Q1. Two students investigated reflex action times.

This is the method used.

1. Student **A** sits with his elbow resting on the edge of a table.
2. Student **B** holds a ruler with the bottom of the ruler level with the thumb of Student **A**.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler and records the distance.
5. Steps **1** to **4** are then repeated.

The same method was also used with Student **A** dropping the ruler and Student **B** catching the ruler.

(a) Give **two** variables the students controlled in their investigation.

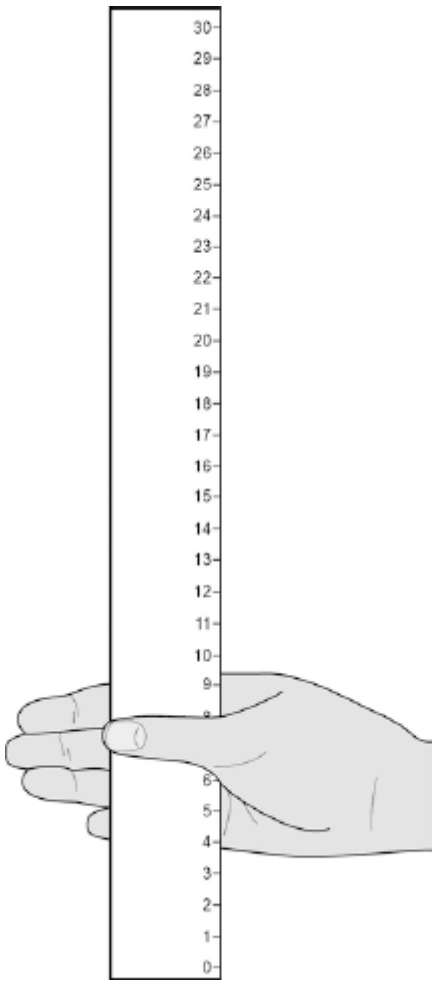
1 .....

2 .....

(2)

(b) **Figure 1** shows one of the results for the Student **A**.

Figure 1



What is the reading shown in **Figure 1**?

.....

Reading on ruler = ... cm

(1)

(c) **Table 1** shows the students' results.

Table 1

Test number	Distance ruler dropped in cm	
	Student A	**Student B**
1	9	12
2	2	13

3	6	13
4	7	9
5	7	8
Mean	**7**	**X**

Circle the anomalous result in **Table 1** for Student **A**.

(1)

(d) What is the **median** result for Student **B**?

Tick **one** box.

8 ☐

11 ☐

12 ☐

13 ☐

(1)

(e) Calculate the value of **X** in **Table 1**.

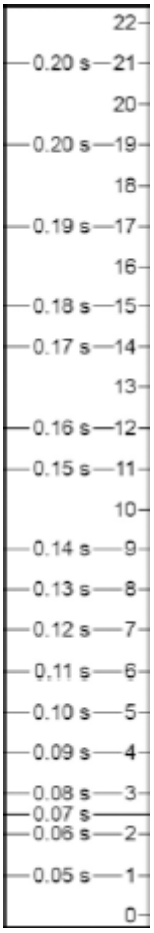
.....

Mean distance ruler dropped = ... cm

(1)

(f) **Figure 2** shows the scale used to convert distance of the ruler drop to reaction time.

Figure 2



Calculate how much faster the reaction time of Student **A** was compared to Student **B**.

Use **Figure 2** and **Table 1**.

.....

Answer = ... s

(2)

(g) What improvement could the students make to the method so the results are more valid?

Tick **one** box.

Use alternate hands when catching the ruler ☐

Carry out more repeats ☐

Use a longer ruler for catching ☐

Use more than two students to collect results ☐

(1)

(h) Student **A** carried out a second investigation to see the effect of caffeine on the reflex action.

Table 2 shows his results.

