Organism level system – 2021/20 GCSE Gateway Biology Combined Science A

1. Nov 2021/Paper_J250/01/No.11

(a) It is important that our body maintains a constant internal environment.

Complete these sentences about maintaining a constant internal environment.

You can use each word once, more than once or not at all.

carbon dioxide **embryonic** **hydrogen** **insulin**

metabolic **oestrogen** **oxygen** **testosterone**

The body needs a constant internal environment so that ..... reactions take place at an appropriate rate.

The body needs to maintain ..... levels so that aerobic respiration can take place.

Blood sugar levels are controlled by the hormone ..... .

[3]

(b) The nervous system helps the body maintain a constant internal environment. It also allows a person to respond to external stimuli.

A person touches a hot pan. **Fig. 11.1** shows the reflex arc involved with a response when a person touches a hot pan.

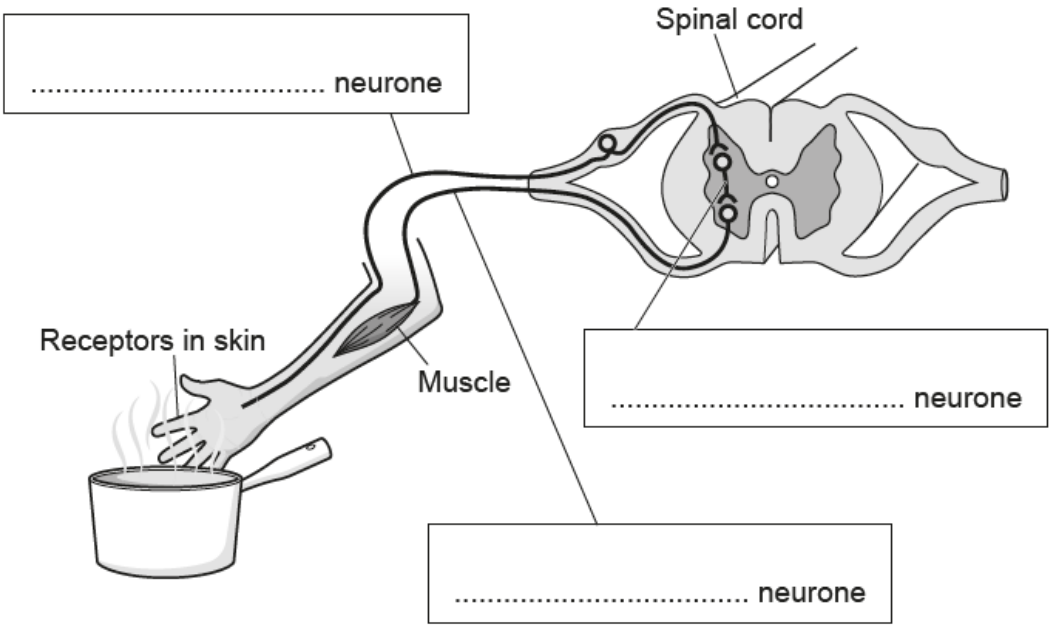

Fig. 11.1

(i) Complete the **three** boxes in **Fig. 11.1** to label the neurones involved in the response. **[3]**

(ii) Draw **two** arrows on **Fig. 11.1** to show the direction the nerve impulse travels along each neurone in the arm. **[1]**

(iii) Explain how the reflex arc prevents too much damage from the hot pan.

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..... **[2]**

(c) Caffeine is a chemical found in coffee and cola drinks.

A scientist investigates the effect of caffeine on reaction times.

They test two groups.

- Group **A** contains 5 boys aged 12 years; they are given 150 cm^3 of a caffeine-free drink.
- Group **B** contains 8 boys aged 15 years; they are given 150 cm^3 of a caffeine drink.

Both groups are tested before and after taking the drink.

(i) Identify **one** variable that has been controlled in this investigation.

..... **[1]**

(ii) **Fig. 11.2** shows the results.

