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Welcome to Physics 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 transcripted 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 different 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, this 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 Kinematics**

**Assignment: 3. Experiment: Making a Soda Straw Balance**

**Materials**

- 1 screw
- 1 paper straw
- 2 microscope slides (call your local doctor or vet explain why you need it and ask if you can buy a couple of slides so you don’t have to buy a whole box, they will probably give them to you.)
- 1 needle
- 1 ruler
- 1 razor blade or scissors (BE CAREFUL)
- 1 Tongue Depressor or Popsicle stick
- 1 Clothespin or a binder clip
• Paper

• Several items to “weigh” on your scale (Salt, several strands of different color hair)

• Block of wood

Follow the directions in the lesson. Please make sure that you follow Formatting Guidelines for Uploading Assignments on page 4. Please include a picture of your experiment in the data section of your upload.

Assignment: 13. Experiment: Determining Reaction Time

Materials

• A partner

• A metric ruler or meter stick

Follow the directions in the lesson Please make that sure you follow Formatting Guidelines for Uploading Assignments on page 4.

Assignment: 18. Special Project

When you started this class, your advisor asked you to message 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 Dynamics

Assignment: 7. Experiment: Circular Motion

Materials

• Glass or plastic tube (barrel of used ball point pen can be used)

• String

• 2 stoppers
- Clip (alligator clip, binder clip, small hair clip)
- Paper clip
- 10 washer
- Stop watch (most cell phones have this feature)

Follow the directions as written in the lab. See the illustration of the lab for the actual set up. For this lab you are to complete a formal lab write up. Please see the example in the Appendix of this manual. Please use charts below to collect your data and graph the data; include both the charts and graphs in your lab write up. Please remember to include photographs of your experiment.

<table>
<thead>
<tr>
<th>1 rubber stopper</th>
<th>2 rubber stoppers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time for 10 rev (sec)</td>
<td>Time for 10 rev. (sec)</td>
</tr>
<tr>
<td>6 washers</td>
<td></td>
</tr>
<tr>
<td>8 washers</td>
<td></td>
</tr>
<tr>
<td>10 washers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 rubber stopper</th>
<th>1 rubber stopper</th>
<th>2 rubber stoppers</th>
<th>2 rubber stoppers</th>
</tr>
</thead>
<tbody>
<tr>
<td>T (sec)</td>
<td>I/T (cyc/sec)</td>
<td>T (sec)</td>
<td>I/T (cyc/sec)</td>
</tr>
<tr>
<td>6 washers</td>
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</tr>
<tr>
<td>8 washers</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10 washers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Unit 3 Work and Energy**

**Assignment: 6. Experiment: Simple Machine**

**Materials**

- Meter Stick
- String
- 2 identical coffee cups
- Weight or coins. The actual lab calls for weight but you can use coins instead. You can Google the mass of specific coins. Using the cups to hold the coins you can change the mass held by the cup to whatever mass you choose.
Please make sure you document any changes you make to the lab. You do not have to complete a formal lab write up for this lab, but you need to summarize all of your steps and answer all of the questions found in the lab. Please follow the formatting guidelines and include a picture of your setup.

Unit 4 Introduction to Waves

Assignment: 2. Experiment: Wave Speeds

Materials

- A slinky
- A stopwatch
- A meter stick

Follow the directions in the lesson. Please make sure that you follow Formatting Guidelines for Uploading Assignments on page 4.

Unit 5 Light

Assignment: 3. Experiment: Light Angles

Materials

- A small rectangular or square mirror
- Pencil
- Flashlight
- A sheet of paper
- A ruler
- Protractor
- A ball bearing

Follow the directions in the lab. Please complete a formal lab report of this experiment.
<table>
<thead>
<tr>
<th>Trial #</th>
<th>Incident Angle (Degree)</th>
<th>Reflected Angle (Degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Unit 6 Semester Review and Exam**

No labs – review and semester exam only

**Unit 7 Static Electricity**

No labs are found in this unit.

**Unit 8 Electric Currents**

**Assignment: 2. Project: Research and Report**

Research and describe the impact of early theorists on the development of society, economics and technology. Choose one of the following:

*Charles Coulomb * Andre Ampere * Alessandro Volta * Georg Ohm

Write a 600 word report integrating their contributions in a historical perspective. Use the *Formatting Guidelines for Uploading Assignments* on page 4. Next to your name, please put the number of words in your paper before you upload it.

**Unit 9 Magnetism**

**Assignment: 2. Experiment: Magnetic Fields**

**Materials**

- 2 Bar Magnets (teacher supply stores)
- 3 Sheets of stiff cardboard
- Iron filings (Can be obtained at a hardware store, Lowes Home Depot, Plumbing store anywhere iron pipe is cut)
Follow the directions in the lesson. Please make sure you follow *Formatting Guidelines for Uploading Assignments* on page 4. Please include a picture of your experiment in the data section of your upload.

**Unit 10 Atomic and Nuclear Physics**

No labs in this unit

**Unit 11 Review**

No labs in this unit

**Unit 12 Semester Review and Exam**

No labs – review and semester exam only

**Unit 13 Final Exam**

No labs exam only
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.