Methods

The methods section of a scientific paper describes all of the experimental procedures and equipment used throughout the research. The goals of the methods section are to: 1) provide enough detail for someone else to duplicate your work, and 2) explain why each procedure was done.

While this is a very straightforward section of the paper, it can still be challenging to write. This is also one of the first sections you will write based off of the procedure you developed to perform the experiment.

Content

Use the following information to help guide your writing of the methods section:

- Describe all procedures and WHY they were done. Simple laboratory procedures (i.e. finding the mass) don't need to be explained, but should still be mentioned.
- Any mathematical procedures should also be described at the appropriate time. What calculations did you do and why?
- Describe the equipment that you used, especially if it is important to the experiment. Describe any special reasons for choosing equipment. Ordinary equipment does not need to be explained.
- Drawings of any experimental apparatus are appropriate, but should be labeled and referenced in the text.

Guiding Questions

- What did you do and why?
- What materials/equipment were used?
- How/why were these used?
- How much?, How long?, etc.
- What mathematical calculations did you perform? Why?

Style

- Use the past tense and avoid first person.
- Describe procedures as if conducting the experiment.
- Write in paragraphs like any other paper. Do not give procedures as an enumerated list.
- Chemical symbols and numbers with units are perfectly acceptable!
- Proofread carefully! Be concise and as clear as possible. This section should be easily readable.

Writing Methods and Procedures

Write out a first draft of a methods section using the procedure from the Synthesis of a Copper Compound lab. Remember to explain why different steps were done! Use the following examples to help.

Examples

Use past tense and avoid first person.

"The 3.0 M HCl was added to the zinc metal in a 150 mL beaker."	**NOT**	"I added 3.0 M HCl to the zinc metal in a 150 mL beaker." OR "Add 3.0 M HCl to the zinc metal in a 150 mL beaker."

Explain experimental procedures.

"The $CaCO_3$ was placed in a drying oven for 3 hours to remove excess water."	**NOT**	"The $CaCO_3$ was placed in a drying oven."

Synthesis of a Copper Compound

1. Weigh between 1.8-2.2 g of copper (II) sulfate pentahydrate to the nearest 0.01 g. Be sure to use proper procedure for the balance used. Record the mass of copper (II) pentahydrate.
2. Transfer the chemical to your 150-mL beaker. Add 10 mL of distilled water to the beaker. Swirl or stir to completely dissolve the solid.
3. Add 10 mL of 6.00M NaOH to the solution in the beaker, and carefully swirl or stir to mix. **CAUTION:** 6M NaOH is very caustic and will burn your skin!
4. Place the beaker on a hot plate or a ring stand with wire gauze. Cover the beaker with a watch glass to cover. Heat the mixture to the boiling point. Try to avoid spattering, especially on the watch glass. If spattering occurs use a wash bottle to wash all the solid back down into the solution. Heat until the blue solid has been completely decomposed to copper (II) oxide. Allow the mixture to cool.
5. Weigh a piece of filter paper. Use gravity filtration to obtain the product. Be patient and add small amounts. Use your wash bottle and small amounts of water to wash all of the precipitate into the filter paper.
6. When all liquid has filtered through the paper, wash the precipitate with your rinse bottle. Start at the top of the filter paper. Do 2-3 small rinses.
7. Carefully remove the filter paper and copper (II) oxide precipitate. Allow to dry for at least 24 hours.