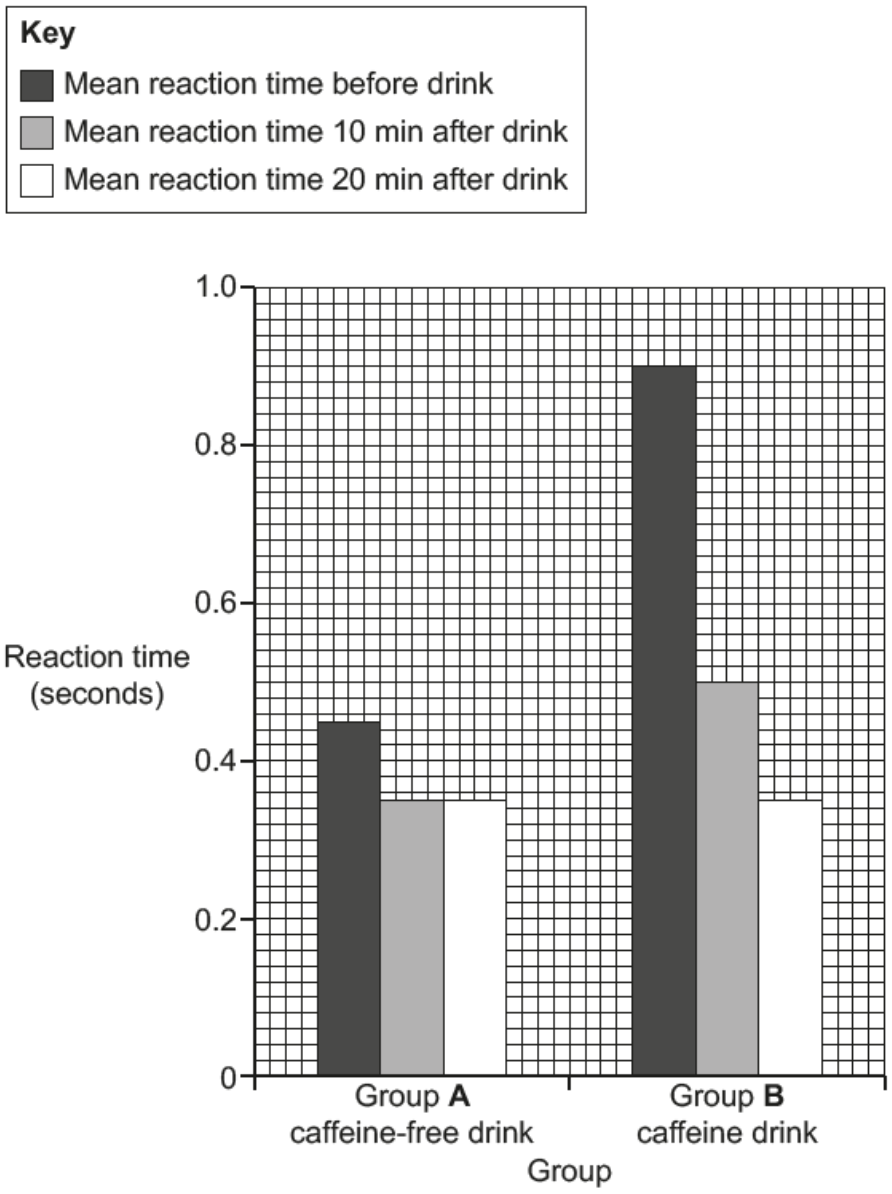

Fig. 11.2

Use data from **Fig. 11.2** to describe the effect of caffeine on reaction time.

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..... **[2]**

2. Nov 2021/Paper_J250/01/No.15

Catalase is an enzyme found in potato. Catalase breaks down hydrogen peroxide to form water and oxygen.

A student investigates the activity of catalase.

This is the method they follow:
– Cut equal sized pieces of potato.
– Put one piece of potato into a conical flask.
– Add 50 cm^3 of dilute hydrogen peroxide.
– Collect the oxygen produced in 15 minutes using a measuring cylinder full of water.

Fig. 15.1 shows the set-up of their investigation.

