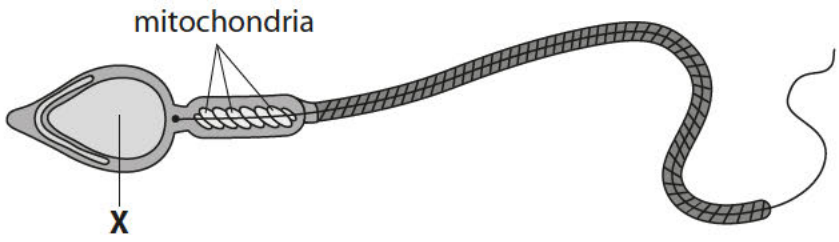
1 The diagram shows a human sperm cell.



(a) (i) Structure **X** on the diagram contains DNA.

Name structure **X**.

(1)

.....

(ii) Which statement is true for DNA?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** DNA is made up of amino acids and bases.

☒ **B** DNA is made up of amino acids which give instructions to make proteins.

☒ **C** In DNA, the bases A and T are complementary.

☒ **D** Every gene in a DNA molecule contains only three bases.

(b) Sperm cells are involved in fertilisation.

Define fertilisation.

(2)

(c) (i) Describe the function of mitochondria.

(2)

(ii) Gene mutations in DNA can produce abnormal mitochondria.

Explain how a gene mutation can produce a different protein.

(2)

(Total for Question 1 = 8 marks)

2 (a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

A person with diabetes cannot control

(1)

☐ **A** the water content of their blood

☐ **B** the glucose content of their blood

☐ **C** their body temperature

☐ **D** their body mass index

(ii) Explain how Type 1 diabetes can be controlled.

(3)

(b) Adrian is 180 cm tall and has a mass of 120 kg.

A person who has a high Body Mass Index (BMI) is more likely to develop Type 2 diabetes.

Calculate Adrian's BMI using the equation.

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(2)

answer = ...

*(c) Body movement is controlled by nerve impulses.

Explain how impulses are transmitted in a reflex arc to prevent a person from injuring themselves.

(6)

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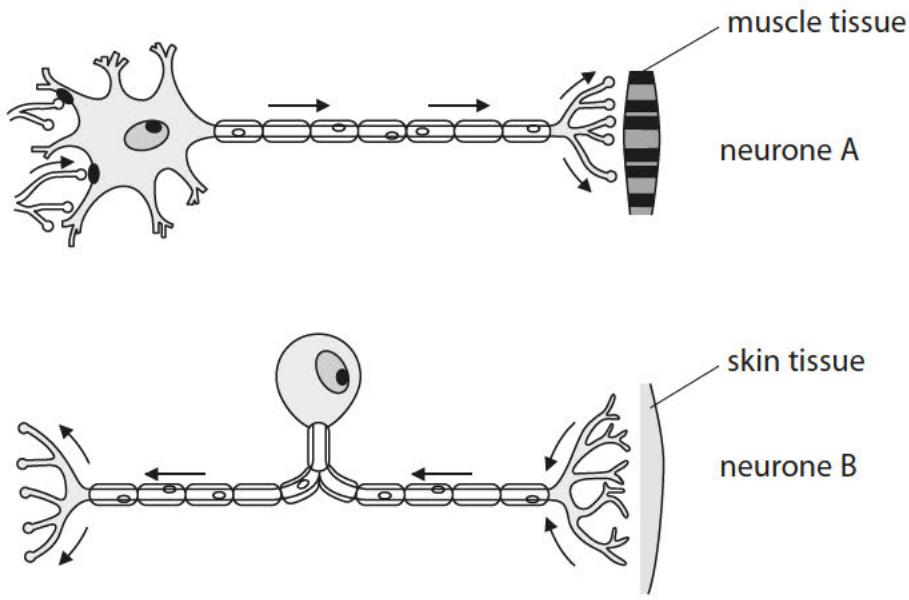
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(Total for Question 2 = 12 marks)

3 The diagrams show the structure of two neurones A and B.



(a) Complete the sentences by putting a cross (☒) in the box next to your answer.

(i) Neurone A is a

(1)

☒ **A** motor neurone

☒ **B** reflex neurone

☒ **C** relay neurone

☒ **D** sensory neurone

(ii) Neurone B sends information to the

(1)

☒ **A** brain and spinal cord

☒ **B** hormones which results in a response

☒ **C** muscle tissue

☒ **D** receptor cells in the skin

(b) Explain how information travels along the axon of a sensory neurone.

(2)

(c) Describe the role of the myelin sheath.

(2)

(d) Describe the pathway of a nerve impulse through a reflex arc.

(3)

(Total for Question 3 = 9 marks)

4 There are many different types of cell in the human body.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

An embryonic stem cell can

(1)

- ☒ **A** differentiate into any type of cell
- ☒ **B** differentiate into only one type of cell
- ☒ **C** only be obtained from embryos
- ☒ **D** only produce haploid cells

(b) Describe how the structure of a red blood cell is related to its function.

(3)

(c) Describe the function of platelets.

(2)

*(d) Mitosis and meiosis are types of cell division.

Compare these two types of cell division.

(6)

(Total for Question 4 = 12 marks)