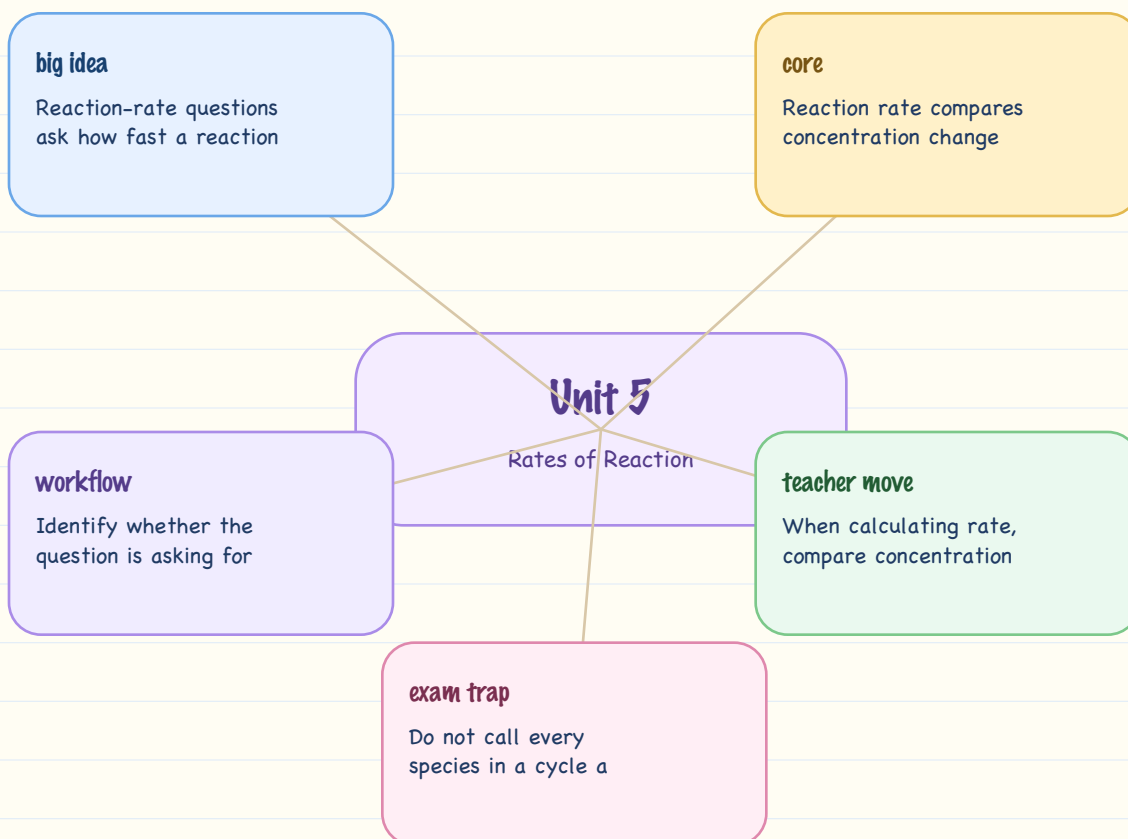


## Unit 5 Visual Notebook

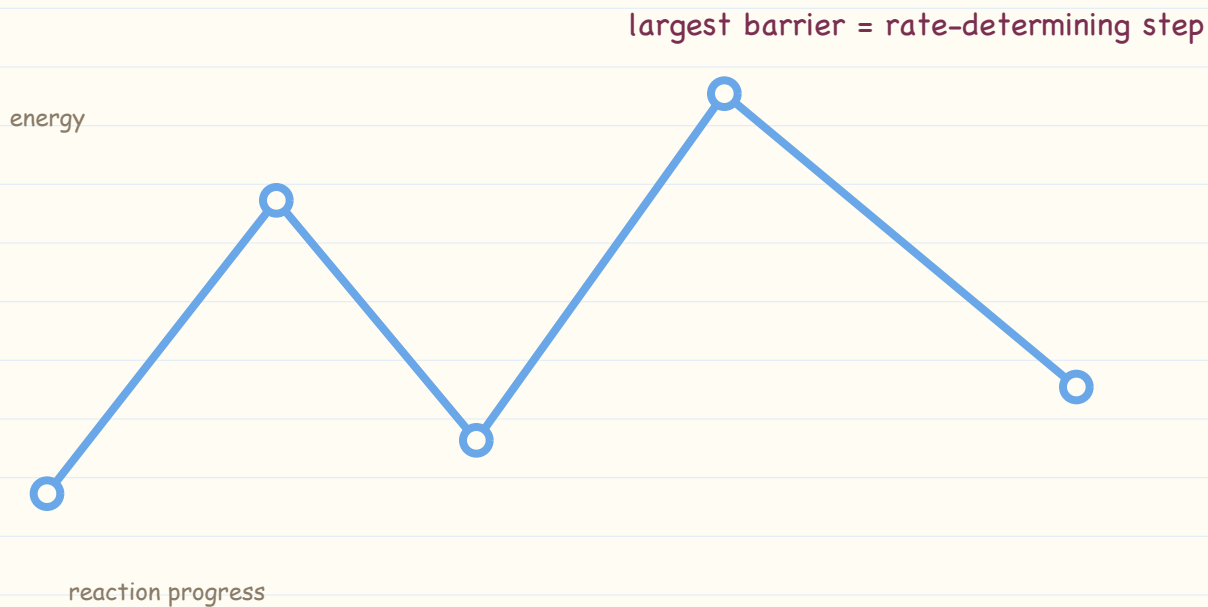
# Reaction Rates, Mechanisms, and Energy Diagrams

### DISTILLED FROM VIDEO

5 lessons, P97-P101. Diagrams summarize the same source-locked workflows.



# Visual Strategy



## Teacher routine

- Barrier = transition-state energy minus current state.
- Catalyst lowers activation energy and is regenerated.
- Explain rate changes using successful collisions.

# Cornell Notes

**cue**

Core idea

## Core idea

- Reaction rate compares concentration change with time.
- Collision theory explains rate changes using collision frequency, collision energy, and successful orientation.
- Temperature, concentration, surface area, and catalysts affect the number or success of collisions.

**cue**

Workflow

## Workflow

- Identify whether the question is asking for rate calculation, factor explanation, mechanism reading, or energy-barrier comparison.
- For mechanism diagrams, mark what enters, what leaves, what is regenerated, and what appears only in the middle.
- For energy diagrams, compute barriers by subtracting the reactant/intermediate energy from the transition-state energy.
- Use the largest barrier to locate the slow or rate-determining step.

**cue**

Teacher moves

## Teacher moves

- When calculating rate, compare concentration change over time.
- Explain rate changes using successful collisions.