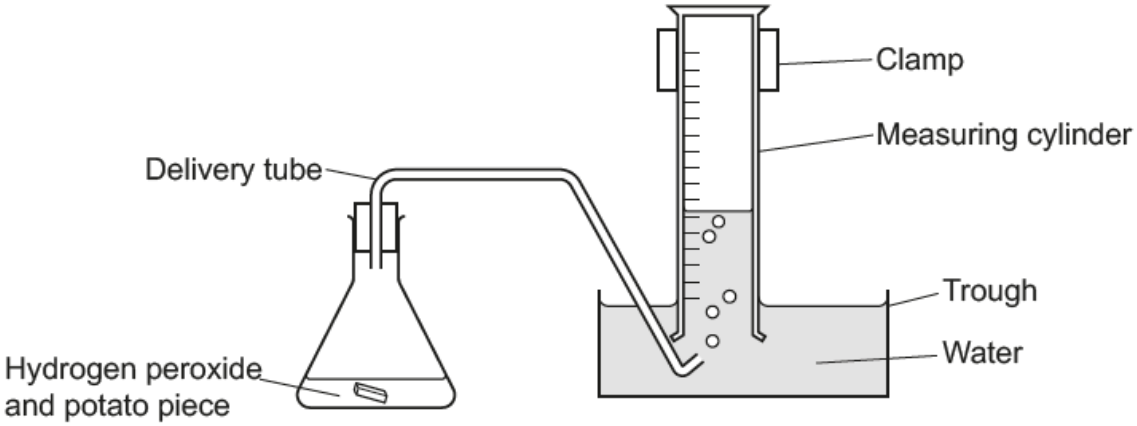

Fig. 15.1

The student then repeats the investigation, increasing the number of potato pieces each time.

(a) (i) Each time the student repeats the investigation they use 50 cm^3 of new dilute hydrogen peroxide.

Explain why they need to replace the dilute hydrogen peroxide.

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..... **[2]**

(ii) Explain why the student does **not** need to replace the potato pieces already in the flask when repeating the investigation.

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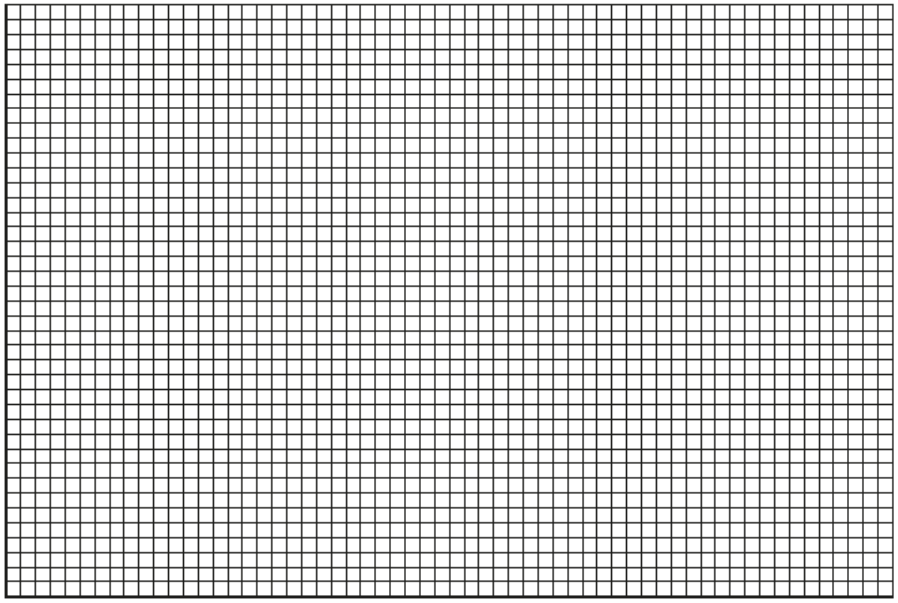
..... **[1]**

(b) The table shows their results.

Number of pieces of potato	Volume of oxygen collected in 15 minutes (cm^3)
1	0.7
2	1.2
3	1.9
4	
5	3.2
6	3.8

(i) Plot a graph of the results and draw a line of best fit.



[4]

(ii) Use the graph to find the expected volume of oxygen produced when **4 pieces** of potato are used.

Volume of oxygen = ... cm^3 **[1]**

(iii) Use the data in the **table** to calculate the rate of reaction when the student used **6 pieces** of potato.

Give your answer to **2** significant figures.

