**The effect of enzyme concentration on the rate of a reaction STUDENT**

**Introduction**

Trypsin is a protease that catalyses the breakdown of other proteins. By making a serial dilution of Trypsin solution, you will observe the effect of changing enzyme concentration on the rate of a reaction.

**Aim**

* To investigate the effect of changing the enzyme concentration on the rate of milk protein breakdown by Trypsin.

**Intended class time**

* 1 hour

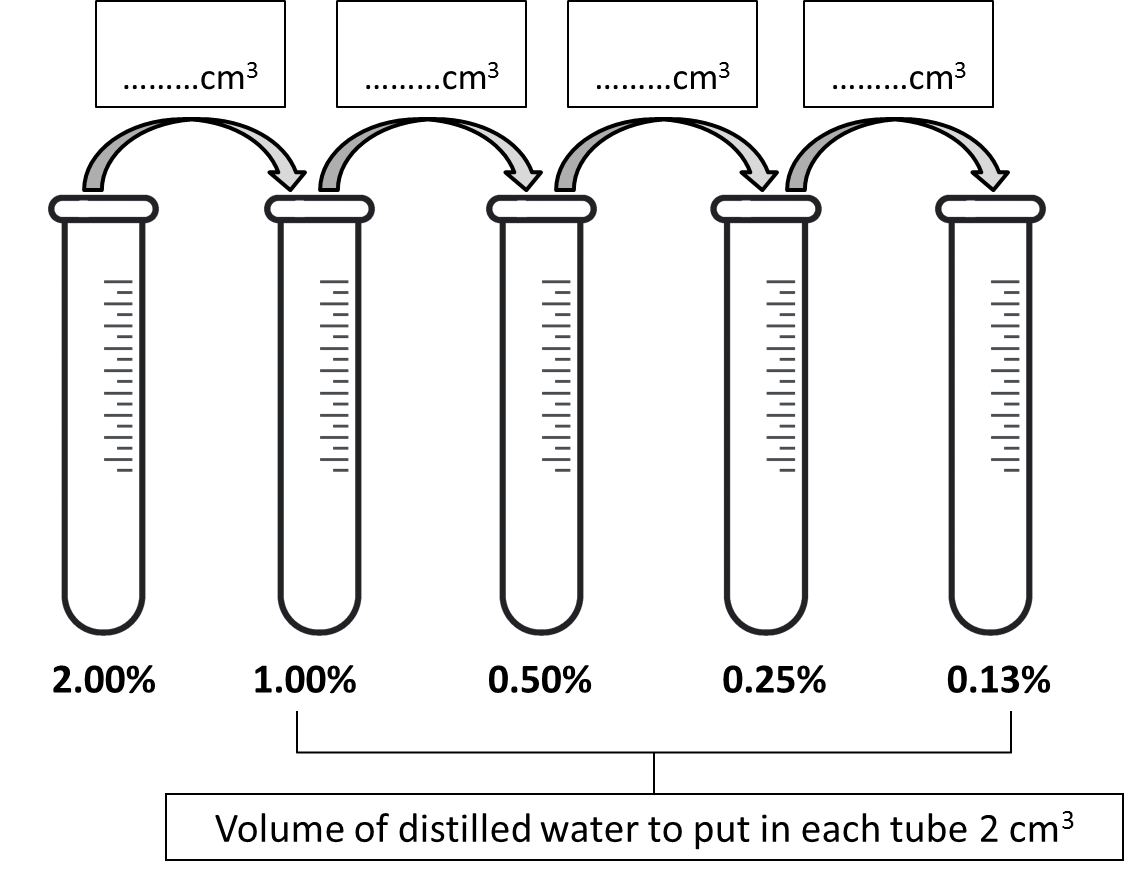
**Equipment**

* Milk powder solution
* 2 % Trypsin solution
* Distilled water
* 5 cm3 syringes
* 4 boiling tubes for the serial dilution
* 5 boiling tubes for the main practical
* Stopwatch/timer
* Marker pen
* PAG4.2 OCR Observation Sheet

**Method**

*Note: In this activity you will measure the time taken for a reaction to reach a standardised endpoint. The rate of the reaction will be calculated as 1/time to end point.*

1. Serial Dilution: First you need to prepare the following concentrations of enzyme solution: 1.00%, 0.50%, 0.25% and 0.13% by using the 2.00% Trypsin solution and distilled water. Use the following diagram to help you:



1. Label five boiling tubes with the Trypsin concentrations you have prepared and place 2 cm3 milk powder solution into each.
2. Hold one of the tubes up against the Observation Sheet. You should not be able to see the text through the milk solution.
3. Add 2 cm3 of 2.00% Trypsin solution to the boiling tube labelled 2.00% and immediately start the stopwatch.
4. Hold the tube up against the Observation Sheet and stop the timer once the writing becomes visible.
5. Record your result in a suitable table. Include a column for rate of reaction.
6. Repeat steps 3 - 5 for the other four concentrations, 1.00%, 0.50%, 0.25% and 0.13%.
7. Plot a graph of time versus enzyme concentration.
8. Finally, plot a graph of rate of reaction versus enzyme concentration.

**Extension questions**

1. What variables were controlled in this practical activity?
2. What could you have done to improve the validity of your results?
3. Discuss this activity with the rest of the class. Did everybody get a similar result?
4. What conclusions would you draw from this practical activity?

**To submit**

For this piece of work to count towards Practical Activity Group 4 of the GCE Biology Practical Endorsement, you should have evidence showing your serial dilution volumes and an appropriate and complete results table and a graph. You also need to have considered the above questions as the answers to these questions will aid you in preparation for your written examinations.