South Pasadena • AP Chemistry

Name ___________________________________

Period ___ Date ___/___/___

15 • Reaction Kinetics

RATE INTRO

We have all seen a lightstick.

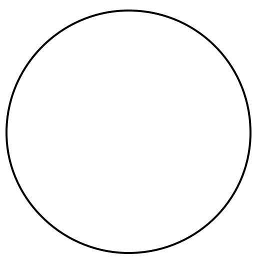
We know it glows when it is snapped & shaken?

Q: Why do you snap it?

Q: How long does it last?

Q: Is it always the same brightness?

1. Consider the lightstick used in class. How much of the chemicals inside the lightstick is used up in 10 minutes? (use pie chart)



2. IF the amount of chemical used up in 10 minutes were ¼ of the total, calculate the amount of chemical after each 10 mins?

0	100 mg
10	75 mg
20	
30	
40	
50	

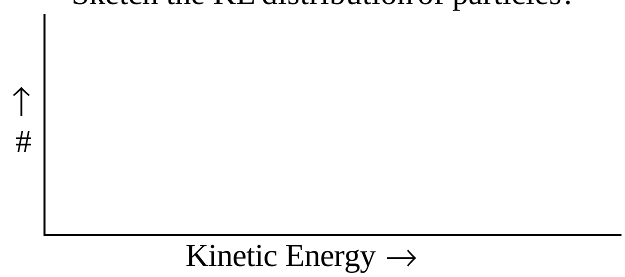
60	
70	
80	
90	
100	

3. IMPORTANT: Not all of the chemical is used up right away. In your mental model of the lightstick chemicals, what **keeps** the unreacted portion of the chemicals from reacting?

Ideas in Mr. Groves' mental model:

- ☐ particles must collide to react
- ☐ collisions must be hard enough to break bonds
- ☐ some particles have high KE, some have low
- ☐ temperature is a measure of the average kinetic energy of the particles

4. Sketch the KE distribution of particles:



Draw the curve.
Mark the "threshold energy."
Color in the particles that ***will*** react.

5. Using two different colors, add a curve to #4 showing the same chemicals at a **higher** temperature and a curve at a **lower** temperature.

6. The ***area under the curve*** must always be the same because it represents ___________
____

7. Predict what you will observe when we place one lightstick in hot water and one in cold water.

Why do we keep one lightstick at room temperature?

8. Q: WHY do particles have to hit with a certain amount of energy?
A: To get over the energy barrier (Activation Energy).

Sketch the Potential Energy of the **reactants** and **products** in the lightstick reaction:

Potential Energy →

reaction coordinate →

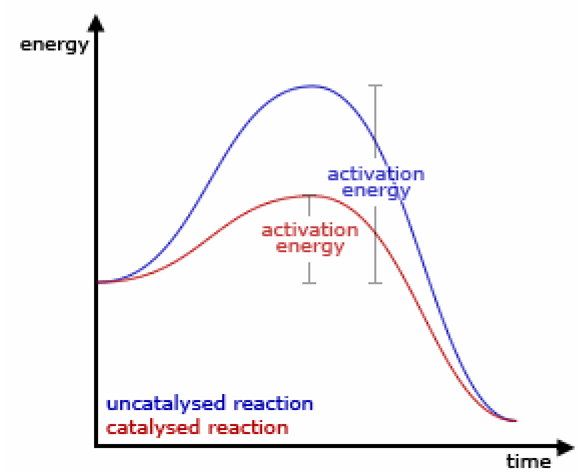
9. When the P.E. drops, energy is given off in the form of ______________.

10. Between the reactants and products there is an energy barrier. The energy needed to go from the reactants to the top of the barrier is called the:

_______________________ _____________

11. The particles get this energy by ______________ into one another hard enough. They exchange their _____ for _____.

12. A catalyst lowers this barrier.



Homework:

13. Graph the data from Question #2

14. If the “amount” of chemical were measured in milligrams, mg, what **units** would be used to describe the **rate** the lightstick chemical is being used?

15. What is the rate for the first 10 minutes of the lightstick (according to the data in #2).

16. What is the rate for the ***second*** 10 min? (Is this the same? greater? less?)

17. How long will the lightstick described in Question #2 continue to give off light?

18. What is the half-life of the lightstick?

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