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5.5 Collision Model

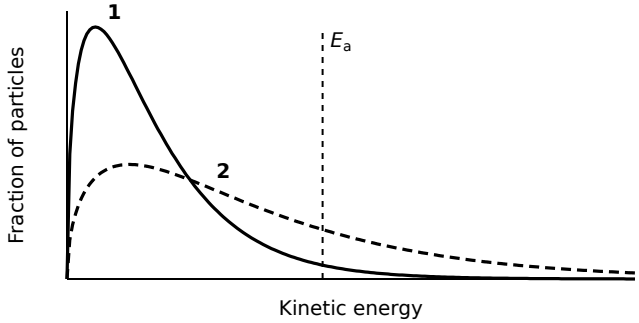
AP Chemistry

Explain each answer at the particle level. Connect every rate change to collisions and activation energy.

1. A collision between two reactant particles must pass two tests to be successful. Name both tests, and define activation energy, E_a.

2. Gas particles at room temperature collide billions of times every second, yet many gas reactions take minutes or hours. Explain how both facts can be true.

3. The graph shows the energy distributions of one gas sample at two temperatures.



(a) Which curve, 1 or 2, is at the higher temperature? Justify your answer.

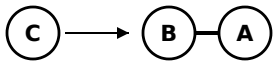
(b) Shade the region that represents particles that can react at the higher temperature.

(c) Use the graph to explain why the reaction is faster at the higher temperature.

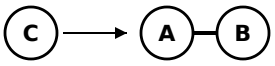
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4. Atom C reacts with molecule AB to form C–A and B. Both collisions below have more than enough energy.

Collision 1



Collision 2



Which collision can be successful? Explain why the other collision makes no products.

5. The concentration of reactant A is doubled at the same temperature.

(a) Explain why the reaction rate increases.

(b) Does the fraction of collisions that are successful change? Explain.

6. A student says, "Heating a reaction makes it faster mainly because the particles collide more often." Evaluate this claim.

7. A reaction mixture is moved from 40 °C to an ice bath at 0 °C. Predict what happens to the rate and explain using the collision model.

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