Rate of reaction = ... cm^3 / min **[3]**

(c) The reaction is exothermic.

Suggest how the student could improve their investigation to control the temperature.

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..... **[1]**

3. Nov 2020/Paper_J250/01/No.16

(a) Hormones are used for coordination within the human body.

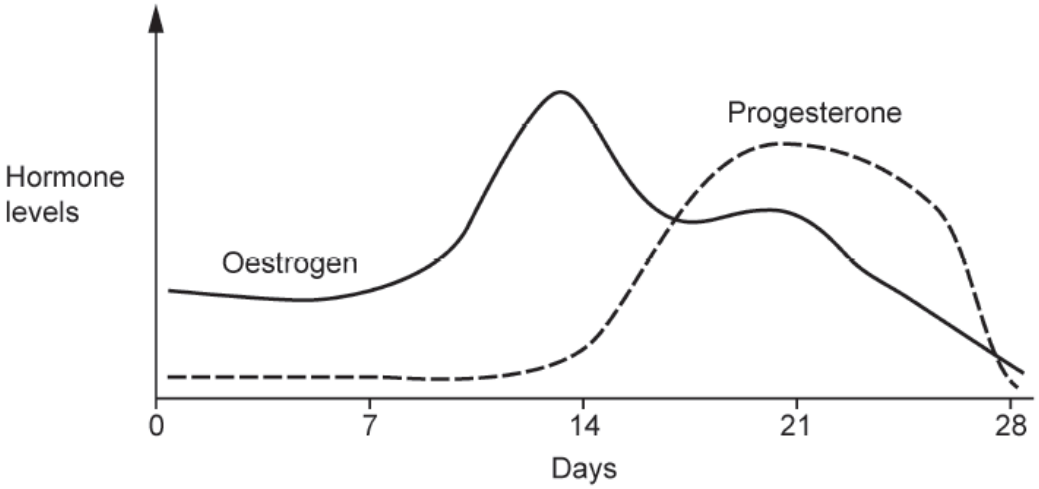
Complete these sentences about hormones.

Hormones are chemical ..... .

Hormones are made in ..... glands.

[2]

(b) **(i)** The diagram shows how the levels of the hormones oestrogen and progesterone change during the menstrual cycle.



Describe how changes in the levels of these hormones affect the thickness of the uterus wall.

Use data from the graph in your answer.

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..... **[2]**

(ii) What is the role of FSH in the menstrual cycle?

..... **[1]**

4. Nov 2020/Paper_J250/02/No.4

Which statement about skin cells is correct?

A They are diploid cells containing one set of chromosomes.

B They are diploid cells containing two sets of chromosomes.

C They are haploid cells containing one set of chromosomes.

D They are haploid cells containing two sets of chromosomes.

Your answer ☐ **[1]**

5. Nov 2020/Paper_J250/02/No.5

Which of these will **increase** the amount of water in the soil?

A Evaporation

B Precipitation

C Translocation

D Transpiration

Your answer ☐ **[1]**

6. Nov 2021/Paper_J250/07/No.10

A patient has the following symptoms:

- tiredness
- lack of energy
- weight gain
- sensitive to cold
- pain in their muscle.

Their doctor suggests the symptoms are caused by a gland in their neck not producing enough of one hormone.

Which hormone is the patient deficient in?

A Adrenaline

B Insulin

C Thyroxine

D Testosterone

7. Nov 2021/Paper_J250/07/No.15

(a) The body maintains a constant internal environment in different ways.

One example is maintaining body temperature.

Explain why it is important to maintain body temperature.

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..... **[2]**

(b) The nervous system helps the body maintain a constant internal environment. It also allows a person to respond to external stimuli.

A person touches a hot pan. **Fig. 15.1** shows the reflex arc involved with a response when a person touches a hot pan.