Table 2

Test number	Distance ruler dropped in cm	
	Without caffeine	With caffeine
1	9	5
2	6	5
3	9	4
4	6	7
5	10	4
Mean	**8**	**5**

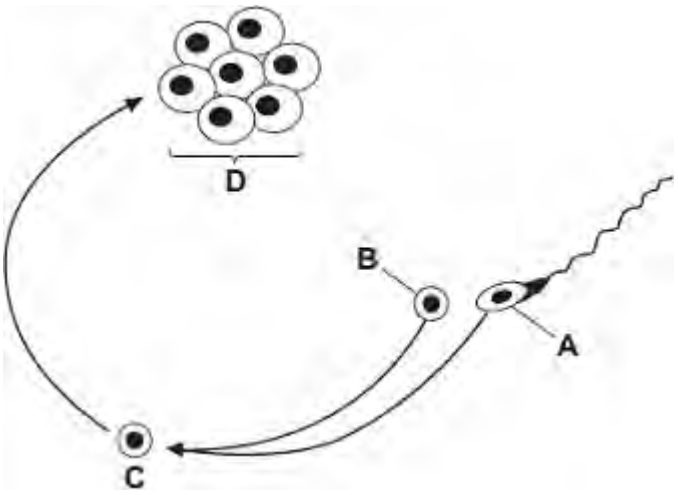
Give **one** conclusion about the effect of caffeine on reflex actions.

.....

.....

(1)
(Total 10 marks)

Q2. The diagram shows some of the stages in IVF (in vitro fertilisation).



(a) Use words from the box to name structures **A**, **B**, **C** and **D**.

egg	embryo	fertilised egg	ovary	sperm

Structure **A** .....

Structure **B** .....

Structure **C** .....

Structure **D** .....

(4)

(b) What do doctors do next with structure **D**?

.....

.....

.....

.....

(2)

(c) The table gives statistics for an IVF clinic.

	Age of women treated

	Below 35 years	35 – 37 years	38 – 39 years	40 – 42 years
Number of women treated	414	207	106	53
Number of women who produced one baby	90	43	17	1
Number of women who produced twins	24	8	4	1
Number of women who produced triplets	1	0	0	0

(i) About what proportion of the treated women aged 35 – 37 years produced one or more babies?

Draw a ring around your answer.

one quarter **one third** **half**

(1)

(ii) This clinic does **not** give IVF treatment to women over 42 years of age.

Use data from the table to explain why.

.....

.....

.....

.....

(2)

(iii) The committee which regulates IVF treatment now advises that only one embryo is used in each treatment.

Suggest **one** reason for this.

.....

.....

(1)

(Total 10 marks)

Q3. The body controls internal conditions.

(a) Use words from the box to complete the sentences about water loss from the body.

kidneys	liver	lungs	skin

(i) Water is lost in sweat via the .....

(1)

(ii) Water is lost in urine via the .....

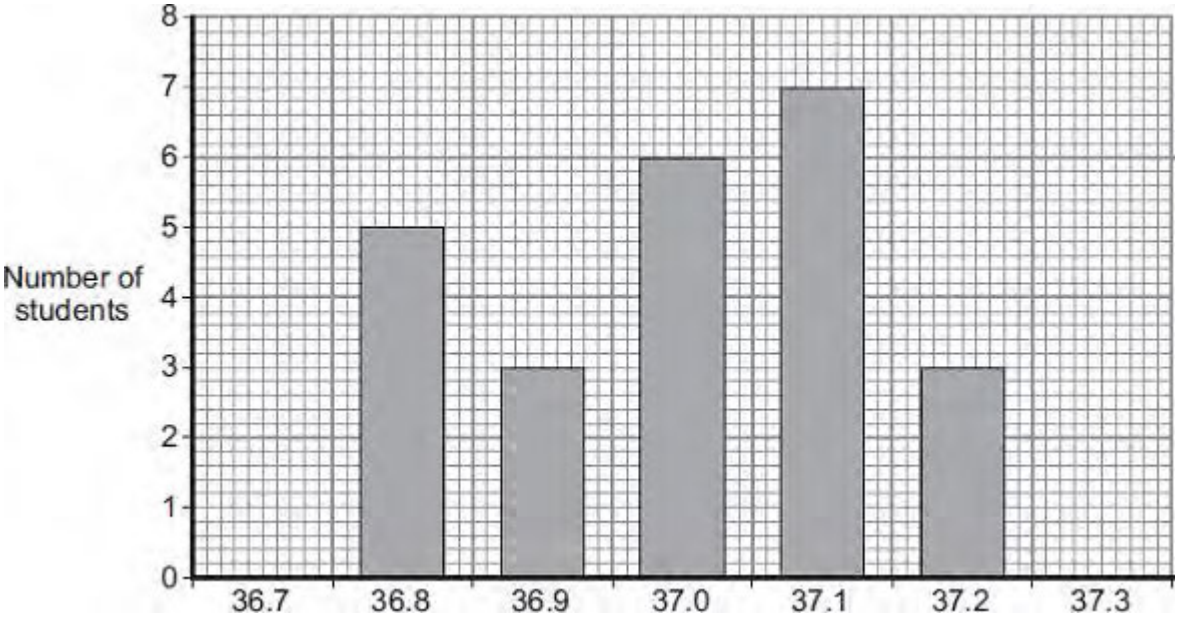
(1)

