1 Insulin is an important hormone.

(a) Name the organ that produces insulin.

(1)

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(b) State the role of insulin in the body.

(2)

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(c) (i) Describe how bacteria can be genetically modified to produce human insulin.

(5)

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(ii) The term that best describes bacteria that have been genetically modified to produce human insulin is

(1)

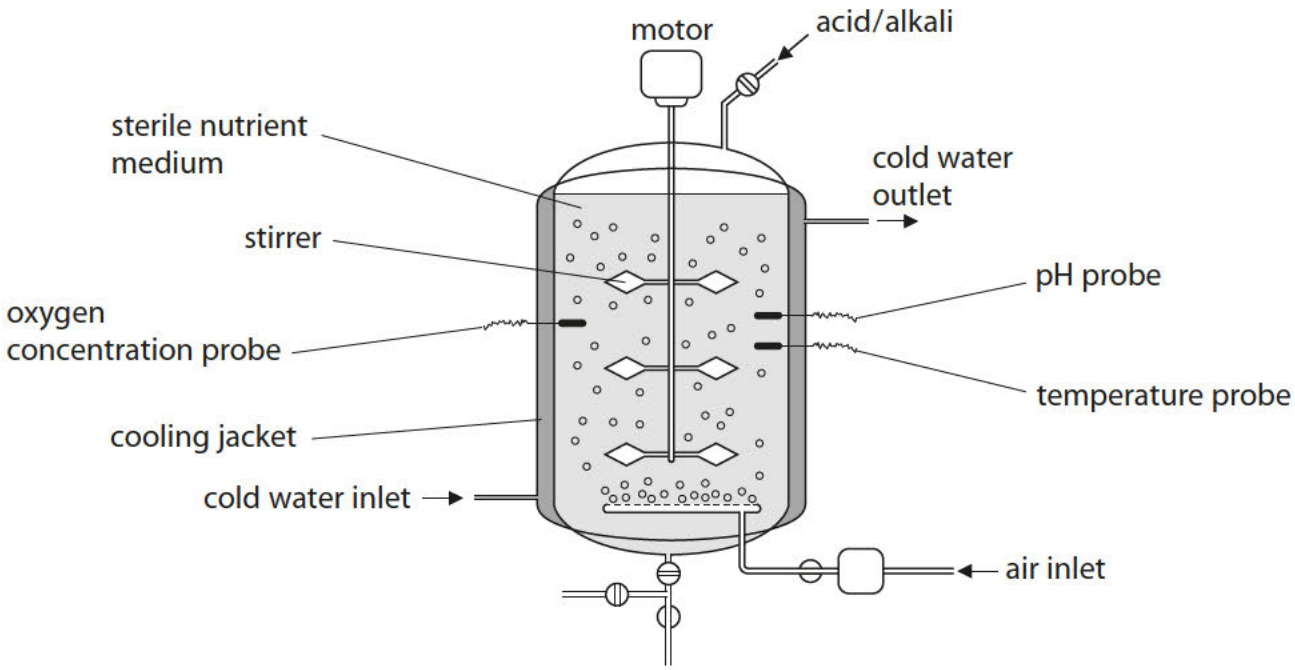
☐ **A** antibiotic

☐ **B** aseptic

☐ **C** pathogenic

☐ **D** transgenic

(d) The diagram shows part of a fermenter used to grow large numbers of genetically modified bacteria.



(i) Suggest how the air inlet helps the genetically modified bacteria to grow.

(2)

(ii) If the pH probe stops working the pH in the fermenter becomes more acidic.

Describe and explain how this affects the production of human insulin.

(4)

(Total for Question = 15 marks)

2 The picture shows a sheep that has been genetically modified to contain a human gene for making a human protein in its milk.



The protein in its milk is a blood clotting substance called factor IX.

(a) The process of genetic modification used to produce this sheep involves the use of two types of enzyme. One enzyme cuts DNA and the other enzyme joins DNA. The process also used a vector.

(i) Name the enzyme that cuts DNA.

(1)

.....

(ii) Name the enzyme that joins DNA.

(1)

.....

(iii) Name a vector.

(1)

.....

(b) This sheep is transgenic.

What is meant by the term **transgenic**?

(1)

(c) The transgenic sheep can be reproduced by cloning.

Suggest the advantages of reproducing the transgenic sheep by cloning.

(3)

(d) (i) Name the small structures in normal plasma that are involved in blood clotting.

(1)

(ii) Explain why is it important to have blood that clots.

(2)

(Total for Question = 10 marks)