

# QA8 – Enzyme Inhibitors

1. Give the definition of an enzyme.

A **protein** which acts as a **biological catalyst**.

2. Name the two types of inhibition:

1. **Competitive**
2. **Non-competitive**

3. Describe competitive inhibition.

Competitive inhibition occurs when the inhibitor molecule has a **similar structure** to the target **substrate**. This allows the inhibitor to **bind directly to the active site** of the enzyme. This **blocks** the active site, and **prevents the substrate from binding** – inhibiting by competing with the substrate.

4. Explain the differences between competitive and non-competitive inhibitors.

**Non-competitive inhibitors** work by **binding away from the active site** of the enzyme. In doing so, they trigger a **conformational change** in the structure of the enzyme, **changing the shape of the active site**. This means that the substrate will **no longer have a complementary shape** to the active site, and therefore cannot bind.

**Increasing substrate concentration** will **counteract** the effect of a **competitive inhibitor**. However, it will have **no effect** if the inhibitor is **non-competitive**. This is because a non-competitive inhibitor changes the structure of an enzyme, effectively removing the enzyme's activity. If there are enough non-competitive inhibitors to affect the structure of all the enzymes, then increasing the concentration of the substrate won't be able to counteract the inhibition.

5. Substrate concentration is one factor which affects the activity of enzyme inhibitors. Complete the following sentences:

- For **competitive** inhibition, when the substrate concentration is increased then the effect of the inhibitor is **decreased**
- For **non-competitive** inhibition, when the substrate concentration is **changed** it will have no effect on the inhibitor.

6. Describe how a gradual change in temperature from 0 °C to 100 °C would affect the salivary amylase enzyme. Explain your answer.

As the temperature **increases from 0 °C**, the **rate of enzyme action will increase**. This is because the enzymes will **gain kinetic energy**, allowing them to move and **catalyse reactions faster**. The rate of reaction will only increase up until a critical point. At this critical temperature the enzyme will have so much energy that they **denature**, as the bonds giving the protein its tertiary structure will break. This will stop the enzymes from working, and at any temperature past this point, the reaction will not occur.