ACTIVITY 1 DIGESTION OF CARBOHYDRATES

Materials
- Test tube rack
- Six test tubes
- Wax Pencils
- 37°C water bath
- Hot plate
- 400 ml beaker w/ DI water

Solutions
- Starch solution
- Amylase
- Lugol's Iodine
- Benedict's reagent

Procedure
1. Number the test tubes C1 to C6 with the wax pencil.
2. Add 2 ml of the starch solution each to C1 and C2.
3. Add 2 ml of amylase solution to C1.
4. Add 2 ml of DI water to C2.
5. Place C1 and C2 in the test tube rack inside the 37°C water bath and leave them in there for 30 minutes. Use the colored tape provided to differentiate between groups.
6. Remove C1 and C2 from the 37°C water bath. Mix the contents of each tube thoroughly.
7. Divide C1 equally into C3 and C4.
9. To test for the presence of starch, add one to two drops of Lugol's Iodine into tubes C3 and C5. A dark blue to black color indicates starch is present, while a light brown indicates no starch. Record your results in Table 1.
10. To test for the presence of monosaccharides, add 10 drops of Benedict's reagent to tubes C4 and C6. Gently swirl the tubes to mix then set them in a boiling water bath for three to five minutes. Record your result in Table 1.
   a. Blue (-) negative result, no sugars present
   b. Green (+) low sugar concentration
   c. Yellow (++) moderate sugar concentration
   d. Orange (+++) high sugar concentration
   e. Red (++++) saturated sugar concentration

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Digestion of Starch by Amylase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lugol's Test for Starch</td>
<td>Benedict's Test for Sugars</td>
</tr>
<tr>
<td>Starch + amylase (Tube C3)</td>
<td>Starch + amylase (Tube C4)</td>
</tr>
<tr>
<td>Starch + water (Tube C5)</td>
<td>Starch + water (Tube C6)</td>
</tr>
</tbody>
</table>

All tubes tested with Lugol's Iodine must be discarded into the Iodine waste bottle.
All tubes tested with Benedict's Reagent must be discarded into the Benedict's waste bottle.

This handout was made to go along with Exercise 42 in the Laboratory Manual for Anatomy & Physiology by Michael G. Wood. Inspiration and changes were from Exploring Anatomy & Physiology in the Laboratory, 2nd edition by Erin C. Amerman.
ACTIVITY 2 DIGESTION OF LIPIDS

Materials
- Test tube rack
- Four test tubes
- Wax Pencils
- 37°C water bath

Solutions
- Litmus cream
- Lipase solution

Procedure
1. Label the test tubes L1, L2, L3, and L4.
2. Fill each tube approximately a quarter full, or 2-3 ml, of heavy cream.
3. Add 1 ml of lipase to tubes L1 and L2.
4. Add 1 ml of DI water to tubes L3 and L4.
5. Add a pinch of bile salts to tubes L1 and L3.
6. Record the smell and color of the solutions in the test tubes under the “Start” columns of Table 2.
7. Incubate the test tubes for one hour in the 37°C water bath.
8. After one hour, remove the test tubes and place them in the test tube rack.
9. Carefully smell the solutions by wafting the fumes from each tube toward your nose. Do not directly smell the contents in the test tube.
10. Record the smell and color of the solutions under the “End” columns of Table 2.
11. The litmus cream (indicator) is red in acidic conditions and blue in basic conditions.

Please note, the color of the solution may not be the best indicator that the reaction has worked. As the cream breaks down into fatty acids, the solution will become more soluble to the indicator. A change in texture and in smell will tell you that the experiment worked, regardless of the change in color.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Digestion of Lipids by Lipase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Smell</td>
</tr>
<tr>
<td></td>
<td>Start</td>
</tr>
<tr>
<td>Cream + Lipase + Bile Salts (L1)</td>
<td></td>
</tr>
<tr>
<td>Cream + Lipase (L2)</td>
<td></td>
</tr>
<tr>
<td>Cream + Water + Bile Salts (L3)</td>
<td></td>
</tr>
<tr>
<td>Cream + Water (L4)</td>
<td></td>
</tr>
</tbody>
</table>

Collect all contents in the **Cream Waste Bottle**. Rinse once, and then clean with soap and water in the sink.

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ACTIVITY 3 DIGESTION OF PROTEINS

Materials

- Test tube rack
- Three test tubes
- Wax Pencils
- 37°C water bath
- pH paper

Solutions

- Protein solution
- Pepsin
- 0.5 M Hydrochloric Acid
- Biuret reagent

Procedure

1. Number two test tubes P1, P2, and P3.
2. Add 2 ml of protein solution to each.
3. Add 1 ml of pepsin solution to tubes P1 and P2.
4. Add 1 ml of 0.5 M HCl to P1 and P3.
5. Add 1 ml of DI water to P2 and P3.
6. Use the pH paper to determine the pH in both test tubes. Record the results in Table 3.
7. Place each tube in the 37°C water bath for one hour.
8. Remove and place the test tubes into the test tube rack. Add 5 drops of Biuret reagent to each test tube.
9. Record the color change in Table 3. The presence of amino acids is indicated by a light pink to lavender color. Undigested protein is indicated by a dark purple color.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Digestion of Proteins by Pepsin</th>
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<tbody>
<tr>
<td>pH</td>
<td>Color Change</td>
</tr>
<tr>
<td>Protein + Pepsin + HCl (P1)</td>
<td></td>
</tr>
<tr>
<td>Protein + Pepsin + Water (P2)</td>
<td></td>
</tr>
<tr>
<td>Protein + Water + HCl (P3)</td>
<td></td>
</tr>
</tbody>
</table>

All tubes tested with **Biuret reagent** must be discarded into the **Biuret waste bottle**.