(iii) Water is lost in the breath via the .....

(1)

(b) Students investigated body temperature in the class.

The bar chart shows the results.



(i) One student used the bar chart to calculate the mean body temperature of the

class.
The student calculated the mean body temperature as 37.0 °C.

How did the student use the bar chart to calculate the mean?

.....

.....

.....

.....

(2)

(ii) How many students had a body temperature higher than the mean of 37.0 °C

.....

(1)

(iii) Body temperature must be kept within a narrow range.

Why?

.....

.....

(1)

(Total 7 marks)

Q4. Human body temperature must be kept within narrow limits.

The image shows a cyclist in a race.



© Ljupco/iStock/Thinkstock

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

blood	**brain**	**kidney**	**sweat**	**urine**

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 ..... .

(3)

(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**.

	Sports drink		
	A	**B**	**C**
Ratio of glucose (g per dm3) to ions (mg per dm^3)	15:14	12:1	2:7

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)

(ii) Why should sports drinks contain ions?

.....

.....

(1)

(iii) Why should a person with diabetes **not** drink too much sports drink?

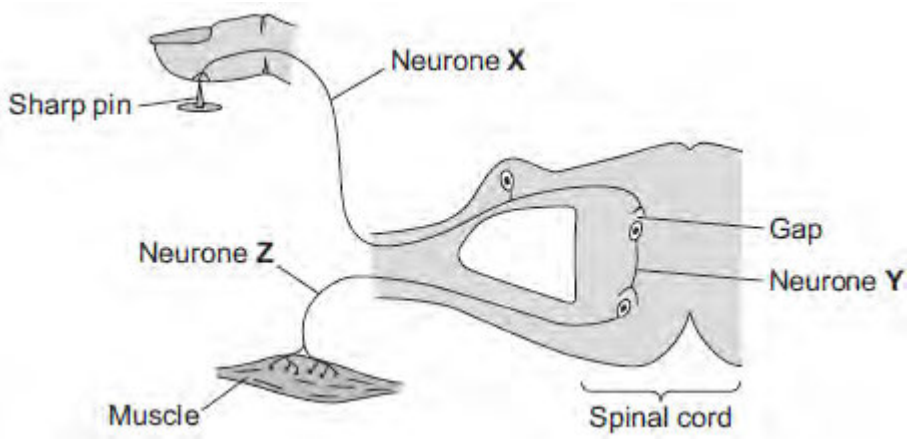
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.....

(1)

(Total 6 marks)

Q5. 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)

Q6. Humans use the nervous system to react to changes in the environment.

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

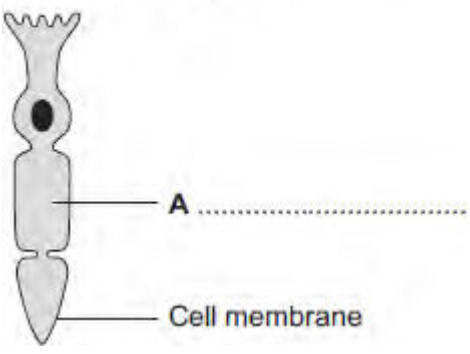
Draw a ring around the correct answer.

