

A. SOME “ISMs”

METABOLISM = the web of **all the enzyme-catalysed reactions** in a **cell** or **organism**

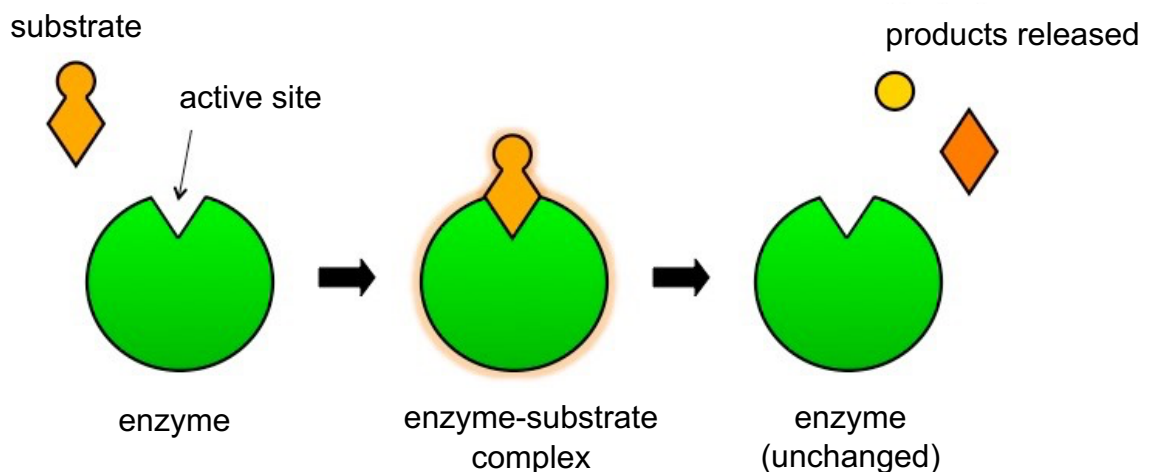
ANABOLISM = the **synthesis** of **complex** molecules from **simpler** molecules, involving **condensation** reactions (e.g. glucose + galactose → lactose)

CATABOLISM = the **breakdown** of **complex** molecules into **simpler** molecules, involving **hydrolysis** reactions (e.g. lactose → glucose and galactose)

B. FUNCTION

- An enzyme is a **protein** that acts as a **biological catalyst** by **speeding up** the **rate** of a **chemical reaction**.
- They **lower** the **activation energy** needed for a chemical reaction to happen by **bringing** the **substrate** **closer** and **weakening** the **bonds** within it.
- Enzymes are **not changed** or consumed by the reactions they catalyse and so can be **reused**. They carry out both **anabolism** and **catabolism**.

