

Chemistry 30
Unit 2: Chemical Kinetics
Assignment 3: 4-1 to 4-3

1. Explain why the rate of a chemical reaction increases as the concentration of the reactants increases.

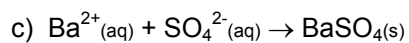
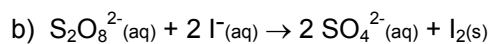
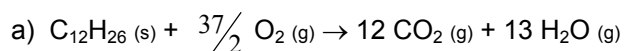
2. Consider two gases A and B in a container at room temperature. What effect will the following changes have on the reaction rate between these gases (increase, decrease, no effect)?

a) The pressure is increased.

b) The number of molecules of gas A is doubled

c) The temperature is decreased

3. Which of the following reactions will have the fastest rate? The slowest? **Explain**



Explanation:

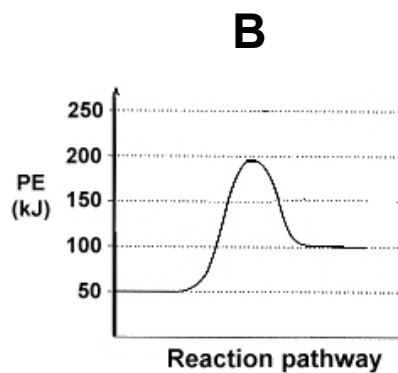
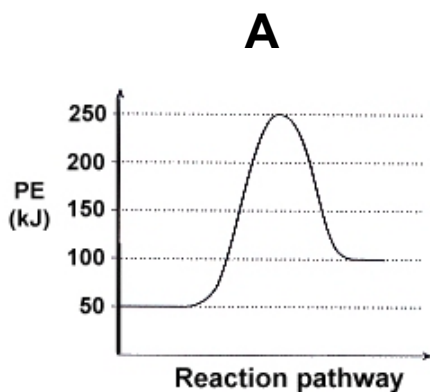
4. The series of steps by which an overall chemical reaction takes place is called the

Name: _____

5. The slowest step in the series of steps in a chemical reaction is called the

6. Define activation energy.

7. Consider the following potential energy diagrams which represent two chemical reactions. On the basis of these diagrams, which reaction would you expect to occur at a faster rate? Why?

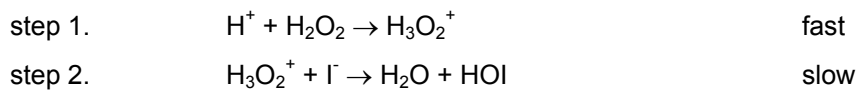


8. Which will react faster, zinc with 3 M hydrochloric acid or zinc with 1 M hydrochloric acid? Why?

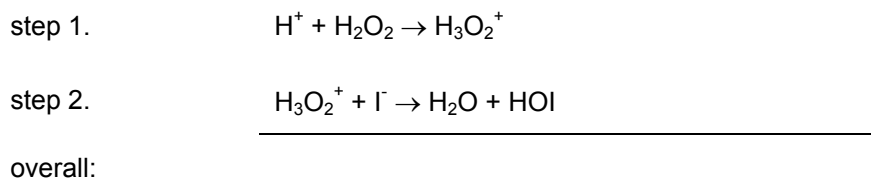
9. White phosphorus reacts immediately and rapidly with oxygen when exposed to air. What can you say about the amount of activation energy required for this reaction?

Name: _____

10. Hydrogen peroxide reacts with hydrogen ions and iodide ions according to the following reaction mechanism:



- a) Write the overall reaction described by this mechanism



- b) If you wanted to increase the rate of the overall reaction, would it be better to increase the concentration of H^+ or I^- . Why?

11. At 20°C, a small strip of magnesium reacts with 3.0 M hydrochloric acid to produce 12 mL of hydrogen gas in 20 s.

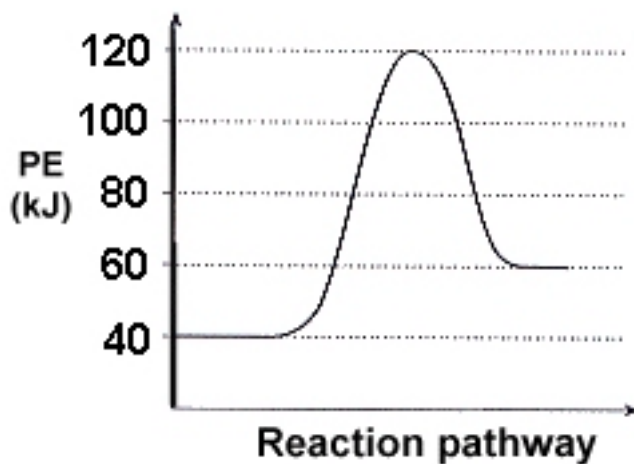
- a) Calculate the rate of this reaction.

- b) What volume of hydrogen might be produced in 20 s at 30°C?

hint – what change in temperature has occurred? What is the general rule for what happens to the rate with this amount of temperature change? At this new rate, how many mL will be produced in 20 seconds?

Name: _____

12. Consider the following potential energy diagram:



- a) Is the forward reaction endothermic or exothermic: _____
- b) Determine ΔH for the forward reaction: _____
- c) Determine ΔH for the reverse reaction: _____
- d) Determine E_a for the forward reaction: _____
- e) Determine E_a for the reverse reaction: _____
- f) Label the location of the activation complex in the diagram.
- g) Add to the diagram a possible pathway for a catalyzed reaction.

13. Sketch a potential energy curve for an reaction based on the information provided below.

Label the parts representing the activated complex, activation energy, and change in enthalpy, ΔH .

$$\Delta H_{\text{forward}} = -30 \text{ kJ}$$

$$E_{a \text{ reverse}} = +50 \text{ kJ}$$