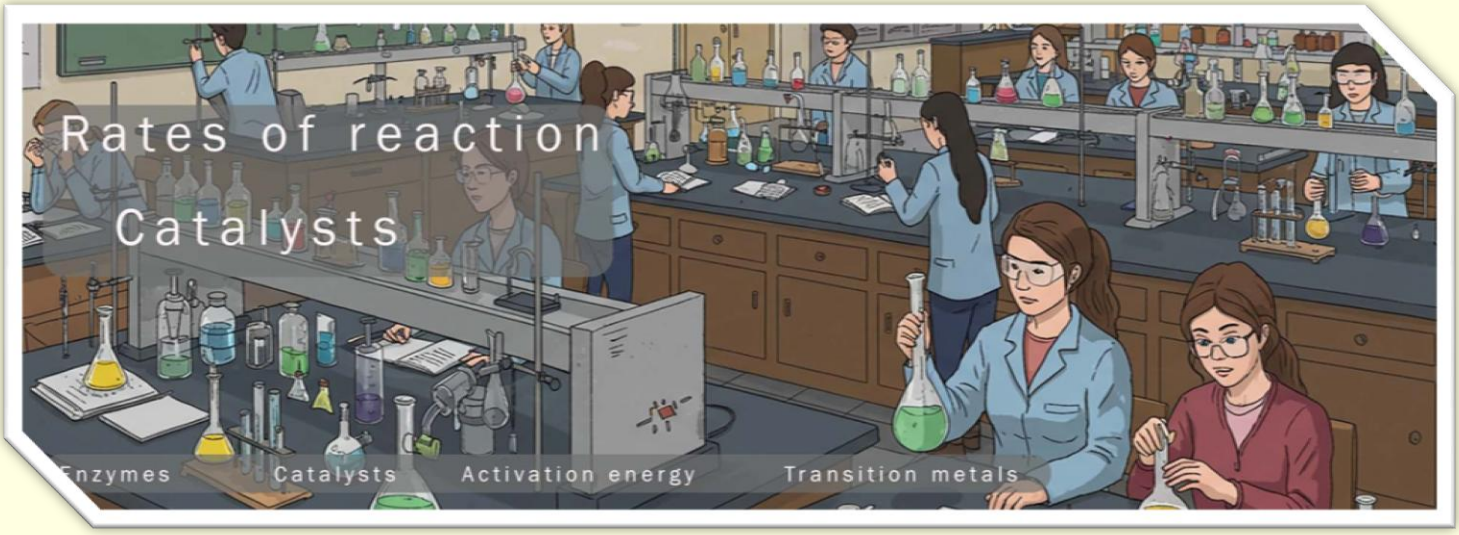



Answer all the questions below and then check your answers

1. What is the function of a catalyst in a chemical reaction?

a) Increases the temperature of the reaction

b) Increases the rate of reaction without being used up

c) Lowers the energy released in the reaction

d) Changes the reactants into different substances

2. Which of the following is a catalyst used in the decomposition of hydrogen peroxide?

a) Iron oxide b) Nickel c) Manganese dioxide d) Platinum

3. Why are transition metals often used as catalysts in industrial processes?

a) They lower activation energy and speed up reactions

b) They react with all reactants to form products

c) They increase the activation energy required for the reaction

d) They are cheap and readily available

4. Define the term catalyst.

5. Explain why only a small amount of catalyst is needed in a reaction.

6. What enzyme catalyses the decomposition of hydrogen peroxide in living cells?

GCSE style questions

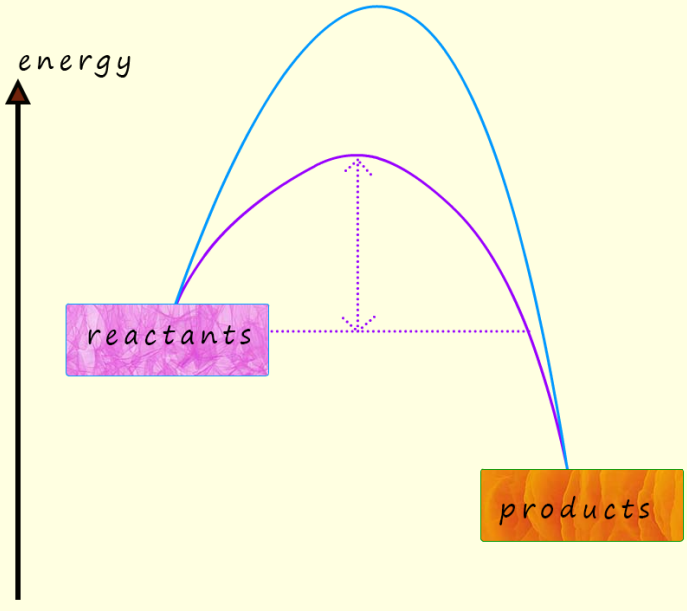
7. (a) A student investigates the decomposition of hydrogen peroxide using manganese dioxide as a catalyst. She measures the volume of oxygen gas produced over time.

