Many of our 9:00 am classes will be a Pilot of the new PHY 241: General Physics 1 Laboratory that will be conducted this Fall. Therefore the files that are given will be organized as "Prelabs" and as "Lab manuals"

Prelab 1

Complete the following 4 tasks before coming to the "Lab 1" class Thursday 5-25 at 9 am.

Task 1: Read the following Safety Sheet

The equipment used in the Introductory Physics Labs has been designed and chosen with the students' safety in mind. However, any time a large number of people are using equipment, rare and unusual accidents occur and we want to minimize the damage in such instances. Therefore, there are a few simple rules we need everyone in the lab to observe.

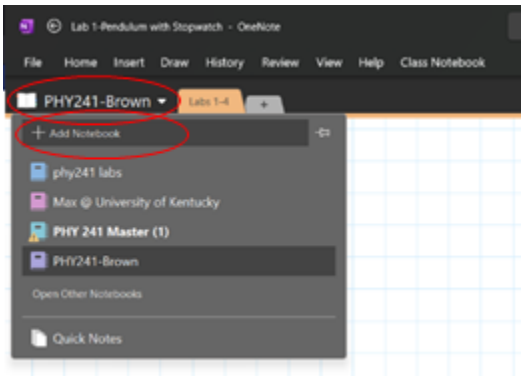
- Everyone is expected to use good judgment. This covers a long list of (hopefully) obvious rules:
    1. Never lick any piece of equipment.
    2. Never throw anything in lab (unless explicitly told otherwise).
    3. Never aim a projectile launcher at a person, especially your own face.
    4. Never aim a laser in anyone's eye.
    5. ….
- Students should never be left alone in the Introductory Physics Labs without a TA or Instructor present.
- Students should wear closed toe shoes to protect the feet from dropped equipment. Also, clothing should be chosen to allow for a reasonable range of movement including walking, bending to the ground, reaching over tables, etc.
- Liquids should never be on the lab bench because of computers or other electrical equipment.
- If something looks or feels hot, or is smoking, **unplug it** and then immediately send a group member to notify the instructor. One person should continue to watch the item in question, just in case it catches fire.
- If at any time you feel something is unsafe, please notify the instructor to correct the problem and/or address your concerns.
- All accidents, injuries, and broken equipment should be reported to the instructor immediately. Broken equipment should be placed in a box labeled "Broken Equipment" at the front/side of the room to be evaluated by the instructor.

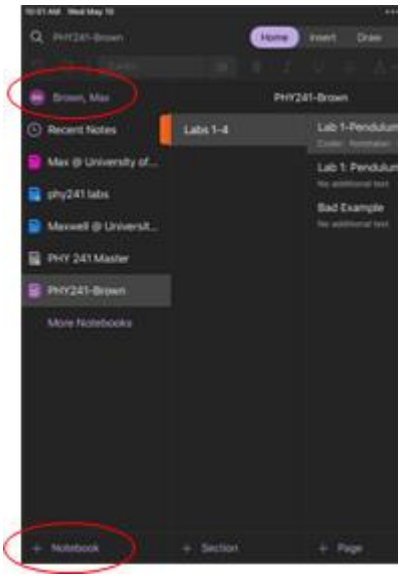
Task 2: Get OneNote Working
If you do not yet have OneNote, you can download Microsoft Office 365 directly from UK Links to an external site.or you can go to https://www.onenote.com/hrd

Links to an external site. to sign in with your linkblue credentials.

