Experiment 13 Worksheet: Hard Vs. Soft: How Do You Like Your Water?

**Purpose:** *(A statement should be made here regarding what your experiment is designed to accomplish.)*

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________________________________________________________________________
________________________________________________________________________
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________________________________________________________________________

**Procedure:** *(Describe here how you went about completing your experiment. Use enough detail that someone could repeat it, if necessary. Also reference any books or manual you may have used to assist you.)*

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________________________________________________________________________

**Data:** *(Note: in the following tables, D = distilled water, T = tap water, W = well water and H = artificial hard water.)*

Describe the appearance of the watch glasses for D and T. Give the reason for any differences.

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________________________________________________________________________

*(Complete the Table using experimental results)*

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Water</th>
<th>Appearance</th>
<th>Reaction Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BaCl₂</td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Record mL of soap/detergent needed to form persistent foam.

Soap: D = _____ mL T = _____ mL
Detg: D = _____ mL T = _____ mL

Reason for differences:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Record mL of soap solution used to form a foam after water has been treated with the reagent.

Na$_2$CO$_3$: D = _____ mL T = _____ mL
Na$_2$B$_4$O$_7$: D = _____ mL T = _____ mL

Which is the more effective softener?
________________________________________________________________________
________________________________________________________________________
Conclusions: (Summarize your results here and discuss possible errors that may have occurred during the testing.)