

Exploration Stations!

- For each of the stations in the room, you will be doing simple tasks involving lab equipment and concepts from the main topic areas of physics.
- You will be working with your group of 2-3, but you will be completing this observations sheet **individually**.
- You will have a limit of 5 minutes per station.
- When you hear the bell, rotate to the next station. By the end of the activity you will have completed each station's activity

Your Task:

- You will be answering the questions at each station on your own sheet of notebook paper.
- Re-write the question (or summarize it), then answer as completely as you can.

Station #1

- **Materials:** Radiation monitor, Radiation Sources (disks and needle)
- Turn on the radiation monitor by moving the switches to "**Audio**" and "**x1**"
- Set the monitor flat on the lab table and place one of the radiation sources a few cm in front of the wire mesh screen.
- (Make sure the rest of the sources are at least an arm's length away from the monitor)

Station 1 questions:

1. compare/contrast the behavior of the 4 radiation sources at the station (green, red, and orange disks, needle)
2. What happens if you place the metal sheet directly between the source and the detector so that it looks like a wall between them? Explain for EACH of the 4 sources.

Station #2

- At this station there are 7 tuning forks, all of different frequencies
- Use **only** the pink rubber hammer or the green rubber block to hit the tuning fork. Nothing else is an acceptable or appropriate tuning fork activator.
- Please be careful not to hit the forks so hard that either the hammer breaks or the tuning forks bend...you just need to tap lightly.
- Listen to the fork's sound by bringing it close to your ear.

Station 2 Questions:

1. Pitch is the term we use to describe how high or low a note sounds. Rank the seven tuning forks from lowest pitch to highest pitch.
2. Does the sound you hear depend on where you hit the tuning fork? Explain.
3. Does the sound you hear depend on how close the fork is to your ear when you listen to it? Explain.

Station #3

- Step 1: Determine the mass of the animal at this station using the **triple beam balance**.
- Step 2: Now determine the mass of the same animal using the **electronic scale**.
- Step 3: Determine the mass of the same animal using the **spring scale**

Station 3 Questions:

1. Complete the following table:

Measuring Device	Mass of Animal	How sure are you?
Triple Beam Balance		±
Electronic Scale		±
Spring Scale		±

2. Which of these devices is the least appropriate for measuring mass? Why?
3. What are some benefits and disadvantages of using each of these devices to measure the mass of objects in a lab?

Station #4

- Pull the car up to a position approximately 30 cm from the top of the ramp
- Press the red "reset" button on the timer box, then release the car.
- Record the time (in Sec. (s)) on your observation sheet
- Somehow get the car to roll through the ramp with:
 - A) a shorter time
 - B) a longer time

Station 4 Questions:

1. Record the time it took for the car to pass through the photogate when you released it from 30 cm below the top of the ramp.
2. Describe what you did to the car in order to record a longer time interval on the photogate timer.
3. What was that longer time you recorded?
4. Why do you think your method worked?

Station 4 Questions (cont.)

5. Describe what you did to the car in order to record a shorter time interval on the photogate timer.
6. What was this shorter time?
7. Why do you think this method worked?

Station #5—Physics in Careers

- Do NOT log off the computer when you are done.
- You may use any of the supplied resources, but please leave all of them at this station when you are done:
 - Laptop with internet
 - List of possible websites
 - Articles
- Each group member must have a **DIFFERENT ANSWER** to this question.

Station 5 Question:

1. Other than a physicist, an engineer, or a science teacher, what is a career that uses the principles of physics in some way?
2. HOW does a person with this career use physics in their daily tasks?

Station #6

- At this station there is a solar panel wired to a digital multimeter.
- Please do not change any of the settings on the multimeter! Thank you!
- **Step 1:** Record the voltage displayed on the multimeter for normal classroom lighting
- **Step 2:** Cover the solar panel slightly with your hand. Record the voltage.
- **Step 3:** Remove your hand, then shine the flashlight onto the solar panel. Record the voltage. (please make sure the flashlight is off before you leave!)

