Name: _____ **Date:** _____ **Period:** _____

Physics Exploration Stations

Lab Partner(s): _____

Instructions: *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 assigned partners, but you will be completing this observations sheet individually.*

You will have a limit of 7 minutes per station. When you hear the bell or buzzer, rotate to the next station. By the end of the activity you will have completed each station's activity.

STATION #1: TUNING FORKS

1. Pitch is the term we use to describe how high or low a note sounds. Rank the tuning forks' frequency from highest pitch to lowest pitch:

   _____ > _____ > _____ > _____ > _____

2. Does the sound you hear depend on how close the fork is to your ear when you listen to it? Explain.

3. It is possible to make the tuning fork on the wooden box ring without needing to touch the tuning fork or the box! Explain how to make this happen:

STATION #2: MASSES

When reporting masses, make sure that you are reading the scale to the correct decimal place and include units!

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

4. Which of these devices is the least appropriate for measuring mass? Why?

5. What are some benefits and disadvantages of using each of these devices to measure the mass of objects in a lab?

STATION #3: CAR/RAMP WITH PHOTOGATES

6. 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.

Time (s) required for car to pass through photogate from position 1				
Trial 1	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**

Average time = _____ s

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

t_2 = _____ s

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

t_3 = _____ s

STATION #4: SPRING OSCILLATIONS

9. 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?

10. 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 #5: MOTION DETECTOR

11. Sketch the graph you are trying to produce with the car.

12. What did you have to do to the car in order to match the graph described in the instructions? Be specific in your description.

STATION #6: OPTICS BENCH WITH LENS

13. At which two positions for the lens is a clear image formed on the screen?

Position 1: _____ cm **Position 2: _____ cm**

14. Sketch one of the images:

15. Is the image inverted (upside-down), or upright, compared to the original object (the light source)? _____

16. Compare/Contrast the images seen at positions 1 and 2.

STATION #7: BATTERY-POWERED BUGGY

17. What distance did the buggy move? _____ m

18. What was the time you recorded?
    Trial 1: _____ s
    Trial 2: _____ s
    Trial 3: _____ s
    Average time: _____ s

19. 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 in the space below, and label your axes appropriately.

STATION #8: HOPPING FROGS

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

STATION #9: COLOR MIXING

21. Which 2+ color slides did you mix to create the color red? _____

22. Which 2+ color slides did you mix to create the color blue? _____

23. Which 2+ color slides did you mix to create the color green? _____

24. How can you create the color black by mixing the slides? _____

25. Using the color photograph and the narrow strips, which color rectangle(s) would you use to match the color of the sky in the picture? *(These are marked with the saturation level, so record both the letter and the number ☺)*

STATION #10: PHYSICS IN THE NEWS

26. Which website did you choose to search?

27. Which headline sounded interesting to you? Why?

STATION #11: FASTER FALLING

28. **Prediction**: Which will fall faster: the clay or the flat piece of paper? Why?

29. Specifically describe the motion of the paper and the clay when they are dropped from the same height at the same time.

30. Is there any way to drop the paper and the clay so that they fall at the same speed? Describe what you did and your results.

31. **Prediction**: Will different sizes of clay fall at different speeds?

32. Describe your results. Was your prediction correct?

STATION #12: CAREER SEARCH

33. Other than a physicist, a physics teacher, or an engineer, <u>what is are (at least) two careers that use the principles of physics</u> in some way? How?

STATION #13: THE BIRD AND THE WORM

34. **Thought Experiment**: A tropical bird is sitting on a tree branch when it looks down and sees a big juicy worm! The bird lets go of the tree branch and swoops down to pick up the worm and returns to its perch on the branch.

    If the Earth is spinning on its axis so that the ground moves at 464 $^{m}/_{s}$ (1038 mph), why doesn't the tree, ground, and worm rush away from the bird when it lets go of the branch? (Note: This was at one point in history used as <u>evidence</u> that the Earth is <u>not</u> spinning!)

    Explain the solution to this seemingly paradoxical situation!

STATION #14: PHYSICS TRIVIA

35. Why do astronauts inside orbiting space shuttles experience weightlessness?

36. What is causes the phases of the moon (full moon, waning crescent moon, etc.)?

37. What causes the seasons? Why is it warmer in the summer and colder in the winter?

38. Why is the sky blue? Why does ocean water look blue when viewed from above?

39. Circle the names you know:

    Aristotle Galileo Newton Einstein Hawking

    Do you know what their contributions to physics are/were?

STATION #15: ON THE REBOUND

40. **Prediction**: If you were to drop each of the balls at this station from a height of 1.00 m to the lab station table-top, how much energy would each have once it reaches the table? Rank each in order from greatest energy to least energy and explain your reasoning.

_____ > _____ > _____ > _____ > _____ > _____

41. What was the rebound height for each ball?

Type of ball	Rebound height (cm)
Tennis ball	
Billiard ball	
Ping-Pong ball	
Golf Ball	
Steel Marble	
Plastic marble	

42. Based on your data, which ball retained the greatest percentage of its total energy? Explain your reasoning.