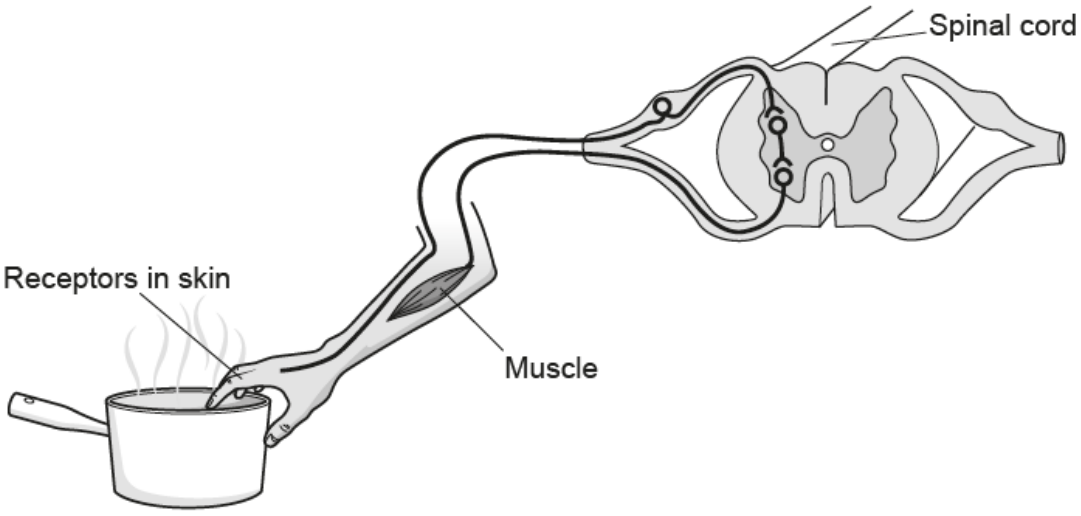

Fig. 15.1

Use **Fig. 15.1** to explain how the nervous system coordinates a response to touching the hot pan.

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..... **[4]**

(c) Caffeine is a chemical found in coffee and cola drinks.

A scientist investigates the effect of caffeine on reaction times.

They test two groups:

- Group **A** contains 2 boys aged 15 years; they are given 150 cm^3 of a caffeine-free drink.
- Group **B** contains 2 boys aged 15 years; they are given 150 cm^3 of a caffeine drink.

Both groups are tested before and after taking the drink.

(i) Suggest **one** reason why their method produces results that may **not** be reproducible.

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..... **[1]**

(ii) **Fig. 15.2** shows the results.

