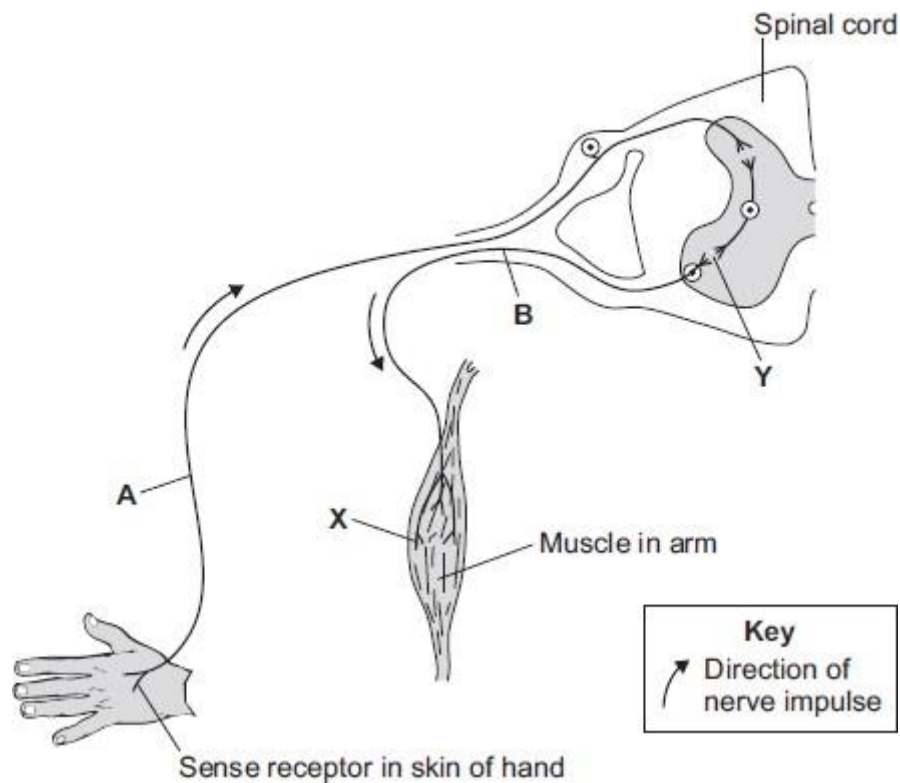
(2)

(Total 5 marks)

6

(a) **Diagram 1** shows the neurones and parts of the body involved in a response to touching a hot object.

Diagram 1



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

- (i) Draw a ring around the correct answer to complete each sentence.

Neurone **A** is a

motor neurone.
relay neurone.
sensory neurone.

At point **Y** there is a tiny gap between two neurones called

an effector.
a receptor.
a synapse.

(2)

- (ii) The hand touches a hot object. An impulse travels through the nervous system to the muscle (point **X**). The muscle moves the hand away from the hot object.

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

Tick (✓) **one** box.

contract

relax

stretch

(1)

- (iii) The action described in part (a) (ii) is a reflex action.

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

Use information from the diagram.

(1)

(iv) Reflex actions like this are useful.

Explain why.

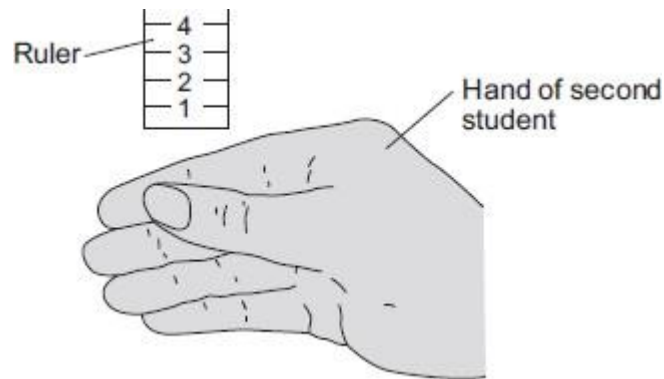
(2)

(b) Some students investigated the effect of caffeine on a person's reaction time.

