FLINN SCIENTIFIC

Name_____

Enzyme Catalysis Worksheet

Questions — Activity 2

Part 1. General Reaction

a. What is the enzyme in this reaction?

b. What is the substrate in this reaction?

c. What are the products in this reaction?

d. How could you show that the gas generated in this reaction is oxygen?

Part 2. Boiled Catalase

How does the reaction compare to the one using the unboiled catalase? Explain the reason for this difference.

Part 3. Living Tissue

a. What do you observe?

b. Hypothesize what would happen if the living tissue were boiled before being added to the H_2O_2? Support your hypothesis using your observations from Activity 2.

Observations and Analysis — Activity 3

Table 1

	Time (seconds)							
	Baseline	**10**	**30**	**60**	**120**	**180**	**360**	**Uncatalyzed H_2O_2**
a) Baseline*	——							
b) Initial volume of $KMnO_4$ in buret (mL)								
c) Final volume of $KMnO_4$ in buret (mL)								
d) Amount of $KMnO_4$ consumed (mL) (line b – line c)								
e) Amount of H_2O_2 reacted (line a – line d)								

*Remember that the baseline tells how much H_2O_2 is in the uncatalyzed, control sample.

Activity 3 Questions

1. Calculate the baseline (line a) by subtracting baseline column line b from baseline column line c. Record the baseline value in all the line a boxes in Table 1.

2. Calculate the amount of $KMnO_4$ consumed by subtracting line b from line c in Table 1 for each trial. Record the value in all the line d boxes in Table 1. The difference between the initial and final readings on the buret also indicates how much H_2O_2 is left after the enzyme-catalyzed reaction. The shorter the time, the more H_2O_2 remains and therefore the more $KMnO_4$ is necessary to titrate to the end point.
3. Calculate the amount of H_2O_2 that has reacted by subtracting line d from line a in Table 1 for each trial. Record the value in all the line e boxes in Table 1.
4. What percent of the H_2O_2 spontaneously decomposes in 24 hours? Calculate the amount by dividing the uncatalyzed H_2O_2 decomposition (line d) by the number of days the beaker was allowed to decompose from Activity 1, then multiply by 100%.
5. Graph the data for enzyme-catalyzed decomposition of hydrogen peroxide on graph paper. *Hint:* See Figure 1 in the *Background* section.

   For this graph you will need to determine the following:

   a. The independent variable (*x* axis): _____

   b. The dependent variable (*y* axis): _____

Post-Lab Analysis and Conclusions

1. Determine the initial rate (0 to 10) of the reaction and the rates between each of the time points on Graph 1. Record the rates in the table below. See equation on page 3.

	Time Interval (seconds)					
	0 to 10	**10 – 30**	**30 – 60**	**60 – 120**	**120 – 180**	**180 – 360**
Rate*						

* Reaction rate (mL H_2O_2 consumed or reacted/sec)

2. When is the rate the highest? Explain.

3. When is the rate the lowest? Explain.

4. Why was sulfuric acid added to the reaction at specific times during Activity 3? Relate this to enzyme structure and chemistry.

5. Catalase was kept on an ice–water bath. Predict the effect lowering the temperature would have on the rate of enzyme activity. Explain your prediction.

6. Design a controlled experiment to test the effect of varying pH, temperature or enzyme concentration on the rate of an enzyme-catalyzed reaction. (Answer on a separate sheet of paper.)
7. A small portion of the human population has genetic disorders linked to malformed enzymes. If you were a carrier for an enzymatic genetic disorder that causes extreme mental retardation and death before the age of three, would you want to know? Explain the reasons behind your choice. (Answer on separate sheet of paper.)

Disposal

Consult your instructor for appropriate disposal procedures.