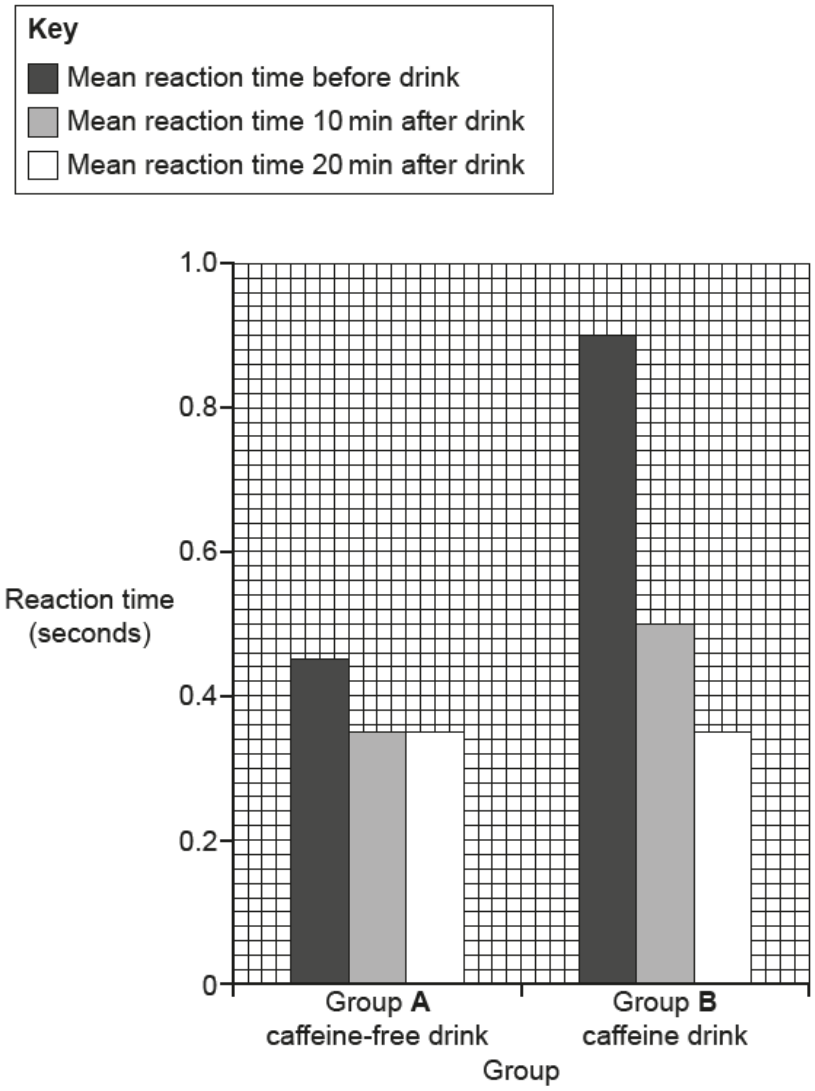

Fig. 15.2

Compare the data for group **A** with the data for group **B**.

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..... **[2]**

8. Nov 2021/Paper_J250/07/No.16

Infertility can be treated using *in vitro* fertilisation (IVF).

Eggs are collected from the ovary of the woman and fertilised by sperm in a Petri dish.

The fertilised eggs are then placed into the uterus of the woman.

(a) The graph shows the success rate per cycle of IVF compared to the age of the woman.

Use data in the graph to describe the effect of age on success rate.

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..... **[2]**

(b) Infertility can also be treated using the hormones LH and FSH.

(i) Explain why these two hormones are used to treat infertility.

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..... **[2]**

(ii) Use of these hormones can result in more than one embryo developing inside the uterus. This may have personal, social or economic implications for the mother.

One reason would be the increased stress on the mother's heart.

Suggest **one** other reason.

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..... **[1]**

9. Nov 2021/Paper_J250/08/No.15

The cornea is a part at the front of the eye that allows in light.

(a) The cornea can be damaged by injury or disease. Treatment often requires a local anaesthetic. Local anaesthetics stop nerve impulses passing along the sensory neurone.

Use your knowledge of the structure of a reflex arc to explain why a person would not feel pain.

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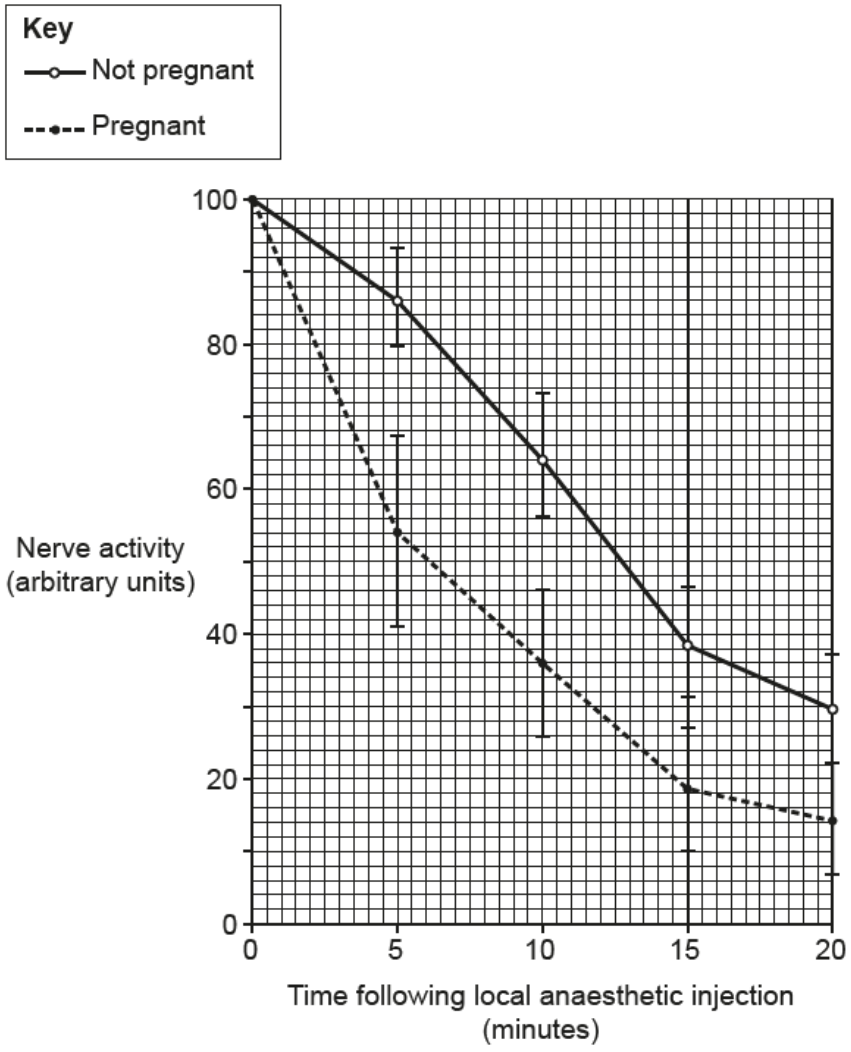
..... **[2]**