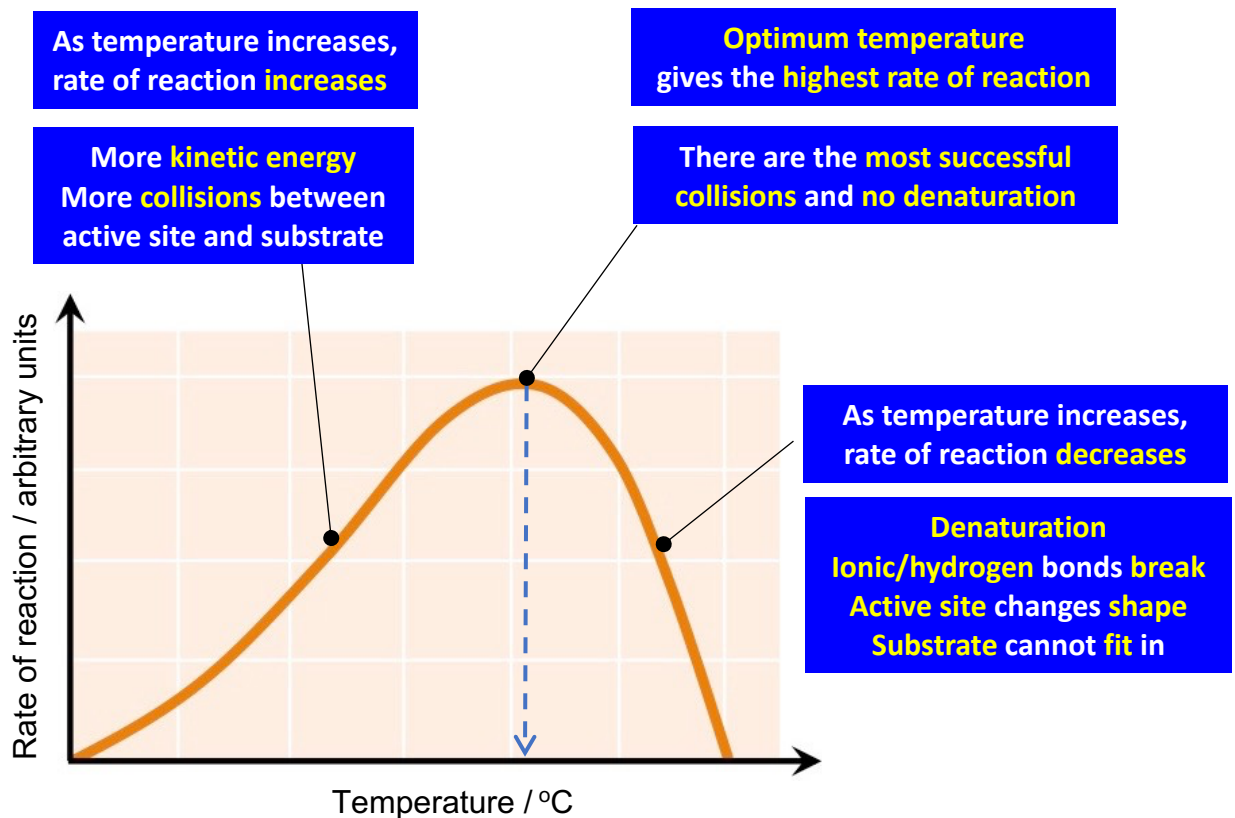
C. THE LOCK AND KEY HYPOTHESIS



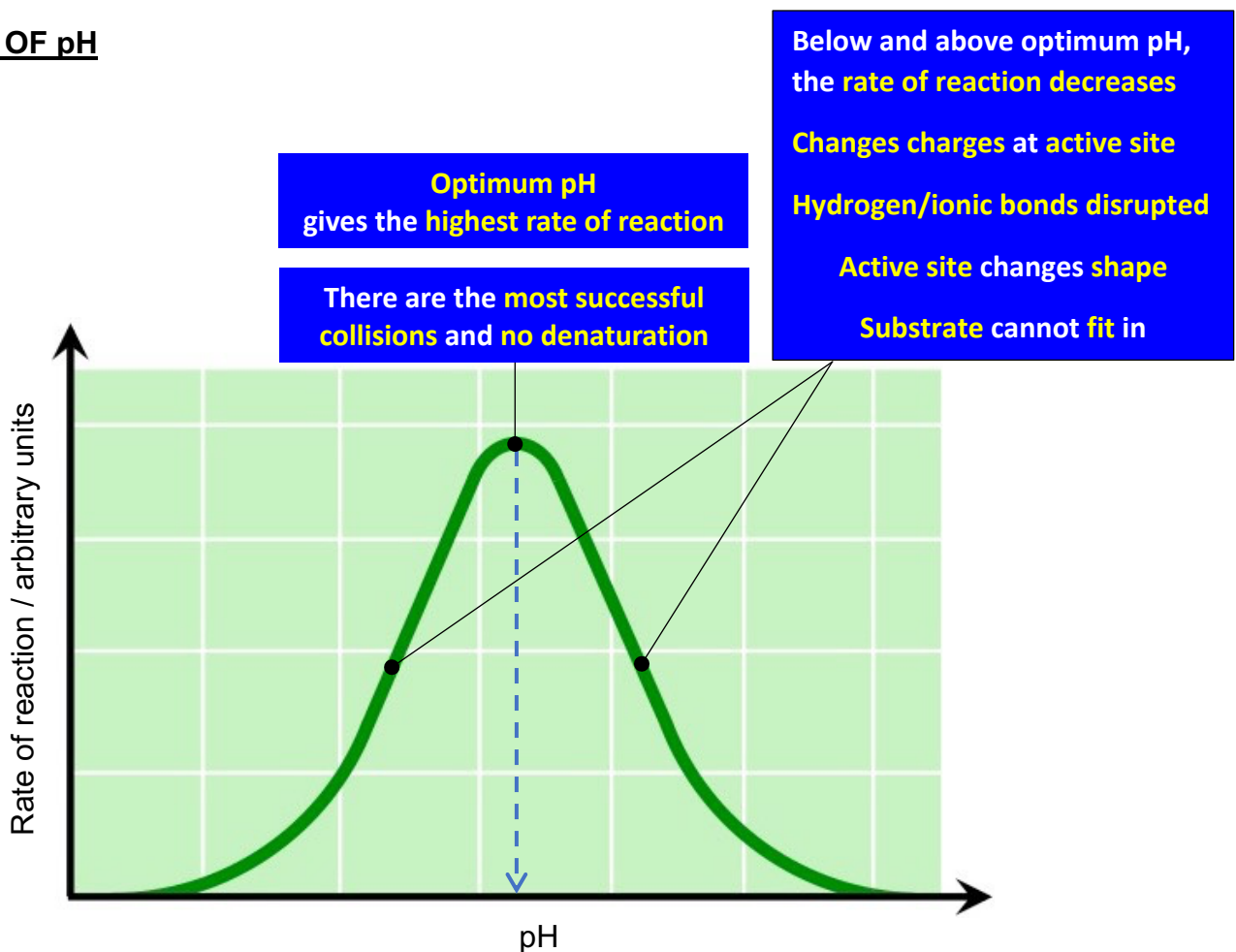
- Each enzyme has an **active site** that is a **specific shape**
- The **active site** is a **complementary shape** to its **substrate**
- Substrate **binds** to **active site**, forming an **enzyme-substrate complex**
- Brings **substrate(s)** **close together** in active site
- **Bonds** are **weakened** in the **substrate**
- **Activation energy** for the **reaction** is **lowered**
- **Products** are **released** and the **enzyme** is **unchanged**