Once you have OneNote Opten sure that you can:

A) Create a new notebook. Title it something like "PHY241-Name" since you will be sharing this notebook with your group members



or


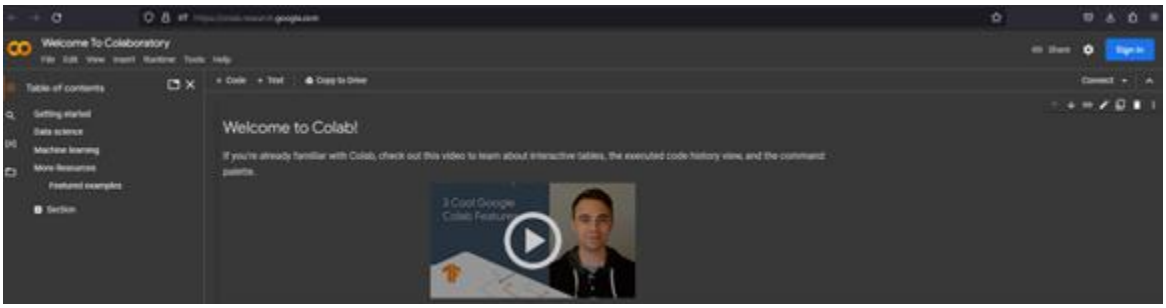
B) Create handwritten notes,

C) Take screenshots and insert them into the notebook.

Let us know if you were not able to complete any of these tasks at the start of the session Thursday at 9 am.

Task 3:Go to Google Colab

Links to an external site.. You should see a screen like:



Your first task is to "Sign In" with the Blue button in the top right corner. I recommend using your "LinkBlue@g.uky.edu" account but this is not required.

After you are signed in, select the "Welcome to Colaboratory" to work through this introductory document.

The video at the top of the page is not very helpful for us... but please read the sections titled: What is Colab? Getting Started, and Data Science. Feel free to mess around with the code provided to figure out how things work.

Once you have played with this webpage a bit, **select all of the following answers** that will **output** the number of seconds in a day when placed in a Colab code cell.

A)
```
seconds_in_a_day = 24*60*60
seconds_in_a_day
```

B)
```
seconds_per_minute = 60
minutes_per_hour = 60
hours_per_day = 24
seconds_per_day = seconds_per_minute*minutes_per_hour*hours_per_day
seconds_per_day
```

C)
```
print(86400)
```

D)
```
s=86400
```

Task 4: Uncertainty

In physics, we will often measure the same quantity many times. Any time we take a repeated measurement we can use the "Average" and the "Standard Deviation" to simplify the collection of measurements. Average, usually represented by a "Bar" over a symbol like $\bar{X}$ has a formula that you are probably familiar with

$$\bar{X} = \frac{1}{N}\sum_{i=1}^{N} X_i$$

On the other hand, the "standard deviation" represents the "uncertainty" in the data and is usually represented as δX. Standard Deviation is calculated with a slightly less familiar formula.

$$\delta X = \sqrt{\frac{\Sigma(X_i - \bar{X})^2}{N}}$$

IMPORTANT: After calculating both the average and the standard deviation, **a researcher must round the <u>uncertainty</u> UP so there is only one significant figure, and then we round the average normal at the same precision as the uncertainty.**

In an experiment to measure the length of a material, a student performed 10 identical trials and recorded the data as shown below:

Trial	length (cm)
1	1.44
2	1.52
3	1.68
4	1.73
5	1.63
6	1.71
7	1.79
8	1.74
9	1.63
10	1.47

If we want to compute this in python we can use this piece of code:

```
import numpy as np
xdata=np.array([1.44,1.52,1.68, 1.73, 1.63, 1.71, 1.79, 1.74, 1.63, 1.47])
xerror=np.std(xdata)
xaverage=np.average(xdata)
print("xaverage is", xaverage)
print("xerror is", xerror)
```

```
xaverage is 1.634
xerror is 0.11412274094149685
```

The student needs to report the final result in the form $L = \bar{L} \pm \delta L$. Which of the following will be the valid way to record his findings in his lab report? (Important: This question is more about rounding rules than calculating the values)

A) $(1.6 \pm 0.2)\ cm$
B) $(1.634 \pm 0.114123)\ cm$
C) $(1.64 \pm 0.11)\ cm$
D) $(1.63 \pm 0.12)\ cm$