



Integrated Physics & Chemistry
Lab Manual

LUOA

2013-2014

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Welcome to Integrated Physics and Chemistry Lab at LUOA. Laboratory

is a very important component of any science class. The lab must be completed in conjunction with your regular science class. If you have a question regarding the lab, you have two options. You can message your instructor within the curriculum, or you can call into the LUOA office at 1-866-418-8741 option 4 (teacher), option 3 (science). Science help is available from 8:30-5:00 Eastern Standard Time, Monday through Friday.

Important Things to Know

1. We pray for you. If you need prayer for anything specific let us know. We will add you and your need to our prayer list and will pray for you. ☺
2. Labs are not optional. You must complete all of the labs found within a unit before the unit test may be attempted. Please do not ask us to allow you to “just take a zero.” It is one of our greatest desires to see you be successful and be prepared for all the plans that the Lord has prepared for you. This class is transcribed as a lab science; therefore, all labs must be completed.
3. The directions and the supplies may differ in this manual from those in lesson. ALWAYS FOLLOW THOSE IN THIS LAB MANUAL. Please refer to this document often; a hard copy can be very helpful.
4. The Messaging System is an easy way to contact your teacher, if you have questions about the labs or your classwork in general. Please remember to be respectful. Use Mr. or Mrs. when you send your message. Watch your spelling and capitalization (you are not texting friends; this is school).

5. Teachers have 24 hours to respond to your messages, and 24 – 48 hours to grade your submissions. This does NOT include the weekends.
6. The curriculum will permit uploads of a wide variety of formats (.csv, .docs, .pdf, .xls, .xlsx, .docx, .jpeg, .jpg, .ppt, .pptx, .txt, and .rtf). Uploads in MS Word (.docs or .docx) are preferred, and in some cases, may be required. Word documents enable the teachers to give comments along with scoring and are more universally accepted than some other formats.
7. Repeatedly submitting blank assignments or disregarding teacher comments may lead to your science progress being blocked until the work is completed satisfactorily.

Course Expectations

In this course, there are certain expectations. We want you to be aware of these expectations from the very beginning. Please read the following guidelines and follow them when submitting your assignments. Understand that while some of these guidelines may apply to all of your work (Headings & Complete Sentence Answers for instance), others only are needed with certain assignments (Science Reports & Science Lab Reports for example).

Questions must be answered in complete sentences.

What is meant by complete sentences?

- When speaking of answers, complete sentences do not mean only grammatically complete. It also means to use part of the question in the answer.
- Q: What color are your eyes?
A: My eyes are blue.
- Q: Which planet is nicknamed the “red planet”?
A: The planet nicknamed the red planet is Mars.

Formatting Guidelines for Uploading Assignments: Some science assignments require that your work to be submitted in a more formal way. These reports need to follow the following guidelines. Failure to follow these guidelines may result in your assignments being reassigned.

- Headings – Please include your name, date, and Unit/Assignment numbers at the top of any uploaded work.
- Formatting – Papers should be written in MLA format
 - 12 inch font
 - Times New Roman
 - Double Spaced
 - 1-margin
 - Work Cited Section or Page
 - Left Justified
 - Indented Paragraph
 - Section headings are useful and add clarity to a report. (These may be bolded and underlined, size 14, and centered).
- Sources – Generally, in research work, at least 2 academic sources will be asked for. If you are citing the internet, keep in mind that Wikis, Google, ASK and a few other search engines are not considered academic sources! Academic sources should be listed using proper formatting at the end of your report in a Works Cited section.
 - All work will be submitted to the plagiarism checker *Safe Assign*.

Formatting for Formal Science Lab Reports- For some of your experiments and projects, a science lab report format is needed to separate the separate areas of your experiment.

If a science lab report is required then the work will be reassigned if it is not there. A template of a Science Lab Report format can be found in the Appendix at the end of this manual.