The students used the following steps.

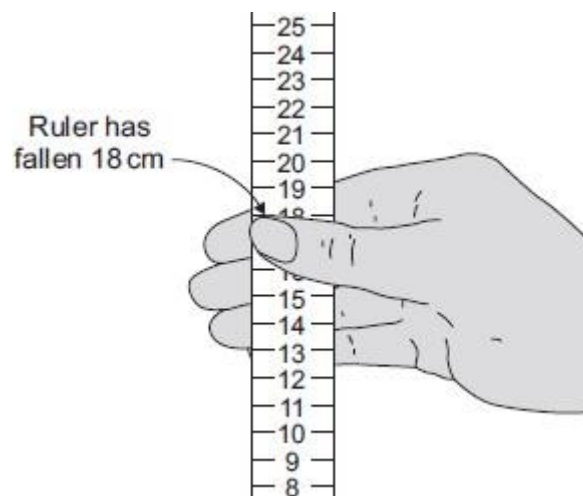
1. One student held a ruler just above a second student's hand, as shown in **Diagram 2**.

Diagram 2



2. The student let go of the ruler. The second student caught it as soon as possible, as shown in **Diagram 3**.

Diagram 3



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.

Distance ruler fell before it was caught in cm
Before drinking coffee
18
21
25
15
19
16
12
21
Mean = 18.4

Distance ruler fell before it was caught in cm
After drinking coffee
8
13
11
17
10
14
13
13
Mean = 12.4

- (i) The students used the reading on the ruler as a measure of the reaction time.

What do the results show about the effect of caffeine on reaction time?

(1)

(ii) Look carefully at **all** the data in **Table 1** and **Table 2**.

Using the data in **Table 1** and **Table 2**, give **one** reason why a scientist may **not** accept your conclusion in part **(b) (i)**.

(1)

(iii) How could the students improve their investigation?

Suggest **two** ways.

1. _____

2. _____

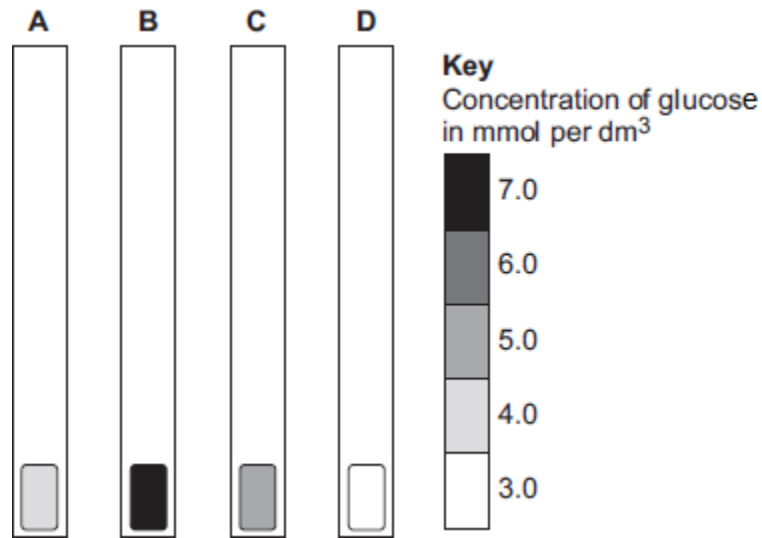
(2)

(Total 10 marks)

7 Blood glucose concentration in humans must be kept between 4.4 and 6.1 mmol per dm³.

Four students, **A**, **B**, **C** and **D**, tested their blood glucose concentration with glucose testing strips.

The diagram shows the results of their tests and the key from the test strip bottle.



(a) (i) Which student, **A**, **B**, **C** or **D**, has diabetes and has eaten a large piece of cake?