D. EFFECT OF TEMPERATURE

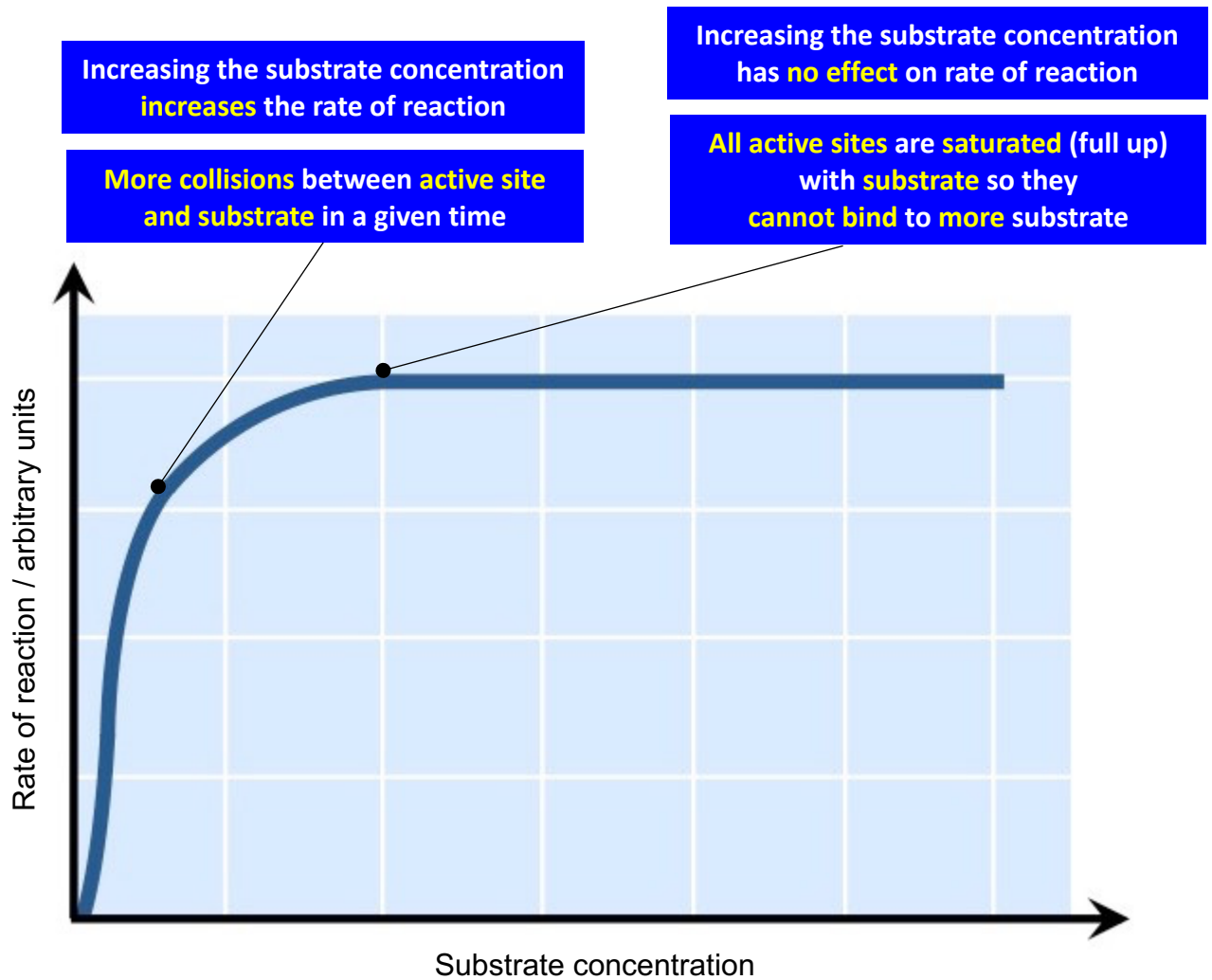
- The **fall** should always be drawn at **least twice as steep** as the **rise**.



