Section A

Answer **all** questions in this section.

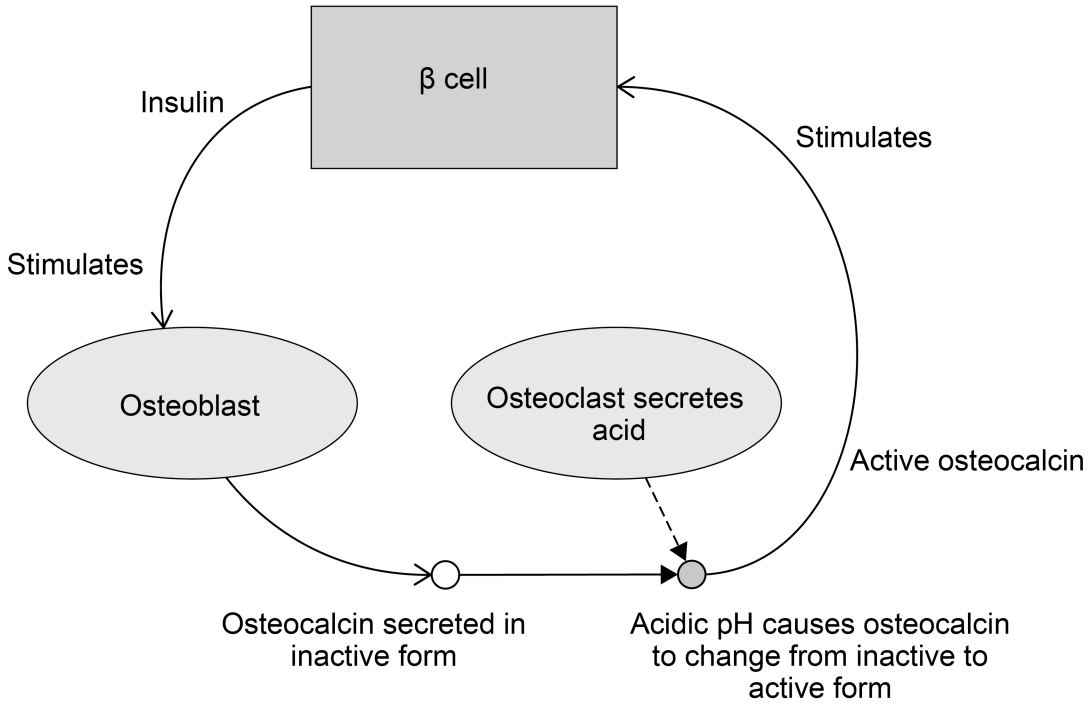
You are advised to spend no more than one hour and 15 minutes on this section.

0 1 Broken bones are repaired by cells called osteoclasts and osteoblasts.

Osteoblasts secrete a hormone called osteocalcin in an inactive form. Osteocalcin is a protein. The active form of osteocalcin binds to a receptor on beta (β) cells in the pancreas, stimulating them to release insulin. Osteoblasts have receptors for insulin.

Figure 1 shows how the production of osteocalcin by osteoblasts is controlled by positive feedback.

Figure 1



0 1 . 1 The secretion of osteocalcin (in an inactive form) by osteoblasts is controlled by positive feedback.

Use information from **Figure 1** to explain why this is positive feedback.

[2 marks]

0 1 . 2 The acidic pH conditions created by osteoclasts cause the inactive form of the protein osteocalcin to change into the active form of osteocalcin.

Suggest how.

[2 marks]

0 1 . 3 Binding of insulin leads to an increase in the rate of respiration in cells such as osteoblasts.

Explain how.

[2 marks]

6