(i) Write the balanced chemical equation for this reaction.

(ii) Explain how the student could confirm that the gas produced is oxygen.

(b) The student repeats the experiment but adds twice as much manganese dioxide. Predict how the rate of reaction will change and explain why.

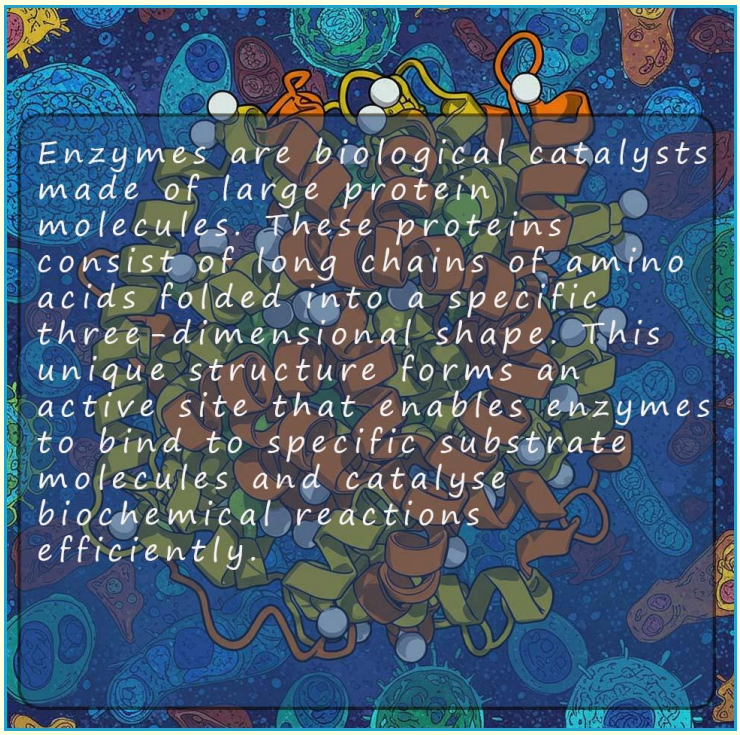
8. The graph opposite shows the energy profile for an exothermic reaction taking place with and without a catalyst present.



(i) What does the purple coloured vertical dotted line represent?

(ii) Explain how the catalyst affects the activation energy.

9. Enzymes are biological catalysts. Explain how their structure allows them to catalyse specific reactions.




10. Describe two industrial uses of catalysts and explain why they are beneficial.

11. Explain why some catalysts, such as platinum and rhodium, are expensive but still widely used in industrial applications.

## Answers

1. What is the function of a catalyst in a chemical reaction?

a) Increases the temperature of the reaction

b) Increases the rate of reaction without being used up

c) Lowers the energy released in the reaction

d) Changes the reactants into different substances

**Answer:** b) Increases the rate of reaction without being used up

2. Which of the following is a catalyst used in the decomposition of hydrogen peroxide?

a) Iron oxide b) Nickel c) Manganese dioxide d) Platinum

**Answer:** c) Manganese dioxide

3. Why are transition metals often used as catalysts in industrial processes?

a) They lower activation energy and speed up reactions

b) They react with all reactants to form products

c) They increase the activation energy required for the reaction

d) They are cheap and readily available

**Answer:** a) They lower activation energy and speed up reactions

4. Define the term catalyst.

**Answer:** A catalyst is a substance that increases the rate of a chemical reaction by providing an alternative reaction pathway with a lower activation energy, without being used up in the process.

5. Explain why only a small amount of catalyst is needed in a reaction.

**Answer:** A catalyst is not used up during the reaction, meaning it can be reused multiple times to facilitate the reaction, so only a small amount is necessary.

6. What enzyme catalyses the decomposition of hydrogen peroxide in living cells?
**Answer:** The enzyme catalase catalyses the decomposition of hydrogen peroxide in living cells.

