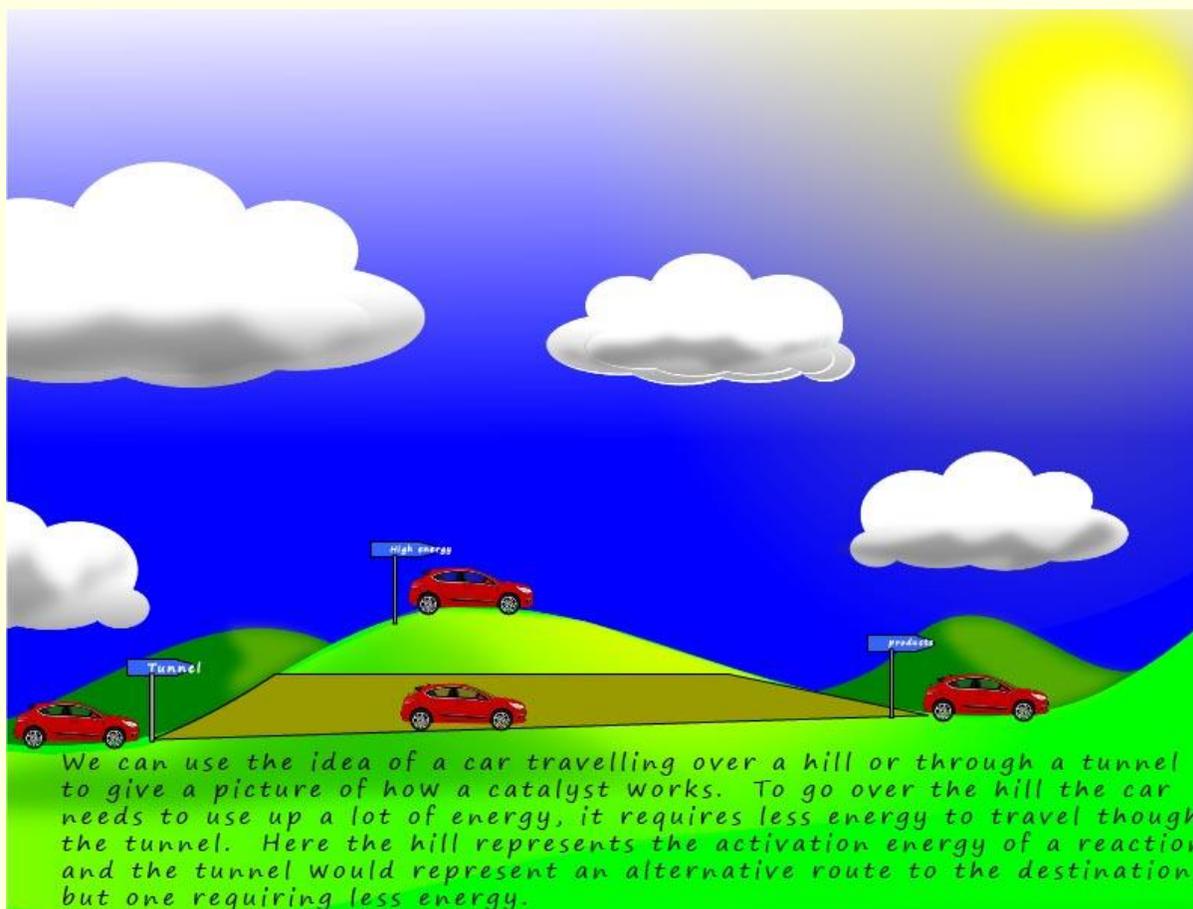


RATES OF REACTION

CATALYSTS

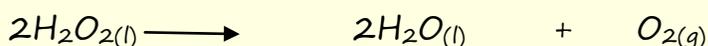
Answer all the questions below and then check your answers.

1. What is a catalyst?
2. Why are catalysts used in industry?
3. What does the phrase activation energy of a chemical reaction mean?
4. Use the diagram below to explain how catalysts work. Use the following words in your answer: activation energy, reactants, products, surface area.



5. When catalysts are used are they spread out thinly or used as large lumps? Explain your answer?
6. Why are only small amounts of a catalyst needed in any chemical reaction and why do they not need constant replacing?
7. What type of materials are commonly used as catalysts?
8. Hydrogen peroxide decomposes according to the equation below:

Hydrogen peroxide_(l) \longrightarrow hydrogen oxide_(l) + oxygen_(g)



- i. What catalyst is used to decompose hydrogen peroxide in the school lab?
- ii. How does this catalyst work?
- iii. How could you investigate how the amount of catalyst affects the rate of decomposition of hydrogen peroxide? Draw a diagram and explain how you would carry out the experiment.

Rates of reaction and catalysts

Answers

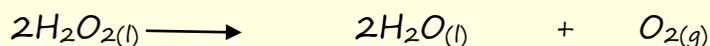
1. What is a catalyst? Substance that speeds up a chemical reaction by providing an alternative route from reactants to products that has a lower activation energy.
2. Why are catalysts used in industry? Speed up reactions, reduce costs, allow more products to be made, allow reactions to occur at lower temperatures, saves money and energy.
3. What does the phrase activation energy of a chemical reaction mean? Minimum amount of energy needed for reactant substances to collide successfully and turn into products.
4. Use the diagram below to explain how catalysts work. Use the following words in your answer: activation energy, reactants, products, surface area.



In the diagram the hill represents an energy barrier, similar to the activation energy in a chemical reaction. Without a catalyst the car (which represents the reactants) needs to use a lot of energy to get over the hill in order to form the products. The tunnel would represent the catalyst, it provides a way of getting from the reactants to the products by using a lot less energy, it lowers the activation energy of the reaction.

5. When catalysts are used are they spread out thinly or used as large lumps? Explain your answer? Catalysts are surface active agents, this means that reactions involving catalysts take place on the catalyst surface. This means they need as large a surface area as possible, so must be spread very thinly.
6. Why are only small amounts of a catalyst needed in any chemical reaction and why do they not need constant replacing? Catalysts are not used up in a chemical reaction. Reactants absorb onto the catalyst surface, react and then leave the catalyst surface. This happens millions of times every second. The catalyst is not used up, it only provides a surface for the reaction to occur on. Catalysts are always spread out thinly to increase surface area, so only a little is needed
7. What type of materials are commonly used as catalysts? Transition metals and transition metal compounds.
8. Hydrogen peroxide decomposes according to the equation below:

Hydrogen peroxide_(l) \longrightarrow hydrogen oxide_(l) + oxygen_(g)



- i. What catalyst is used to decompose hydrogen peroxide in the school lab? *Manganese dioxide is commonly used.*
- ii. How does this catalyst work? *Provides an alternative route from reactants to products which has a lower activation energy.*
- iii. How could you investigate how the amount of catalyst affects the rate of decomposition of hydrogen peroxide? *Draw a diagram and explain how you would carry out the experiment.*