(1)

(ii) Which student, **A**, **B**, **C** or **D**, is in most need of eating carbohydrates?

(1)

(iii) Which student, **A**, **B**, **C** or **D**, has a healthy blood glucose concentration?

(1)

- (b) (i) Name the hormone that people with diabetes inject to prevent their blood glucose concentration from becoming too high.

(1)

- (ii) Blood glucose concentration is monitored in the body.

Which organ monitors blood glucose concentration?

Draw a ring around the correct answer.

brain

liver

pancreas

(1)

(Total 5 marks)

8

Some people with diabetes do not produce enough insulin to keep their blood glucose at the correct levels.

- (a) (i) Which organ monitors blood glucose levels?

Tick (✓) **one** box.

liver

pancreas

skin

(1)

- (ii) What effect does insulin have on glucose in the blood?

Tick (✓) **one** box.

Insulin causes glucose to move into the cells.

Insulin increases the amount of glucose in the blood.

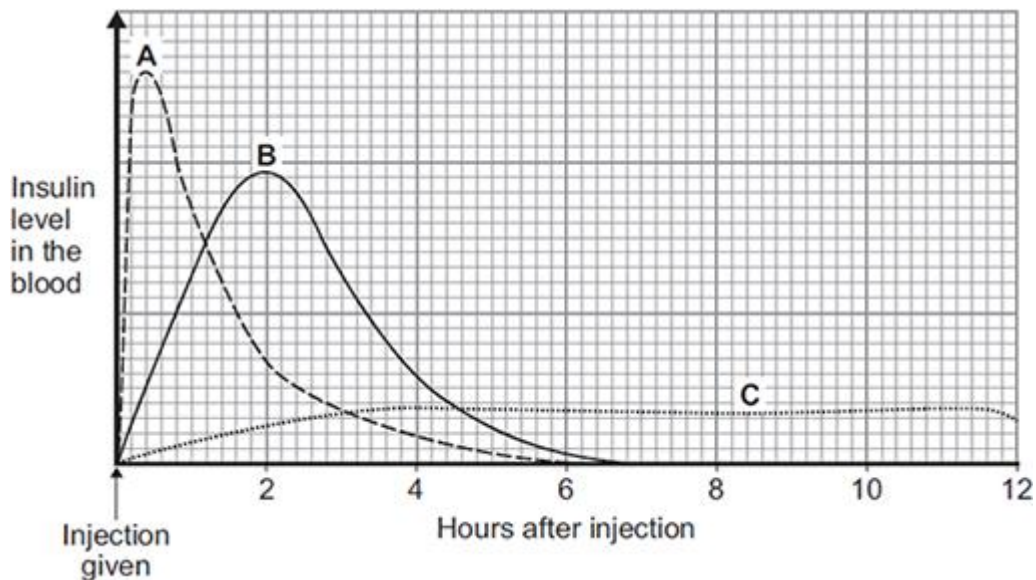
Insulin converts glucose to starch.

(1)

- (b) Some people with diabetes inject insulin several times a day.

There are different types of insulin.

The graph shows some information about three different types of insulin, **A**, **B** and **C**.



- (i) Which type of insulin, **A**, **B** or **C**, should a person with diabetes inject just before eating a meal high in carbohydrates?

Give a reason for your answer.

(2)

- (ii) A woman with diabetes has a blood glucose level of 12 mmol per dm³ of blood.

The woman's normal blood glucose level is 6 mmol per dm³.

The woman will need to inject insulin to lower her blood glucose level.

For each unit of insulin injected the blood glucose level will fall by 3 mmol per dm³.

How many units of insulin does the woman need to inject to bring her blood glucose level down to the normal level?

Number of units = _____

(1)

(c) Some people have pancreas transplants to treat diabetes.

Give **one** possible disadvantage of a pancreas transplant.

Tick (✓) **one** box.

The pancreas could be rejected.