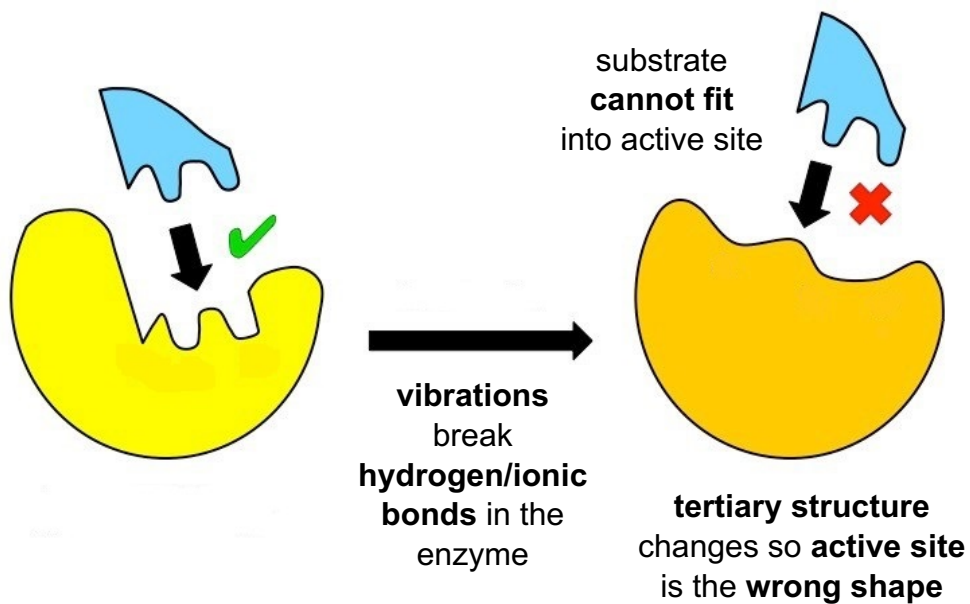
E. EFFECT OF pH



F. EFFECT OF SUBSTRATE CONCENTRATION



G. DENATURATION

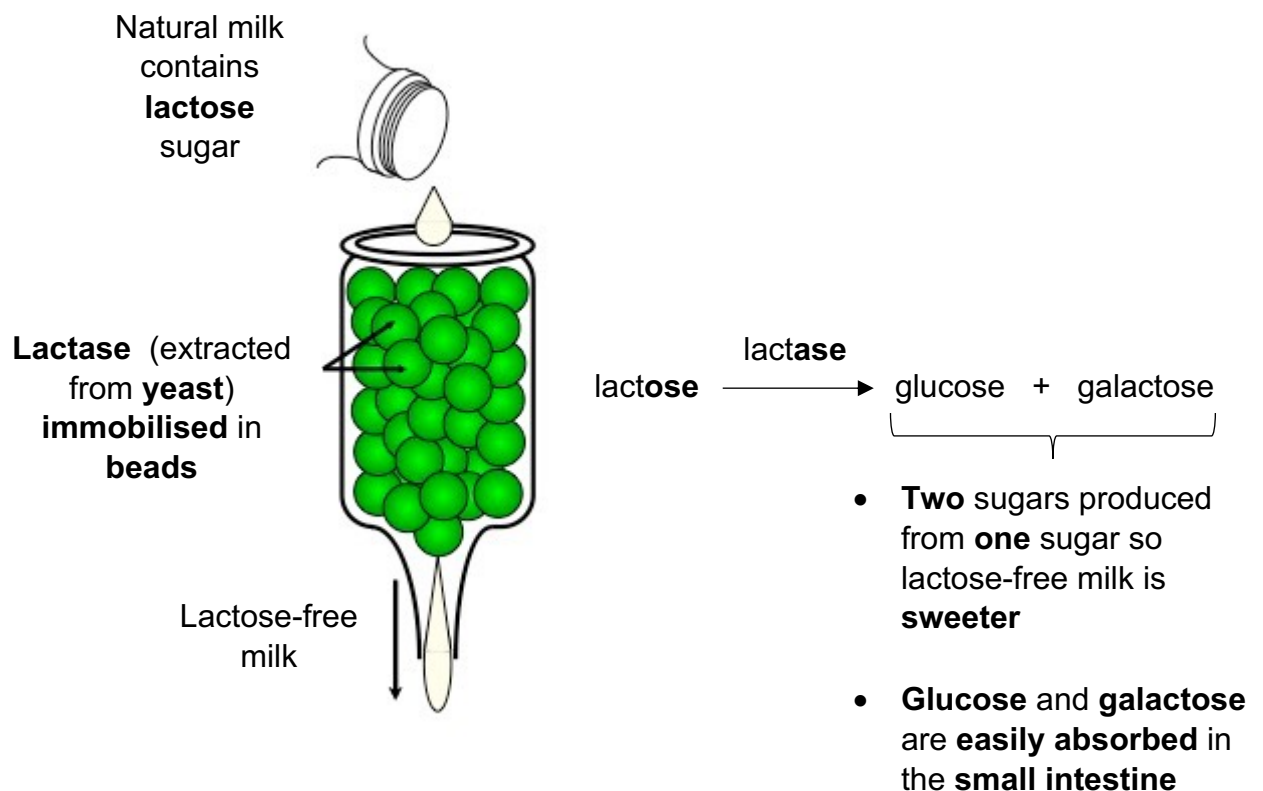


H. USING IMMOBILISED ENZYMES TO PRODUCE LACTOSE-FREE MILK

Immobilised enzymes are **attached** to a **fixed** surface or **trapped** in **beads**

There are **three** main advantages of using them over 'free' enzymes:

- **Products** are **not contaminated** with **enzymes**.
- **Enzymes** can be **reused**, saving money.
- **Enzyme concentrations** can be **higher**.



- People who are **lactose-intolerant** lack the enzyme **lactase**, which is usually produced by the **small intestine**.
- They **cannot digest lactose** to glucose and galactose.
- **Bacteria** in the small intestine **ferment** the lactose, producing **lots** of **gas**.
- This causes **stomach cramps** and **diarrhoea**.
- People who are **lactose-intolerant** need **lactose-free** milk.