Station 6 Questions:

1. Complete the following table:

	Voltage (mV)
Normal Classroom Lighting	
With Hand Covering	
With Flashlight	

2. Describe your observations. Do you see any pattern with the voltages? Explain.

Station #7

- Please do not overstretch any of the springs
- **Part 1:** Lift up the masses on both **spring A** and **spring B** (same size mass, different springs)
- **Part 2:** Lift up the masses on both **spring B** and **spring C** (same spring, different masses)

Station 7 Questions:

1. For **Part 1**, describe the behaviors of the two springs as they oscillate with the same size masses. What did you observe, and what do you think the reasoning is for the different behaviors?
2. For **Part 2**, describe the behaviors of the two masses as they oscillate on the same size spring. What did you observe, and what do you think the reasoning is for the different behaviors?

Station #8

- The light source and the white screen are set up and should not be moved.
- To turn on the light source, you simply need to plug it in! There's no switch ☺
- **Your Task:** Find the 2 locations where you can place the lens and find a clear image on the screen.

Station 8 Questions:

- At which two positions for the lens is a clear image formed on the screen?
Position 1: ____ cm
Position 2: ____ cm
- Sketch one of the images.
- Is the image inverted (upside-down), or upright, compared to the original object (the light source)?
- Compare/contrast the images seen at each of these positions?

Station #9: Electric Circuits

- Circuit A** is set up with 2 batteries, a lightbulb, a switch, and wires. Please do not disconnect anything in this circuit
- Circuit B** is set up the same as circuit A, but without the switch.
 - In the opening in the wires left by removing the switch, clip one of the following into the circuit and observe the results:
 - Toothpick
 - White Ceramic Resistor
 - Small Brown Resistor
 - Pencil
- When you are done, make sure that the set-up has been returned to its original format, with the empty space in the wiring.

Station 9 Questions

- What did you have to do to Circuit A in order to make the light bulb light? Why do you think you needed to do this?
- Circuit B: Which of the objects, when inserted into the open space of the wiring, allowed the light bulb to light up?
- Are you surprised by any of the results? Explain.

Station #10

- Your Task: Make the frogs hop into the air. Observe what needs to be done, the resulting motion, and what you can do to change the overall behavior of the frog.
- Have fun 😊

Station 10 Questions:

1. Describe how you got the frog(s) to hop into the air.
2. What kind of energy changes do you think are happening?

Station 11

- Choose one of the news sites that are listed on the Word document open on the laptop.
- Select a headline, related to physics, that sounds interesting to you.

Station 11 Questions:

1. Which website did you choose to search?
2. Which headline sounded interesting to you?
3. Why did it interest you?
4. What was the article about?

Station 12—Battery powered buggy

- On the Excel Sheet on the laptop, there is a list of distances. Select a distance that has not already been tested by a previous group. Write your selected distance on your lab sheet. List your names after the distance that you used!
- Turn on the buggy and get ready to set it down at the 0.00 m mark.
- At the same time you set it down, start your stopwatch. Stop the stopwatch when the buggy reaches your selected distance
- Repeat for at least 3 trials.
- Record your values in the Excel file as well as on your own sheet.

Station 12 Questions:

1. What distance did the buggy move?
2. What was the time you recorded?
 Trial 1: _____ s
 Trial 2: _____ s
 Trial 3: _____ s
 Average Time: _____ s
3. If you were to draw a graph to illustrate the motion of the buggy as it traveled the length of the lab station, what would you expect it to look like? Sketch your prediction, making sure to appropriately label your axes.

Station #13: Heating Up

- Fill the styrofoam cup so that it is about 1/3 full (a little less than half) of water from the tap.
- Measure and record the temperature of the water in the cup using the temperature probe.
- Measure and record the temperature of the water in the beaker (on the hot plate) with the second temperature probe.
- Using the dropper pipette, transfer 5 droppers full of water to the styrofoam cup.
- Measure and record the temperature of the water in the cup after adding the 5 droppers of hot water.
- Remove the probes from the water and dump out the water in the styrofoam cup into the sink.

Station 13 Questions:

1. What was the initial temperature of the water inside the styrofoam cup?
2. What was the temperature of the water in the beaker on the hotplate?
3. Predict: based on the initial temperatures, what would you expect to see happen if you transferred 5 droppers full of the hotter water into the cooler water?
4. Did your results agree with your prediction? Explain.
