

## Investigating Factors Affecting Enzyme Activity

/32 marks

Nearly all organisms produce the enzyme catalase. Catalase breaks down hydrogen peroxide as it forms and converts it to oxygen. In this lab activity you will look at the effects of temperature and pH and their effect on the enzyme catalase.

### Materials

|                   |                   |                     |
|-------------------|-------------------|---------------------|
| Hydrogen Peroxide | Distilled Water   | Raw Peeled Potatoes |
| Ice               | Hydrochloric Acid | Sodium Hydroxide    |
| Test Tubes        | Test Tube Rack    | Graduated Cylinder  |
| Stirring Rod      | Beakers           | Beaker Tongs        |
| Test Tube Tongs   | Hot Water Bath    | pH Indicator        |

### Procedure

#### Catalase under normal conditions

- 1) Label three test tubes 1, 2, and 3. Place 2mL of hydrogen peroxide in test tube 1. Place 2 mL of water in test tube 3.
- 2) Cut a small piece of potato and add it to test tube 1. Use the stir rod to push the potato into the hydrogen peroxide and observe the bubbling that results. During the lab you will rate the reactions on a scale of 0 (no reaction) to 5 (very vigorous reactions). Rate this reaction a 4 in your data chart.
- 3) Once the bubbling has stopped pour the liquid from test tube 1 into test tube 2. Add a fresh piece of potato. Record your observations in the chart below.
- 4) Add 2mL of hydrogen peroxide to test tube 1, still containing the potato from still containing the used potato from step 2. Record your observations.
- 5) Cut another piece of potato and place it into test tube 3 along with 2 mL of distilled water. Push it in with a stirring rod and record your observations in the chart below.

#### Effects of temperature on catalase

- 1) Locate a boiling water bath that has been prepared by your teacher.
- 2) Prepare your own ice-water bath by filling a beaker half full of ice and half full of water.
- 3) Prepare a third bath by half-filling a beaker with room temperature water.
- 4) Label three test tubes 1, 2, and 3. Place a small piece of potato in each test tube and cover with a small amount of distilled water.
  - Test tube 1: Place this test tube in the boiling water bath for 5 minutes. Then use tongs to remove the test tube to the rack. Allow it to cool and pour off the water.
  - Test tube 2: Place the test tube in the ice-water bath and leave for five minutes. Remove before you perform step 5.
  - Test tube 3: Place the test tube in the room temperature water bath. Remove before you complete step 5.
- 5) To each test tube add 2 mL of hydrogen peroxide. Record your observations in the chart below.

### Effects of pH on catalase

- 1) Label three test tubes 1, 2, and 3.
  - Test tube 1: Add 2mL of hydrogen peroxide and 1 mL of distilled water.
  - Test tube 2: Add 2mL of hydrogen peroxide and 1 mL of HCl.
  - Test tube 3: Add 2 mL of hydrogen peroxide and 1 mL of NaOH.
- 2) Use a clean stirring rod or dropped to take a drop from each and place it on the indicator paper. Record your observations in the chart.
- 3) Add a small piece of potato to each test tube and record your results.

### Observations (10 marks)

| Part   | Substance Tested                                       | Rate of Reaction (0 to 5) | Other Observations |
|--------|--|---------------------------|--------------------|
| Part 1 | Potato and fresh hydrogen peroxide (test tube 1)       |                           |                    |
|        | Fresh potato and liquid from test tube 1 (test tube 2) |                           |                    |
|        | Used potato and fresh hydrogen peroxide (test tube 1)  |                           |                    |
|        | Potato and water (test tube 3)                         |                           |                    |
| Part 2 | Boiled potato (test tube 1)                            |                           |                    |
|        | Ice bath potato (test tube 2)                          |                           |                    |
|        | Room temp. potato (test tube 1)                        |                           |                    |
| Part 3 | Basic solution (test tube 1)                           |                           |                    |
|        | Acidic solution (test tube 2)                          |                           |                    |
|        | Neutral solution (test tube 3)                         |                           |                    |

### Lab Skill and Clean-Up

10 marks

