**Acids and Bases**

Scientists describe the strength of acids and bases (or alkalis) by their pH. The pH scale measures the concentration of hydrogen ions (H+) on a scale between 0 and 14. Acids have a pH less than 7, while bases have a pH greater than 7.

Test the pH for the following solutions using a pH test strip.

|  |  |  |
| --- | --- | --- |
| **Solution** | **pH** | **Acid/neutral/base** |
| **Vinegar** |  |  |
| **Coffee** |  |  |
| **Orange juice** |  |  |
| **Coca cola** |  |  |
| **Cordial** |  |  |
| **Milk** |  |  |
| **Tap water** |  |  |
| **Lemonade** |  |  |

On the pH scale below show the position of all of the substances from the table above. Also add blood (pH 7.4), stomach acid (pH 3), urine (pH 6) and sweat (pH 5).

**10.5**

**14**

**3.5**

**7**

**0**

**Simulation of Digestion**

Digestion is the process of breaking down food into molecules that are small enough to be digested. The aim of this activity is to simulate the digestive process.

**Materials**

|  |  |
| --- | --- |
| 1 baby carrot (canned) | 10 mL of 0.5% amylase solution |
| Knife and cutting board | 10 mL measuring cylinder |
| Small zip-lock bag | Gauze square |
| 1M HCl | Filter funnel |
| 1M NaOH | Funnel stand |
| 10 mL of 0.5% pepsin solution | 200 mL beaker |
| 10 mL of 0.5% trypsin solution | Pasteur pipettes |
|  |  |

**Procedure**

Organ:

Process:

1. Chop the carrot with the knife on the chopping board
2. Scrape the carrot into the ziplock bag

Why is chewing important?

Organ:

Process:

1. Pour 10mL of pepsin into the bag
2. Add 3 drops of HCl
3. Seal the bag
4. Massage the bag for 5 minutes to mix the contents

Why was HCl added?

1. Carefully open the bag and pour in 10 mL of trypsin and 10 mL of amylase
2. Add 3 drops of NaOH

Organ:

Process:

1. Seal the bag
2. Massage the bag for 5 minutes to mix the contents

Why was NaOH added?

1. Set up the filter apparatus with three layers of gauze in the funnel
2. Filter the contents of the bag

Organ:

Process:

What does the residue left in the filter represent?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nutrient | Organs where digestion occurs | Enzymes used to breakdown nutrient | Organ that produces enzymes | End product |
| Carbohydrates |  |  |  |  |
| Proteins |  |  |  |  |
| Lipids (fats and oils) |  |  |  |  |
| Vitamins/ Minerals / Water |  |  |  |  |

Complete the following table to summarise the digestive processes.

**The effect of pH on Protein Digestion**

Pepsin is the active form of the enzyme pepsinogen that is secreted in the stomach. Pepsin is a protease, which is an enzyme that digests proteins.

**Materials**

|  |  |
| --- | --- |
| Cooked egg white | 2M HCl |
| Three test tubes | 2M NaOH |
| Knife | 10 mL measuring cylinder |
| 30 mL of 1% pepsin | Distilled water |

**Procedure**

1. Label five test tubes: acidic, neutral, basic, acidic/no enzyme, eggwhite only
2. Fill the test tubes as shown in the table below:

|  |  |  |
| --- | --- | --- |
| A | Acidic | 10mL of pepsin, 4 drops of HCl |
| B | Neutral | 10mL of pepsin, 4 drops of distilled water |
| C | Basic | 10mL of pepsin, 4 drops of NaOH |
| D | Acidic/No enzyme | 10mL of distilled water, 4 drops of HCl |
| E | Eggwhite only | 10mL of distilled water |

1. Cut five thin slices of egg white. Each slice should be about the same size.
2. Add one slice to each test tube.
3. Leave overnight.

**Results**

1. Write a hypothesis for this experiment.
2. What is the independent variable in this experiment?
3. What is the dependent variable in this experiment?
4. List three variables that were controlled in this experiment.
5. Why were 4 drops of distilled water added to the neutral test tube?
6. Why were test tubes D and E included in the experiment?
7. Were all of the variables in this experiment adequately controlled?
8. Record your results in the table below.

|  |  |  |
| --- | --- | --- |
| A | Acidic |  |
| B | Neutral |  |
| C | Basic |  |
| D | Acidic/No enzyme |  |
| E | Eggwhite only |  |

1. Do the results support the hypothesis?