Catalysts and dynamic equilibrium

Student activity • observation and reasoning

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The question

Can equilibrium be reached sooner without moving it?

Analyse a paired rate model with and without a catalyst. Keep equilibrium position separate from the time taken to reach it.

Equipment

- Booklet, pencil, periodic table and optional molecular model kit

Desk activity only; keep small model pieces away from mouths.

Course coverage: Chemistry only: 3.21C. Qualitative graphs and particle reasoning.

Plan, model or apparatus sketch

Draw a labelled structure or model to explain your reasoning for this lesson.

Method and reasoning

Read the whole sequence before starting

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1. Draw concentration–time axes for a closed reversible reaction started with reactants.

2. Sketch a product curve approaching a horizontal plateau. Label it qualitative.

3. Add a catalysed curve that reaches the same plateau sooner at the same temperature.

4. Draw forward/reverse rate curves that become equal; do not set both rates to zero.

5. Explain how an alternative reaction pathway assists both directions.

6. Correct the claim that a catalyst permanently shifts equilibrium towards products.

Cleanup

• Return shared equipment and retain corrected reasoning.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Compare identical starting amounts, volume and temperature. Catalyst changes the approach time; the final equilibrium composition is unchanged. Qualitative sketches are not measured curves and no specific rate constants are supplied.

Task	My structure / working	Reason / correction
Concentration curves		
Rate curves		
Explanation		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What happens to equilibrium position with catalyst?

2. What happens to time to equilibrium?

3. Are forward and reverse rates zero at equilibrium?

4. Must reactant/product concentrations be equal?

5. Why must temperature be controlled?

6. Describe the two product curves.