(b) Pregnancy can affect the response of neurones to local anaesthetics.

The graph shows the effect of a local anaesthetic on nerve activity in women.



(i) Look at the data over the first 10 minutes after injection.

Calculate the percentage decrease in nerve activity after 10 minutes when pregnant compared to not being pregnant.

Percentage decrease = ... % **[2]**

(ii) The data in the graph has range bars plotted. These give the highest and lowest values at each point.

Why is this an improvement when presenting this data?

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..... **[1]**

(c) Explain why stem cells taken from embryos are more suitable than those from adult bone marrow.

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..... **[2]**

(d)* Scientists can use embryo stem cell technology for treating damage to the cornea to restore vision.

Read the information in the box.

- Corneal cells are transparent to allow light to pass through.
- Corneal tissue does not have blood vessels in order to remain transparent.
- Corneal transplants from donor tissue are one way to restore vision after damage to the cornea.
- Corneal transplants are at risk of tissue rejection when blood vessels develop in the cornea.
- Scientists are able to genetically engineer donor corneal cells to prevent new blood vessel formation following transplantation.
- The genetically engineered cells produce a protein which prevents the formation of blood vessels.

Describe the main steps involved in genetically engineering donor corneal cells and identify any improvements and risks from this type of treatment.

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10. Nov 2021/Paper_J250/08/No.1

Table 1.1 shows the classification of non-diabetic, pre-diabetic and type 2 diabetes based on their blood glucose levels.

Classification	Blood glucose levels 2 hours after food (mg/dl of blood)	Blood glucose levels 12 hours after food (mg/dl of blood)
non-diabetic	70–99	<140
pre-diabetic	100–125	140–199
type 2 diabetes	>126	>200

Table 1.1

Table 1.2 shows measurements of blood glucose levels taken from 4 people.

	Blood glucose levels 2 hours after food (mg/dl of blood)	Blood glucose levels 12 hours after food (mg/dl of blood)
A	73	140
B	100	125
C	105	148
D	129	206

Table 1.2

Which row in **Table 1.2** shows a person who is a **pre-diabetic**?

Your answer ☐ **[1]**

11. Nov 2021/Paper_J250/08/No.7

The diagram shows a sensory neurone.

What is the part labelled **X**?

A Axon

B Dendrite

C Cell body

D Nucleus

12. Nov 2021/Paper_J250/08/No.8

Look at the table.

	Glucagon released	Insulin released	Action of liver
A	yes	no	glucose converted to glycogen
B	no	yes	glycogen converted to glucose
C	yes	no	glycogen converted to glucose
D	no	yes	glucose converted to glycogen

Which row describes the body's response to a **decrease** in blood sugar levels?

Your answer ☐ **[1]**

13. Nov 2021/Paper_J250/08/No.12

(a) Hormones are used for coordination within the human body.

Complete these sentences about hormones.

Hormones are chemical ..... .

Hormones are made in ..... glands.

[2]

(b) **(i)** The diagram shows how the levels of the hormones oestrogen and progesterone change during the menstrual cycle.

Describe how changes in the levels of these hormones affect the thickness of the uterus wall.

Use data from the graph in your answer.

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..... **[2]**

(ii) What is the role of FSH in the menstrual cycle?

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