- Purpose – What are you trying to show with this project? What is the intent?
- Research – You should not be as detailed as with a research paper. A paragraph that gives some background is fine.
- Hypothesis – This is a prediction of what you think the results of the project will be. Write your hypothesis before you begin the experiment. A common sentence form for a hypothesis is to use an ‘if-then’ statement. (Example: If students get adequate rest, then grades will improve.) (1-2 sentences)
- Procedures – In 1st person past tense, please write a summary of what steps you actually performed while conducting the experiment. Be sure to include any modifications. You should include enough detail so that someone could reproduce the experiment based on what you have written. Presenting your information in a numbered list format is also recommended.
- Data – (VERY IMPORTANT) *Data is often missing and the cause for a great many re-assignments.* Data and observations are vital in science, and it is also vital that data be referred to in your answers. Teachers will look for your data to be presented in an organized manner (usually a table format), and this data should be referred to in your conclusion. Observations may be written out in a descriptive paragraph following the data table.
- Analysis – (Graphs). Many experiments would benefit by showing the data in graphic form. For some projects and experiments, graphic form is a requirement. The graph would be included after your data in the analysis section of your lab report. A *bar*

graph is used when comparisons are being made, as with your Porosity & Permeability experiment. A *line graph* is excellent to show trends, as with your Greenhouse experiment. Finally, a *pie or circle graph* is useful when dealing with percentages.

- **Conclusion** – Begin by stating whether the hypothesis was true or false. Use data and calculations to support your answer. Consider the following questions as you write your conclusion: Why or what happened to result in the outcome you observed? Did you learn anything new? If not, what previously discussed concepts did this lab reinforce? Is there anything you would or could do differently that would improve the experiment? Do you have any other comments/observations you would like to share about this lab?
- **Application** – In what manner can these conclusions be used in the real world?

Unit 1: Explorations in Physical Science

Assignment: 4. Experiment: Making Observations

This assignment will assist you in learning the scientific method. You will work with your hypothesis and make observations.

Materials

- A bowl of peanuts (in shell) or a bag of dried beans (items that look similar but not identical)
- Various measuring tools (metric rulers and string)
- Paper and pencil

Follow the instructions in the lesson. Please make sure you use the formatting guidelines found on page 4.

Assignment: 9. Experiment: Determining Volume

In this experiment you will find the volume of common geometric shapes.

Materials

- Metric ruler
- Small block of wood
- Small rock
- Graduated cylinder, or metric measuring cup (large enough for the wood to fit in)

Follow the instructions in the lesson. Please make sure you use the formatting guidelines used on page 4.

Assignment: 11. Experiment: Determining Density

In this experiment you recognize the characteristics of density, while you design, carry out a scientific investigation and present your findings in a scientific report.

Materials

- A penny, a nickel, and quarter
- Metric ruler
- Metric balance (food scales work or the Post Office will do weigh these for you if you ask nicely)
- Scissors

Type of Coin	Mass (grams)	Volume(mm ³)	Density (g/mm ³)
Penny			
Nickel			
Quarter			

Follow the directions in the *Present Your Findings* section of the lesson. Please make sure you include the hypothesis and the data table and use the formatting instructions found on page 4.

Assignment: 14. Experiment: Special Project

When you started this class, your advisor asked you to email all of your teachers and introduce yourself. Please do so as an attachment to this assignment. Also include your contact information (email and phone number please) as well as a statement that you have read and have accessed this science lab manual.

Unit 2: The Structure of Matter

Assignment: 2. Experiment: Atomic Structure

In this experiment you will investigate a scientific hypothesis and present your findings in a scientific finding in a scientific report.

Materials

- Large Box (At least 40 to 50 cm along all sides)
- Small block of wood (around 6 to 8 cm along all sides)
- 100 marbles or pellets (airsoft pellets work well)
- Metric ruler
- A partner

Follow the directions as written in the lesson. Answer the questions in the lesson; please follow the formatting instructions found in this manual beginning on page 4. Please include a photograph of your experiment when you upload your answer document.

