You will try to find the actual stoichiometry of a chemical reaction between the Ni²⁺ cation and a material called Dimethylglyoxime (DMG)

The (unbalanced) chemical equation is:

\[ \text{Ni}^{2+} (\text{aq}) + z \text{ DMG} \rightarrow \text{Ni(DMG)}z \text{ (red solid)} \]

In this experiment you will be working in pairs to provide data for the whole lab. Your data will become part of a graph from which we will be able to find the “Z” value.
Week 9 – Experiment 7 : REACTION PROPORTIONS

From the Lab Manual:

**Concepts**
- Relationship of amount of product to amounts of reactants used
- Limiting reagent
- Moles as a useful way of expressing composition

**Techniques**
- Quantitative measurement of reactants used from volume or mass of solution used
- Quantitative precipitation and measurement
- Microwave drying of products

**Analysis**
- Data pooling
- Graphical visualization of data

Week 9 – Experiment 7 : REACTION PROPORTIONS

Each pair of students will be given an “assignment number” which will differ from others by the amount of NiCl₂·6H₂O to be used in the experiment.

<table>
<thead>
<tr>
<th>Assignment number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of NiCl₂·6H₂O Solution, mL</td>
<td>2.00</td>
<td>4.00</td>
<td>6.00</td>
<td>8.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Volume of DMG Solution, mL</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Make sure you include your Assignment Number on your Data Report Sheet for handing in.
Ni$^{2+}$ and Dimethylglyoxime – The Reaction Procedure

**Techniques this week:**

Measuring liquid volumes with a syringe (takes practice)

Use of concentrated acid – do this in the fume hood and be careful!

Heating reaction in a water bath

**The Reaction:**

- **Be careful:** make sure that your test tube and ring clamp are held securely to avoid accidents.

- **Wear goggles** throughout this experiment since any time you heat solids and liquids there is a chance of the mixture boiling over.

- **Pay attention** throughout the heating process and make sure that the reaction does not “take off” by becoming too hot. Do not allow your water bath to go dry.

There are hints on how to do this experiment on the 1515L web page.
Ni$^{2+}$ and Dimethylglyoxime – Filtering and Drying

Filtering and Drying

You use a Gooch crucible and filter paper to isolate your product. The Gooch crucible sifts through the air that the solid product is suspended in that it's made of suction.

The filtrate is carried out using a Buchner flask and vacuum suction that are induced by a vacuum pump or filter flask. This is the way the suction is applied to speed up your filtration.

When you have the sample filter out the crucible at room temperature in order to wash the sample on the crucible and then heat it on a hot plate for a further 5 minutes in order to accelerate the drying process. This is the way you can heat the crucible and not damage it.

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There are hints on how to do this experiment on the 1515L web page.

Techniques for filtering/drying:

Filtering with a Gooch crucible and filter paper

Use of a vacuum flask to collect the solution

Heating product in a microwave oven to make sure it’s dry

Ni$^{2+}$ and DMG – Filtering and Drying

Filtering and Drying the Product:

- You need to use a preweighed Gooch crucible (it has holes at the bottom) and filter paper in order to collect your solid product. The filter paper needs to be in the crucible before you get the initial weight (before filtering).

- You filter your red solid using the Buchner flask and vacuum adaptor; make sure the solid is as dry as possible at this point.

- To completely dry the red solid you use the microwave oven; be careful not to heat too high too quickly.
Ni$^{2+}$ and DMG – Compilation of Data

**Data Compilation:**

- Once you have your final (constant) weight of red solid, you will write that number under the appropriate column in the table on the chalk board.

- Once all the data is collected, you will get the class average mass for each Assignment Number.

- If time permits, you will graph the data using the MicroLab software to complete the exercise and find “Z” for the Ni$^{2+}$/DMG reaction. If we run out of time, this is what we will begin with next week; there is a link on the experiment page with instructions for using the graphing software.

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**For Next Lab Session:**

- Read all of the material available (Lab Manual and Website) related to the data analysis using the MicroLab software.

- Email me with any concerns.