The patient will need to inject insulin every day.

The patient's blood glucose levels may rise and fall too much.

(1)
(Total 6 marks)

Mark schemes

- 1** (a) (i) follicle stimulating hormone / FSH 1
- (ii) oestrogen 1
- (b) (i) any **one** from:
- to help them have a baby / get pregnant
ignore to make them fertile
 - to stimulate egg production / release / maturation
 - own levels of FSH / LH / hormone (too) low
allow to increase hormone / FSH / LH levels
do not allow to increase oestrogen levels
- (ii) through the bloodstream 1
- (c) oestrogen 1
- progesterone 1

[6]

- 2** (a) (i) any **one** from:
- glucose
 - oxygen
 - carbon dioxide
 - urea
 - water
- allow hormones*
- allow named example of a product of digestion* 1
- (ii) (cardiac) muscle
- allow muscular* 1
- (b) (i) **B** 1
- (ii) **D** atrium / atria
- ignore references to left or right* 1
- E** ventricle(s)
- ignore references to left or right* 1
- (c) (i) a vein 1

- (ii) an artery 1
- (iii) keeps artery open / wider 1
allow ecf from part cii
- (so) blood / oxygen can pass through (to the heart muscle) 1

[9]

- 3**
- (a) ovary 1
 - (b) 46 1
 - (c) (i) does not fit the pattern 1
or
 it is higher than the 3rd value / it should be lower than the 3rd value / it should be between the 3rd and 5th values
*do **not** allow use of incorrect figures*
 - (ii) As age increases % of women (having a baby) decreases 1
 - (d) (i) 33 2
allow 1 mark for $\frac{66}{2}$
if no answer / wrong answer
 - (ii) low success rate 1

 more likely to have a baby with health problems / abnormalities / a faulty chromosome 1

[8]

- 4**
- (a) (i) stimulus 1
 - (ii) cytoplasm 1

- (b) (i) ear(s)
in this order only 1
- eye(s)
accept retina 1
- skin
ignore extra detail 1

- (ii) A muscle 1

[6]

- 5** (a) sensory neurone 1

- (b) (i) synapse 1

- (ii) a chemical 1

- (c) (What happens to the muscle)
mark both parts of the question together

any **one** from:

- contraction / contracts
ignore relaxation / relaxes / tenses 1
- gets shorter

(How this helps the body)

idea of protection for body (from damage / pain)
eg moves finger / arm away (from pin / stimulus / source of pain)

1

[5]

- 6** (a) (i) sensory neurone 1

a synapse 1

- (ii) contract 1

- (iii) not connected to brain / coordinated only by spinal cord 1

- (iv) automatic / rapid (response)
allow no thinking / faster / less time 1
- protects body from danger / from damage / from burning 1
- (b) (i) caffeine decreases reaction time
accept caffeine speeds up / quicker reactions 1
- (ii) the two sets of results overlap (considerably)
allow use of appropriate numbers – eg 5 of the ‘after’ results overlap with the ‘before’ results
allow ‘wide spread of results’
allow ‘it was just one person’ or ‘it was a small sample’
accept use of one pair of results only – if meaning is clear
accept use of one pair of overlapping results 1
- (iii) any **two** sensible suggestions: eg
- more repetitions
 - perform investigation on several other people
 - use other (measured) amounts of coffee
 - use different / more time intervals
 - other suggested measure of reaction time – eg computer-generated light flash + time measurement
 - use pure caffeine or caffeine tablets
- 2

[10]

- 7** (a) (i) **B** 1
- (ii) **D** 1
- (iii) **C** 1
- (b) (i) insulin 1
- (ii) pancreas 1

[5]

- 8** (a) (i) pancreas 1
- (ii) Insulin causes glucose to move into cells. 1

(b) (i) **A**

1

rapid rise **or** fastest

1

(ii) 2

1

(c) The pancreas could be rejected.

1

[6]