Assignment: 13. Experiment: Separating a Mixture

In this experiment, you will identify and use the physical properties of these substances to separate the components of a mixture.

Materials

- Mixture containing salt, iron filings, small gravel, pennies or raisins
- Screen or kitchen colander
- Funnel
- Filter paper (coffee filters work well)
- Magnet
- Jar (large enough for funnel to sit on top of)

You are to design the plan to separate this mixture into separate components, and then you are to carry out your plan. Once you have completed your experiment, complete the *Present Your Findings* from the lesson. Please make sure you use the formatting guidelines from page three.

** Iron filings can be obtained anywhere pipe is cut: Lowes, Home Depot, Plumbing shops, etc.

Unit 3: Matter and Change

Assignment: 6. Experiment: The Cabbage Indicator

In this experiment you will determine if a solution is an acid or a base.

Materials

- Sliced Red Cabbage
- Stainless steel cooking container with lid
- Food strainer
- Glass bowl/collection beaker
- Coffee filter
- White vinegar
- Baking Soda
- Distilled water

- 2 pieces of notebook paper
- Small clear plastic cups (bathroom cups)
- 6 different household liquids (Sprite, clear shampoo, light clear juice, rain water, water with soil fertilizer....misc.) NO HOUSEHOLD CHEMICALS.

Directions

Preparing the Indicator

1. Cover sliced red cabbage with water in covered pan for 20-30 minutes and simmer over low heat on the stove.
2. Allow to cool completely. Strain into glass bowl; discard the slices from the strainer.
3. Empty bowl back into pan, put coffee filter in the strainer strain contents into the bowl again. (If needed, the “cabbage juice can be refrigerated and stored overnight”).

Experiment

1. Formulate a hypothesis
2. Take one piece of the paper cut into thirds: Label Vinegar (Acid), Baking Soda (Base) and Distilled Water (Control).
3. Fill three of the small cups $\frac{1}{2}$ full of the cabbage juice. Cup 1—add $\frac{1}{2}$ teaspoon of vinegar and stir gently. Cup 2—add $\frac{1}{2}$ teaspoon of baking soda into the cabbage juice and stir gently. Cup 3—add $\frac{1}{2}$ teaspoon of distilled water to the cabbage juice and stir gently.

Record the results for each.

4. Take the second paper and divide into sixths. Write the names of the six liquids you selected.
5. Take six cups and fill half way with the cabbage juice. Place the cups on top of the labels.

6. Next, add about $\frac{1}{2}$ teaspoon of each solution to the appropriate cup and stir gently. Check for a reaction. If no reaction occurs, then repeat. If no reaction occurs, then repeat a third time. Use the distilled water control for a comparison.
7. After testing all of the liquids, take your acid cup and your base cup and pour both in a clear large container. Record the results.

<i>Cup/Content</i>	<i>Color</i>	<i>Result</i>
Vinegar		Acid
Baking Soda		Base
Distilled Water		Control

You will be required to write a formal lab report for this project. Please see the sample lab report in Appendix A. Please include photographs of your experiment in the data section of the report.

Assignment: 16. Experiment: Half-Life

In this experiment, you will simulate half-life decay.

Materials

- 100 Candy pieces (M&M, Skittles, Reese Pieces or even pennies: something with different print on one side).
- A re-sealable baggie or bowl with a lid

- A sheet of wax paper approx. 30x30
- A plastic knife
- A plastic cup

Directions

1. Place radioactive atoms (candy) in baggie or bowl, close the container, and shake for five seconds.
2. Gently pour on to the wax paper.
3. Use the plastic knife to sort into two piles: print (design) up or print (design) down. The ups are decayed atoms. Record your results.
4. Put the un-decayed atoms (or the print side down candies) back in the container, put the decayed atoms in a plastic cup and set aside.
5. Repeat the steps with the un-decayed atoms for 6 half- lives. Record results at each step.

