

7. Insulin is a protein.

(a) (i) State precisely where proteins are made in a cell.

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(1)

(ii) Explain how proteins are transported from their site of production to the outside of the cell.

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(2)

(b) A person who has Type 1 diabetes cannot make enough of the hormone insulin. This is because the beta cells in the pancreas have been destroyed by the immune system. It is possible that, in the future, we will be able to replace beta cells with ones produced from embryonic stem cells.

(i) Explain what is meant by **embryonic stem cells**.

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(1)

(ii) Explain how stem cells might provide a way of obtaining beta cells.

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(1)



(c) Some people object to the use of embryonic stem cells and consider it to be ethically wrong.

State whether you are for or against stem cell research.

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Give reasons for your choice.

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(3)

(d) The occurrence of Type 1 diabetes is more common in some families than others, through many generations even if the members of the family now live in different parts of the world. In pairs of identical twins one twin may develop the condition and the other may not.

Explain what the information above tells you about the causes of Type 1 diabetes.

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(2)

(Total 10 marks)

Q7

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