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**

(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 ☐

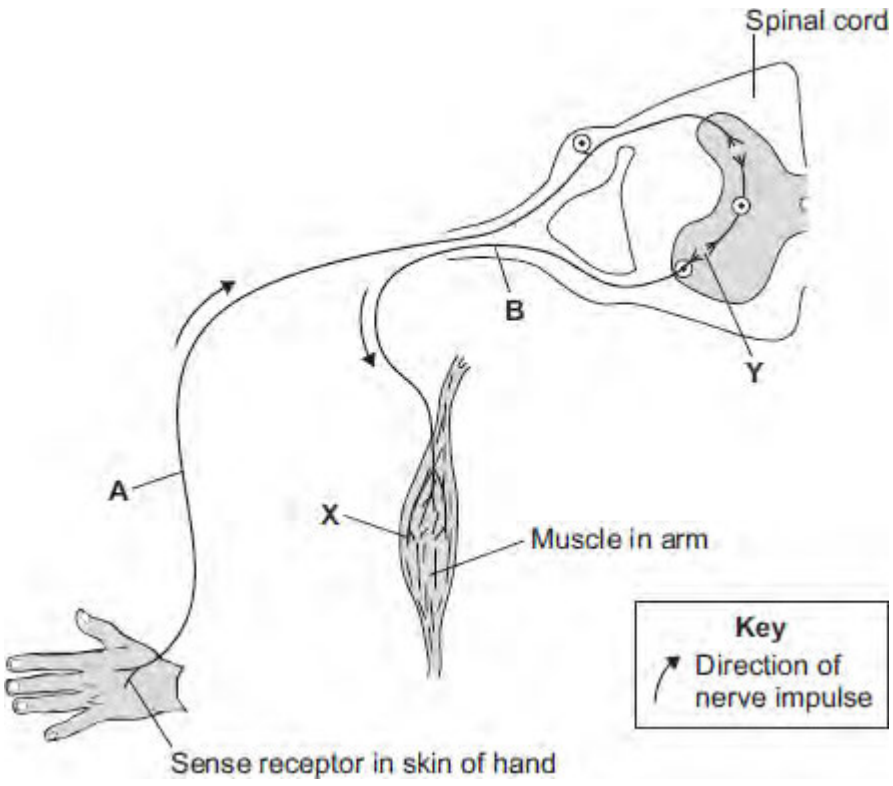
A muscle ☐

A synapse 

(1)
(Total 6 marks)

Q7.(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.

.....

.....

.....

.....

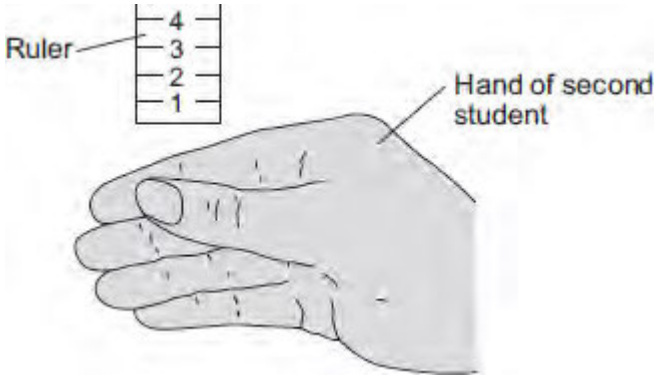
(2)

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

The students used the following steps.

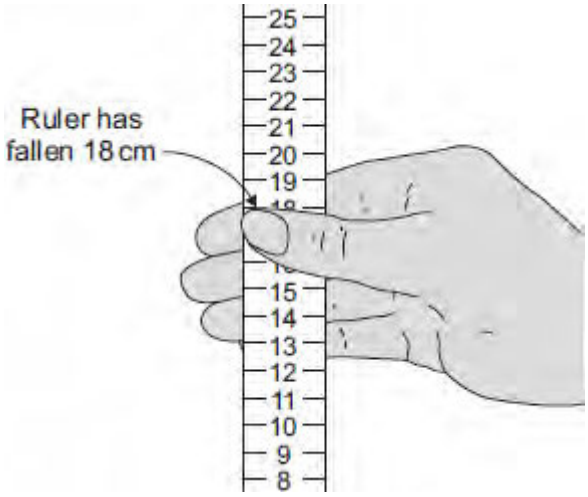
1. One student held a ruler just above a second student's hand, as shown in **Diagram 2**.

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.

Table 1

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

Table 2

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

12	13
21	13
Mean = 18.4	**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)