Half-life	Total-time (sec)	# Un-decayed Atoms	# of Decayed Atoms
0	0	10	
1	5		
2	10		
3	15		
4	20		
5	25		
6	30		

You will be required to write a formal lab report for this project. Please see the sample lab report in Appendix A. Please include photographs of your experiment in the data section of the report.

Unit 4: States of Matter

Assignment: 7. Experiment: Viscosity

In this experiment you will compare and describe the viscosity of several liquids.

Materials

- Egg carton
- Piece of cardboard (large enough for bottom of egg carton, straws, and lid of carton; see picture in the lesson)
- Scissors
- Tape
- A nail or pen (any instrument to punch a hole in the bottom of the egg carton)
- Straws (the same number of straw as you have liquids)
- 1-inch block or a book, some means to angle to egg carton/straw/lid
- A variety of test liquids: ketchup, honey, cooking oil (olive, vegetable, peanut, canola, etc), maple syrup, heavy cream (any type of thick edible liquid). **Honey is suggested.
- Microwave
- Measuring cup

Follow the directions as written in the lesson. You will be required to write a formal lab report for this project. Please see the sample lab report in Appendix A. Please include photographs of your experiment in the data section of the report.

Assignment: 14. Experiment: Pressure in Gases

In this experiment you will collect and analyze data about air pressure in the tires of a car. You will compare these experimental results with published data.

Materials

- A car and its manual
- A licensed driver
- Air pressure gauge
- 16 sheets of paper or thin cardboard (poster board)
- Tape

Follow the directions as written in the lesson. Answer the questions in lesson, please follow the formatting instruction found in the manual on page 4. Please include a photograph of your experiment when you upload your answer document.

Unit 5: Motion and Forces

Assignment: 11. Experiment: Propulsion

In this experiment, you will describe the action and reaction forces in propulsion devices.

Materials

- Balloon
- Empty soda can
- Sharp nail
- Hammer
- Fishing line or sharp thread
- Bowl or water

Follow the directions as written in the lesson. Answer the questions in lesson; please follow the formatting instruction found in the manual on page 4. Please include a photograph of your experiment when you upload your answer document.

Unit 6: Semester Review and Exam

Semester exam and review only no Labs. ☺

Unit 7: Work and Energy

Assignment: 5. Experiment: Conservation of Energy

In this experiment, you will work with potential, kinetic, and mechanical energy.

Material

- Cardboard tube (From paper towels or wrapping paper)
- Lightweight cardboard (to make a box, please see the pattern in the lesson)
- Marbles (4 different masses)
- Tape
- Scissors
- Book
- Metric balance (or you can take marbles to Post office and they will them weigh for you)

Follow the directions as written in the lesson. Answer the questions in lesson, please follow the formatting instructions found in the manual on page 4. Please include a photograph of your experiment when you upload your answer document.

Unit 8: Heat and Flow

Assignment: 4. Experiment: Insulators

In this experiment, you will build and use a calorimeter to measure heat loss. You will analyze data using comparative graphs.

Materials

- Large Styrofoam cup

- Small Styrofoam Cup
- Flat piece of Styrofoam
- Thermometer
- Hot water
- Stove/Microwave (for heating water)
- Insulating material (at least two: shredded newspaper, sheets of newspaper, bits of cloth, small Styrofoam peanuts (packing peanuts), bubble-wrap, feathers, aluminum foil, saw dust, etc.).
- Clock with second hand

Follow the directions as written in the lesson. You will be required to write a formal lab report for this project. Please see the sample lab report in Appendix A. Please include photographs of your experiment in the data section of the report.

Unit 9: Electricity and Magnetism

Assignment: 3. Experiment: Electrostatic Investigations

In this experiment you will, investigate the principles of electrostatics using adhesive tape.

