



Student Guide

Particle Size and Spectral Analysis of AgNO_3 / Cu Lab: Design Challenge

Safety

You must follow all safety rules given by your teacher. Wear goggles, apron and rubber gloves at all times. Wash any silver nitrate spill from your body immediately.

Introduction: In this activity you and your lab group will model the research procedure used by scientists who do actual research. There will NOT be a sheet of specific instructions, but your group will do research on a topic, develop the plan for doing the experiment and create a poster presentation at the end.

Research Process: Your teacher will provide an overview of the nature of the chemical reaction you will explore: reduction of silver nitrate by copper. Typically, the research process follows a standard system.

1. Decide on a concept or problem to investigate
2. Conduct a literature/Google research on the topic
3. Develop a plan of how to attack the problem
4. Develop a plan of action to conduct the experiment
5. Conduct the experiment
6. Analyze the data
7. Publish and/or present the results

You are expected to perform certain specific tasks:

1. Work cooperatively within the lab group
2. Do online or library research prior to starting the experiment
3. Keep a journal record of everything you do
4. Follow all safety and protocol rules
5. Prepare a poster and verbal presentation of your results

Assigned Problems: (use your journal)

State these in your journal so you can keep track of your ideas and solutions for answering them. Please note that EACH PERSON in the group must keep their own Journal.

Problem 1: Investigate the relationship between the size of silver particles formed and the time for which the reaction is occurring.

Problem 2: Do a spectral analysis of the absorption spectrum of the reaction and see if it changes as the experiment progresses.

Problem 3: Make the required measurements to calculate the mass of silver produced based on the molarity of the silver nitrate solution.

Problem 4: Use a laser to illustrate the colloidal nature of the silver nitrate solution.



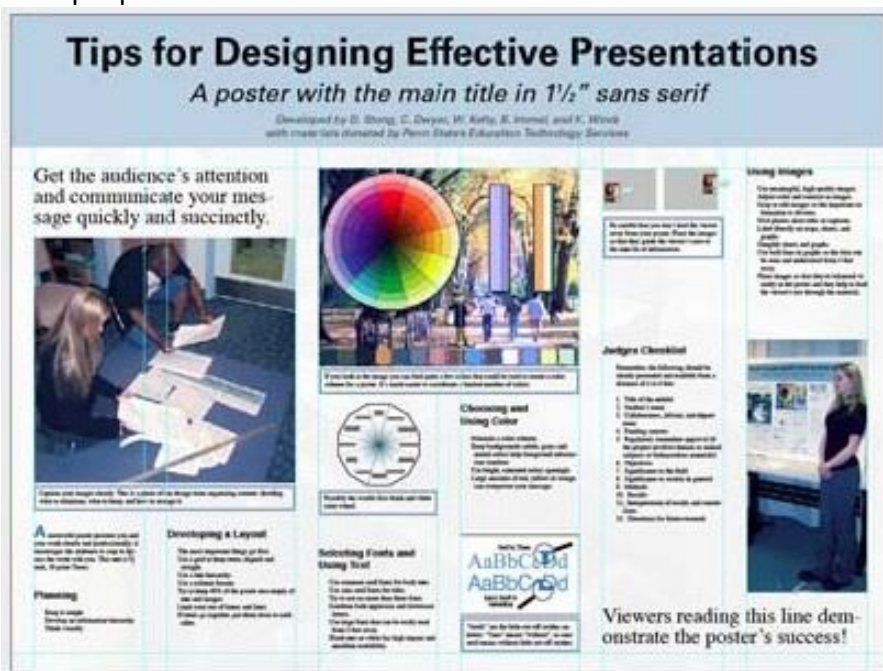
Problem 5: Understand and use Beer's Law to determine the concentration of the copper(II)nitrate solution produced.

Generalized Procedure:

As an inquiry-based laboratory exercise, your group will model the procedure of a real research group. Thus, you will be doing the following. Remember that **ALL** your work must be recorded in your journal. Use the statements below as a guideline to follow as you research, experiment, and report.

1. Understand the nature of Scientific Research and the thoughts and actions of those who participate.
2. Comprehend the specific nature of the problems you are to investigate.
3. Work with your group in developing a plan to gather data that will be analyzed to answer the problems given.
4. Do research that will expand your knowledge of the theory and skills necessary to effectively investigate the problems.
5. Compile a written and photographic record of ALL research and work done throughout the project.
6. Collect data that allows your group to reach meaningful conclusions about the problems.
7. Develop and create a Research poster summarizing and portraying your work. This must be a high-quality poster that is modeled after those produced by actual researchers in a science laboratory situations. The two websites listed below give an overview of what such a poster looks like. A sample of a professional poster is given below.
8. Be able to clearly and completely explain the material portrayed on your poster.

How to Create a Research Poster. NYU Libraries: <https://guides.nyu.edu/posters>
Example poster from site:



Materials: These will be available to the groups and it is up to your group to determine what to use to answer the assigned problems

- Safety goggles
- Lab apron or coat
- Rubber gloves
- (1) 150 mL beaker
- 6 test tubes: 15 X 10 cm
- 6 pieces of copper wire, 15 cm long
- Sandpaper or wire gauze
- Test tube rack
- 80 ml of 0.1 M. AgNO₃ freshly prepared
- Graduated cylinder
- Access to Scanning Electron Microscope or Optical Microscope (see RAIN above)
- Access to a Spectrophotometer (see RAIN above)
- Watch or clock
- Laser
- Camera on your phone

