

Name:
Date:

QB2 - Enzymes as Biological Catalysts

1. Define the term 'biological catalyst', and explain its relation to enzymes.

A biological catalyst is a naturally occurring species, found in organisms, which **speeds up the rate of a chemical** reaction, without itself being used up in the process. **Enzymes are examples of biological catalysts.**

2. Give an example of how enzymes can be used industrially for an economic and environmental advantage.

Although there are a few different ways that this can occur, the general idea is that they provide a route of **lower activation energy** for a reaction, so that that reaction can be done at **lower temperatures**. By using less energy, there is a **cost saving**, and an **environmental benefit**, as less fossil fuels need to be consumed to meet the energy demand. A typical example of this is the use of bacterial enzymes in **biological laundry detergents**.

3. Describe the advantages of using enzymes as biological catalysts.

Enzymes are **highly selective**, and show specificity to certain reactions. They are **naturally occurring**, so they don't need chemical modification. They can be **harvested** from organisms such as bacteria on an industrial scale. They often work well at **low temperatures**, saving on energy usage.

4. Describe the disadvantages of using enzymes as biological catalysts.

Enzymes are very specific, and this can make it **difficult to use them for modified reactions**, or using slightly different substrates. Enzymes catalyse biological reactions, so they **cannot always be applied** to other processes. For example, breaking down plastics. They can be **difficult to extract** from organisms, especially more complex organisms. They can **decompose at high temperatures**, which can make them unsuitable for some industrial processes.