Materials

- Clear adhesive tape
- Plastic straw

Follow the directions as written in the lesson. Answer the questions in lesson, please follow the formatting instructions found in the manual on page 4. Please include a photograph of your experiment when you upload your answer document.

Assignment: 10. Experiment: Diverting a Magnetic Field

In this experiment you will explore how to divert a magnetic field.

Materials

- A strong disk magnet
- Plastic straw
- Tape
- Double-sided tape
- Paper clips (metal not plastic)
- Thin cardboard (cereal box or cake mix box)
- Test materials (pennies, aluminum foil, iron/steel nail, cardboard, crayon, table knife, popsicle stick)
- Compass
- Paper

Follow the directions as written in the lesson. Answer the questions in lesson; please follow the formatting instructions found in the manual on page 4. Please include a photograph of your experiment when you upload your answer document.

Unit 10: Waves

Assignment: 4. Experiment: Changing the Speed of a Wave

In this experiment you will recognize the relationships between wave speed and its medium.

Materials

- Plastic Box (shoe box)
- Paper clips

- 2 Sturdy Rubber Bands (large enough to stretch around the box)

Follow the directions as written in the lesson. Answer the questions in lesson; please follow the formatting instructions found in the manual on page three. Please include a photograph of your experiment when you upload your answer document.

Assignment: 16. Experiment: Law of Reflection

In this experiment you will make observations and measurements to test the law of reflections. You also will analyze your results to determine accuracy.

Materials

- Laser pointer (or a flash light with lens covered with only a small hole in the center)
- Small rectangular or square mirror
- Block of wood to support mirror
- Sharp pencil
- Protractor
- Unlined paper

Follow the directions as written in the lesson. Answer the questions in lesson, please follow the formatting instructions found in the manual on page 4.

Unit 11: Chemistry and Physics in Our World

Assignment: 4. Experiment: Water Acidity and the Environment

Materials

- Sand paper
- Vinegar
- Fresh water

- Small jar with lid
- Several small paper cups, plastic, or small beakers
- Materials to test
 - Part A
 - Raw egg
 - Part B (Select at least 2 of these)
 - Two small sea shells
 - 2 small pieces of coral
 - 2 pennies (use sand paper to remove and surface build up)
 - Two iron or steel nails (use sand paper)
 - 2 Chips of marble, concrete, brick (ask at a Home Depot or Lowes)
 - 2 pieces of chalk
 - 2 small glass beads or other glass

Follow the general directions of the lab. Instead of *Present Your Findings*, you will be required to write a formal lab report for this project. Please see the sample lab report in Appendix A. Please include photographs of your experiment in the data section of the report.

Unit 12: Semester Review and Exam

Semester exam and review only no Labs. ☺

Unit 13: Final Exam

Final exam and review only no Labs. ☺

Appendix A: Model Science Lab Report

Your Name

Date

Course

Unit & Assignment Numbers

Instructor

Lab Title

Purpose

What is the intent of this experiment? “What will happen to _____ if I change _____?”

Research

Record here your background knowledge and research on the topic. While this should not be as detailed as it may be with a Science Report, it still needs to include more than just a reference that you did research. The teacher needs to see what you learned. At least two sources should be included at the end of this section.

Hypothesis

This statement should answer the question in the Purpose section. “Based upon my research, I think that _____ will occur if I change _____.”

Materials

- Please format this to be a
- Bulleted
- List

Methods

1. Please format this to be a
2. *Numbered List*

Data & Observations

Insert your data table here. Any observations may be included in a well written paragraph.

Photographs, if required, may also be in this section.

Analysis

(Insert your graph here)

Conclusion

This paragraph should do two things. First, it answers your Purpose based upon your experiment and the data you collected in the experiment. Second, it should make references to that data.

Reflections and Applications

This is a very important section. It also has two purposes. The first is that it looks back on your experiment and critiques that experiment. What worked well and, conversely, what could have been improved with this experiment? The second purpose is that this section also discusses any possible applications your new knowledge may have in practical ways.