Post-Lab For LAB #3

A GENERAL EXPLANATION which contains within
THE SPECIFIC QUESTIONS FOR Physics 204, LAB 1

Physics 204: LAB
Martens Yaverbaum, Kitayama, Lu & Geiser
John Jay College of Criminal Justice, the CUNY

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I. *Epistemological Table*

BACKGROUND EXPLANATION/REMINDER

(Remember! A claim is a full statement; a claim is expressible as a complete sentence of English, and must therefore contain both a subject *and* a predicate. But note also: a mathematical equation is a sentence: the part before the equals sign is the subject; the rest is the predicate.)
Any claim that we make in a physics lab must have been:

- **Observed / Measured,**
- **Defined,**
- **Derived,**
- **Calculated,**
- **Postulated, or**
- **DISCOVERED through YOUR Research.**

  …
- And once in a while, we will make a claim that *seems* or maybe even is
  Not Justified

Each Physics Post-Lab will contain an EPISTEMOLOGICAL TABLE like the one shown below. Every Epistemological Table will have two columns: CLAIMS on the left, JUSTIFICATIONS on the right. The claims will be filled in for you. Your job is to fill in the justifications, from the seven categories listed above. In some cases, you'll need to provide a little extra information.

1. OBSERVED/MEASURED (using). Measurement and observation are the two basic types of ***data collection***. Measurement is ***quantitative*** data collection: it produces something you would describe with ***numbers***. Observation is qualitative data collection: it produces something that you would describe with ***words***.

When using this category in the Epistemological Table, you should specify either "Observed (qualitative data collection)" or "Measured (quantitative data collection)." In addition, if a claim is the result of measurement, you must specify the measurement device: "Measured using protractor (quantitative data collection)" or "Measured using stopwatch (quantitative data collection)."

2. DEFINED (definition of). This category includes anything that is defined either by the researchers themselves in the course of the lab or by physicists in the past. A definition is ***not*** a discovery. If you define the top of the window to be x=0 or you define average velocity to be displacement over time, you're not figuring anything out about the world; you're simply ***naming*** things. When using this category you must state what is being defined: e.g. "Definition of Mass" or "Definition of Distance." Etc.

3. CALCULATED (from): any ***numerical value*** that is calculated, through ***mathematical operations*** on other (measured or assumed) quantities. When using this category you must state what equation(s) were used to calculate the value: e.g. "Calculated from the definition of average velocity" or "Calculated from Netwon's Second Law."

4. DERIVED (from). Derived knowledge is anything (equation or verbal statement) that is derived (i.e. figured out) through ***logic and/or mathematical proof***. When using this category, you must specify which laws, definitions, observations, etc. you used to derived this statement: "Derived from the definition of acceleration and the midpoint velocity formula" or "derived from Newton's first law."

5. POSTULATED. Postulates are statements that form ***the basic assumptions of an area of study (in this case, physics)***. A postulate is not directly provable, but it is accepted because it makes all the rest of physics possible. Only a VERY small number of claims fall into this category. When using this category, state the name of the postulate: e.g. "Postulated: Galileo's Principle of Relativity" or "Postulated: Newton's Second Law."

6. DISCOVERED THROUGH OUR RESEARCH. This category is reserved for things that you learned not by ***pure*** observation, measurement, derivation, calculation, or postulation, but through ***the strategic combination of these various forms of knowledge***, which we call ***scientific research***. This could be something that you discovered in a previous lab in this course or something that you discovered in this lab, after doing a bunch of data collection AND analysis. If a claim was proved in a previous lab, you should specify which lab: e.g. "Discovered through our research, in the 'Free Fall' experiment."

7.NOT JUSTIFIED. You should use this category VERY rarely. It is reserved for statements that you are taking as true basically just because someone told you they were true and you believed them—i.e. statements that you have no way to verify.

WHAT TO DO FOR THIS PARTICULAR (Lab #1) POST-LAB:

Reproduce this table in a SEPARATE document or sheet of paper and choose among the ***seven*** categories listed above in order to complete it.

NOTE: the Justification **MUST INCLUDE** some sort of prepositional phrase that narrows the type (and makes it easier for instructors to award credit for valid justifications they did not anticipate), e.g.: "derived ***from…***," "measured ***with*** (using)…" "definition ***of…***," etc.

* NOTE! The epistemological categories apply to ***all*** claims (statements, propositions) whether the claims seem true or false! (The categories do not, however, apply to anything that is not a claim: "the number 7" cannot derived nor measured; "the table's length is 7 meters" can be.)