<u>GCSE style questions</u>

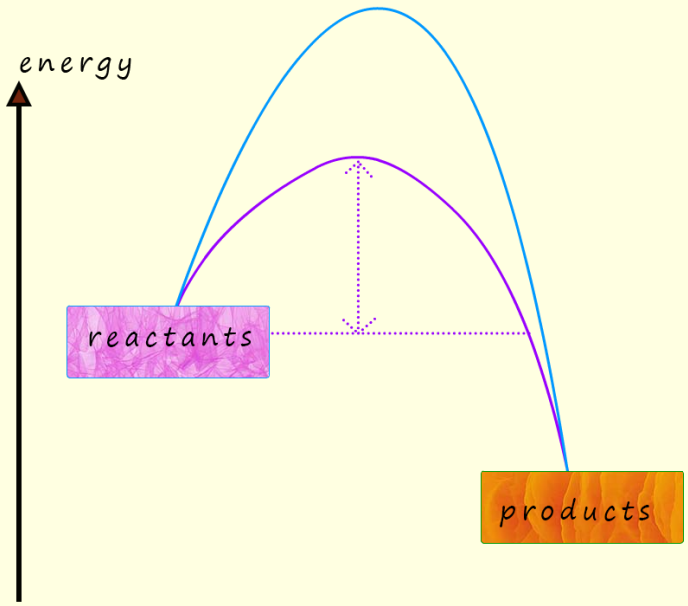
7. (a) A student investigates the decomposition of hydrogen peroxide using manganese dioxide as a catalyst. She measures the volume of oxygen gas produced over time.

(i) Write the balanced chemical equation for this reaction.
**Answer:** $2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$

(ii) Explain how the student could confirm that the gas produced is oxygen.
**Answer:** The student could use the glowing splint test. If a glowing splint is inserted into the gas and it relights, this confirms the presence of oxygen.

(b) The student repeats the experiment but adds twice as much manganese dioxide. Predict how the rate of reaction will change and explain why.
**Answer:** The rate of reaction will increase because more manganese dioxide provides more surface area for the reaction to take place, increasing the number of successful collisions per second.

8. The graph opposite shows the energy profile for an exothermic reaction taking place with and without a catalyst present.




(i) What does the purple coloured vertical dotted line represent?

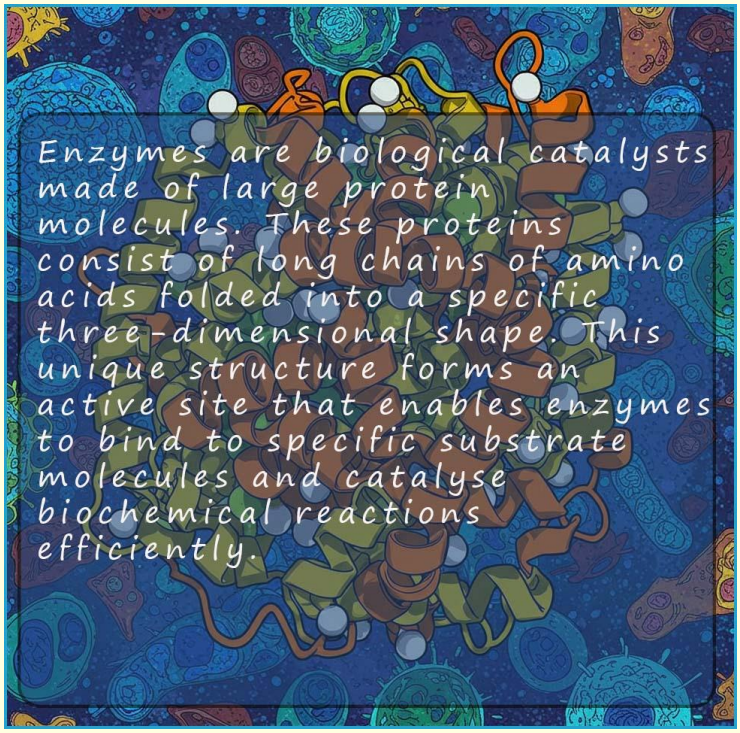
Answer: Activation energy for a catalysed reaction.

(ii) Explain how the catalyst affects the activation energy.

**Answer:** A catalyst lowers the activation energy by providing an alternative reaction pathway, making it easier for reactant molecules to collide with sufficient energy to form products.

9. Enzymes are biological catalysts. Explain how their structure allows them to catalyse specific reactions.

**Answer:** Enzymes have a specific active site that matches the shape of a particular substrate, similar to a lock and key. When the substrate binds to the active site, the enzyme facilitates the reaction and releases the products while remaining unchanged.




10. Describe two industrial uses of catalysts and explain why they are beneficial.

**Answer:** The Haber process uses an iron catalyst to produce ammonia for fertilisers. This speeds up production and reduces energy costs.

Catalytic converters in cars use platinum and rhodium to reduce toxic emissions, making cars more environmentally friendly.

11. Explain why some catalysts, such as platinum and rhodium, are expensive but still widely used in industrial applications.

**Answer:** Platinum and rhodium are expensive due to their rarity, but they are still used because they significantly increase reaction rates, lower operating temperatures, and improve efficiency. Over time, the cost of the catalyst is offset by energy savings and increased production rates.