

**0 9**

Read the following passage.

Alzheimer's disease leads to dementia. This involves small  $\beta$ -amyloid proteins binding together to form structures called plaques in the brain.

Nerve cells in the brain produce a large protein called amyloid-precursor protein that has a complex shape. This protein is the substrate of two different enzymes,  $\alpha$ -secretase and  $\beta$ -secretase. These enzymes are normally produced in the brain. One product of the reaction catalysed by  $\beta$ -secretase is a smaller protein that can lead to  $\beta$ -amyloid protein formation. Many people with Alzheimer's disease have mutations that decrease  $\alpha$ -secretase production, or increase  $\beta$ -secretase production.

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One possible type of drug for treating Alzheimer's disease is a competitive inhibitor of  $\beta$ -secretase. When some of these types of drugs were trialled on patients, the trials had to be stopped because some patients developed serious side effects.

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Use information from the passage and your own knowledge to answer the following questions.

**0 9 . 1**

Suggest how amyloid-precursor protein can be the substrate of two different enzymes,  $\alpha$ -secretase and  $\beta$ -secretase (lines 3–5).

**[2 marks]**


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**0 9 . 2**

One product of the reaction catalysed by  $\beta$ -secretase is a smaller protein (lines 6–7).

Describe what happens in the hydrolysis reaction that produces the smaller protein from amyloid-precursor protein.

**[2 marks]**


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**0 9 . 3**

Many people with Alzheimer's disease have mutations that decrease  $\alpha$ -secretase production, or increase  $\beta$ -secretase production (lines 8–9).

Use the information provided to explain how these mutations can lead to Alzheimer's disease.

**[3 marks]**

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**0 9 . 4**

One possible type of drug for treating Alzheimer's disease is a competitive inhibitor of  $\beta$ -secretase (lines 10–11).

Explain how this type of drug could prevent Alzheimer's disease becoming worse.

**[2 marks]**

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**0 9 . 5**

When some of these types of drugs were trialled on patients, the trials were stopped because some patients developed serious side effects (lines 11–13).

Using the information provided, suggest why some patients developed serious side effects.

**[1 mark]**

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**END OF QUESTIONS**