Claim	**Type of Justification**
a) One researcher shook an end of a long horizontal spring in rapid up/down motions; a second researcher held the spring's other end firmly in place.	
b) The length of the horizontal spring (described above) was approximately 2.74 +/- .005 meters from one researcher ('***boundary***') to the other researcher ('***boundary***').	
c) Sometimes, a little mountain- or valley-shaped irregularity appeared to travel along the otherwise straight horizontal spring—from one boundary to the other.	
d) No particular or identifiable piece of physical material actually traveled the horizontal distance from one boundary to the other.	
e) $\sum \vec{F} = m\vec{a}$.	
f) $\frac{d^2y}{dt^2} = -\omega^2 y$.	
g) A large number of particles undergo harmonic oscillations along strictly vertical axes; if these vertical harmonic oscillations are sufficiently organized, ripples (or '***pulses'***) can be observed traveling along a horizontal axis.	

II. *Research Design Chart.*

BACKGROUND EXPLANATION.

The chart begins with your ***Research Question*** and shows how you proceeded from data collection FOR at least ONE MEASUREMENT all the way toward an answer for that ***Research Question*** (***RQ***).

Note: For this and all future ***Post-Labs***, you need only select ONE particular ***RQ*** and one particular data thread for depiction in a ***Chart***.

Always write your ***RQ*** right above your ***Research Design Chart***

The chart has 3 sections:

DATA COLLECTION →	ANALYSIS: →	CONCLUSION:
Measurement(s) you took or observation(s) you made in the lab.	Some mathematical or logical analysis you did on those measured quantities or observations.	How that analysis helped you answer your Research Question

Example

RQ: how does changing the volume of a chamber affect the temperature of a the gas inside the chamber?

We measured the initial length, width & height of the chamber and got 7 cm, 5 cm, and 8cm, respectively. →	We substituted these values into the equation for the volume of a rectangular prism: V=W × L × H. We concluded that the initial volume of the chamber was 5cm × 7cm × 8cm = 280 cm^3 →	Knowing the initial volume of the chamber allowed us to compare that to the volume after the chamber was compressed, which allowed us to see the change in volume, which helped us determine the relationship between change in volume to change in pressure.

<u>WHAT TO DO FOR THIS PARTICULAR (Lab #3) POST-LAB</u>:

Using the model provided by two figures above, make a ***Research Design Chart*** that applies specifically to at least ONE MEASUREMENT you made in Lab #3.

III. ***The Counter-Factual*.**

WHAT TO DO FOR THIS PARTICULAR (Lab #1) POST-LAB:

In complete sentences of English, answer the following two questions (two parts each, second question is on the next page):

a. Imagine that in the hypothetical counter-factual world, you did and thought about everything in this experiment precisely as you did in your actual John Jay experience, EXCEPT one thing:

   Instead of working with one extremely long spring, each research/lab team worked with an extremely large number of separate little springs. Each team could exercise freedom and creativity in arranging the many little springs any way they saw fit; they could introduce other pieces of reasonably common equipment, spread out and test ideas over large areas, etc.

   In as much specificity as possible, explain how a patterned series of ripples – similar to those observed to travel back and forth the long springs at John Jay – could be generated under these conditions.

b. One fine spring day, the Mayor attends a game at Yankee Stadium. In order to honor him, the announcer commands all 60,000 fans to send a "good old fashioned ***wave*** around the stadium." By rising and sitting in succession, a familiar flurry does indeed make its way through the crowds of people.

   People watch the theatrics at home on their tv's and internet feeds.

   Question: Is it scientifically accurate to refer to this human phenomenon as an example of ***wave motion***? Why or not. Be specific and thorough.

IV. *The Wild Card.*

WHAT TO DO FOR THIS PARTICULAR (Lab #3) POST-LAB:

Imagine that you are shaking a long metal spring the way you did in the real lab at the real John Jay College a couple of weeks ago. In real life. No counter-factual. No tricks.

In the most basic, natural, everyday language to which ***you*** are accustomed to expressing yourself, answer the following question:

You love sending pulses back and forth between you and partner. But eventually you want more of a thrill. You wish to send a 'pulse' to your partner that ***speeds up*** while it travels from you to your lab team partner.

a) What would you have to do or what adjustments would you try to make to your spring in order for: Your pulse to SPEED up while it travels.

In as much specificity as possible, describe in your own words what in as much detail as possible. You can look up whatever you want on the web, but you must only say things that you understand to the point of being able to explain.

b) If your method will achieve the intended effects, explain why. If not, why not.