- A catalyst changes the pathway and is regenerated overall.
- Activation energy is the barrier from the current state to the transition state.

# Cornell Notes

**cue**

Common traps

## Common traps

- Do not call every species in a cycle a catalyst; a catalyst must be regenerated overall.
- Intermediates are produced in one elementary step and consumed in another.
- A lower overall  $\Delta H$  does not automatically mean a faster reaction.
- The rate-determining step is about the highest activation barrier, not the most visually dramatic step.

## Example Cards

### example 1

Unit 5 rate calculation, P97

Average reaction rate

1. Rate compares concentration change with time.
2. If concentration changes from 0.80 mol/L to 0.50 mol/L in 30 s,  $\Delta c = -0.30$  mol/L.
3. Use the magnitude for average disappearance rate.
4. Rate =  $0.30 / 30 = 0.010$  mol/(L·s).

Answer: 0.010 mol/(L·s) for disappearance.

### example 2

Unit 5 energy-barrier strategy, P100-P101

Find the rate-determining step from an energy diagram

1. For each step, subtract the current valley energy from the next peak energy.
2. The biggest activation-energy barrier is the slowest step.
3. A catalyst lowers the barrier by changing the pathway.
4. Do not use overall  $\Delta H$  to decide the rate-determining step.

Answer: The step with the largest activation-energy barrier is rate-determining.