The C² Pipeline is a Wayne State University, College of Nursing, S.T.E.M. Accredited Program
Funded as a 21st CCLC program through the Michigan Department of Education

Perform the activity first:

**Materials:**
- Phenolphthalein pH Indicator (I)
- Cotton Swab
- Ammonia Solution – Liquid 1
- Vinegar – Liquid 2
- White paper

**Procedure:**
1. Dip the cotton swab into the ink (I)
2. Wave the paper back and forth until it is dry
3. Write your secret message on the paper with the cotton swab
4. Spray the paper with the ammonia solution (1)
5. Wave the paper back and forth until it is dry
6. Spray the dry paper with the vinegar (2)

**How it works:**

An acid–base indicator is a substance that changes color as a result of a change in pH. For example, phenolphthalein is colorless below pH 8.2 and pink above pH 8.2. The ammonia solution is basic due to release of hydroxide ions. The presence of hydroxide ions results in phenolphthalein changing color from colorless to pink. The message slowly fades because carbon dioxide in the air dissolves in the solution to produce carbonic acid. The ink disappears when sprayed with the vinegar because the ammonia solution is neutralized by the acetic acid in vinegar.
Invisible Ink Observation Sheet

Name(s):  

Fill in the following table as you perform the experiment.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Finding</th>
<th>Why do you think this happened?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What happened when you wrote your secret message on the paper with the ink?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What happened when you sprayed the ink with the ammonia solution?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What happened when you sprayed the ink with the vinegar solution&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Wayne State University, College of Nursing
C² Pipeline Innovation and Curiosity Center

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