FLINN SCIENTIFIC

Name_____

# Essential Protein and Enzyme Demonstrations Worksheet

## Demonstration #1 — pH and Protein Solubility

### Data Table 1

| Chemical Added to Casein | Observations | Approximate pH |
|---|---|---|
| 250 mL of 0.01 M Sodium Hydroxide | | |
| 10–15 mL Hydrochloric Acid | | |
| 15–20 mL Hydrochloric Acid | | |
| 20–30 mL of Sodium Hydroxide | | |

## Demonstration #2 — Digestive Enzymes at Work

### Data Table 2

| Beaker Contents | Observations |
|---|---|
| Protein, water, and biuret | |
| Protein, pepsin, and biuret | |
| Starch, water, and iodine | |
| Starch, amylase, and iodine | |

## Demonstration #3 — The Floating Catalyst

### Data Table 3

| Beaker | A | B | C | D |
|---|---|---|---|---|
| **Concentration of $H_2O_2$** | | | | |
| **Average Reaction Time** | | | | |
| **Average Rate (1/Time)** | | | | |

## Questions

**Demonstration #1**

1. Casein has both acidic side chains and basic side chains. At a high (basic) pH, ionization occurs in the acidic chains. At a very low (acidic) pH, protonation occurs in the basic chains. Do you think casein is most soluble with a net charge that is positive, negative, or around zero? Why?

2. A protein's isoelectric point is the pH at which the protein has a net charge of zero. Approximate the isoelectric point of casein.

**Demonstration #2**

3. Compare and contrast the observations of the biuret test results. Describe the evidence, if any, for the digestion of protein using pepsin.

4. The pepsin solution was prepared using 0.01 M hydrochloric acid in order to optimize the pepsin enzyme. Why was this necessary?

5. Compare and contrast the iodine test results for starch and starch/amylase. Explain the test results based on the activity of amylase.

**Demonstration #3**

6. What is the purpose of catalase in the human body?

7. Create a graph comparing the Average Reaction Rate to the Concentration of $H_2O_2$ (%).

8. Examine the graph from Question 7. How does the reaction rate change at high versus low concentrations of hydrogen peroxide?