

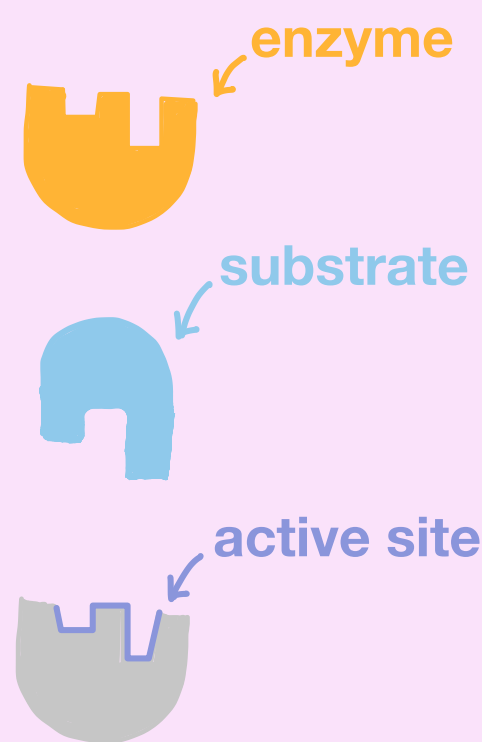
From Lock & Key to Induced Fit: HOW SCIENTIFIC MODELS EVOLVE

A **catalyst** is a substance that speeds up a chemical reaction by lowering the amount of energy needed for the reaction to occur.

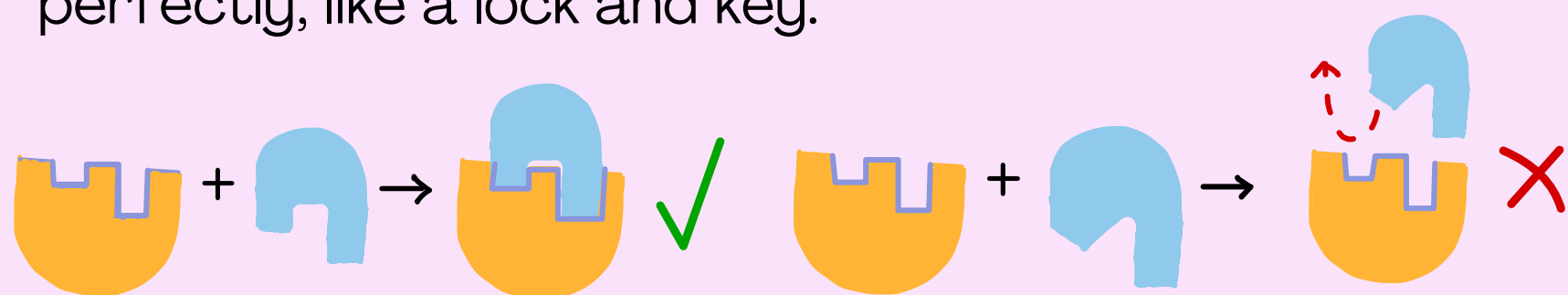
Enzymes are biological catalysts that perform this role in living organisms.

The molecules that bind to enzymes are called **substrates**.

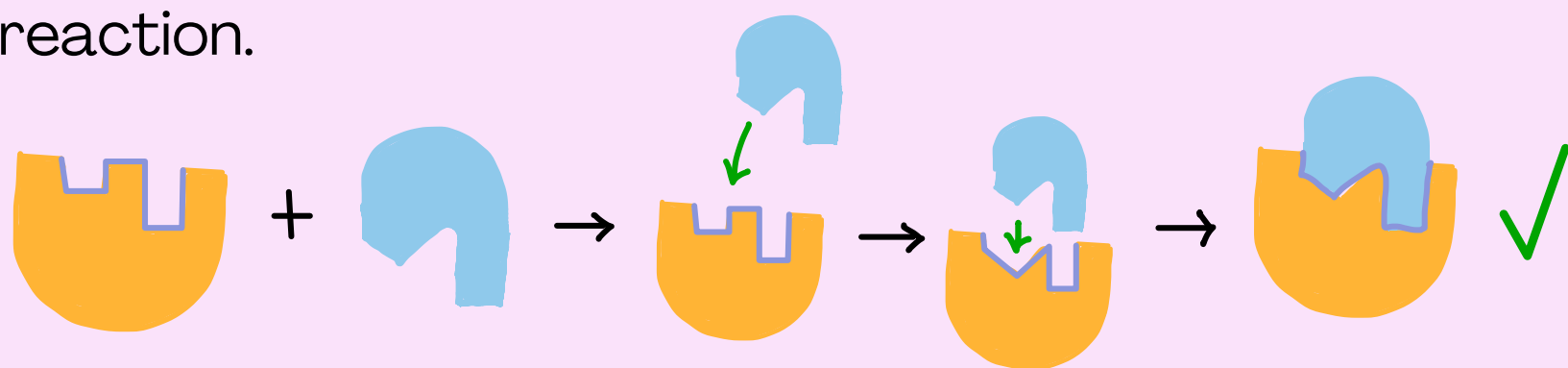
Substrates bind to a specific region of the enzyme called the **active site**, where the enzyme helps the reaction occur.



The interaction between enzymes and substrates was originally described using the “**lock-and-key**” model. This model proposed that the enzyme and substrate have complementary, fixed shapes that fit together perfectly, like a lock and key.



Later, scientists developed the “**induced-fit**” model. Rather than being completely rigid, the enzyme undergoes a slight change in shape when the substrate binds. This creates an optimal fit between the enzyme and substrate and helps the enzyme catalyze the reaction.



IN THE CLASSROOM

- **Study resource** → use this to explain the two different enzyme models, with a visual aid to support learners who understand concepts better through pictures
- **Discussion prompt** → use this example to start a discussion about other scientific progressions and why it is important to be open to new explanations

SCIENTIFIC KNOWLEDGE CAN CHANGE WHEN NEW EVIDENCE BECOMES AVAILABLE

It is important for learners and scientists to remain open to evolving ideas. Science can change as new evidence, technologies, and discoveries become available. The progression of enzyme models demonstrates this. The lock-and-key model was useful for explaining how substrates interact with enzyme active sites, but further research led to the development of the induced-fit model. This provided a more flexible and accurate explanation of enzyme-substrate binding. This shows that scientific models can be useful while still having limitations, and that scientific understanding can be refined as new evidence is found. This means scientists must be willing to question and improve existing explanations when research developments support doing so.

WHY DOES IT MATTER?

Understanding that scientific knowledge can change encourages learners to stay curious, ask questions, and be open to lots of ideas. Science does not stop when we find an explanation. Scientists are always researching, questioning, and looking for new evidence. Recognizing this can help learners see that changing your ideas when you learn something new is an important part of science, and that the best way to approach it is with curiosity.

Lewis, T., & Stone, W. L. (2023, April 24). Biochemistry, proteins enzymes. In *StatPearls [Internet]*. StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK554481/>

Ramroop Singh, N. (2023). *Introduction to biology*. Thompson Rivers University. <https://openintrobiology.pressbooks.tru.ca/>