Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour \_\_\_\_\_\_\_\_\_\_

**Laser Alarm System (summative)**

**Task:** You are a security consultant for the world’s most renowned security company. Your team has been hired to design and construct a laser alarm system to protect the world’s largest, most valuable diamond!

* Your laser must be **reflected, refracted**, and **transmitted** through different mediums and begin and end at the same location, landing on a small bullseye target at the end of the course.
* The diamond you are protecting is located in the center of the bank vault. Your laser must provide 360 degree coverage of the “diamond”.

**Materials**

* Laser (red yarn) -1 concave lens -mirror -bullseye target
* Prism -1 convex lens -1 glass of water

(You may use other materials with Ms. Murphy’s permission)

**Constraints:** Use the following constraints checklist to guide your group. Your engineering plan must meet these requirements

* All of the following equipment provided must be incorporated into your design: laser, bullseye target, mirror, prism, convex lens, glass with water, and 1 convex lens.
* The laser must begin and end at the same location, landing on a small bullseye target at the end of the course.
* The laser must be reflected, refracted, and transmitted through different mediums.

**Instruction Check list:**

\_\_\_1. You will first create a rough draft of your plan. Each partner should contribute to the rough draft. On scrap paper, sketch and annotate a basic design that is fully labeled.

\_\_\_2. Raise your hand and show Ms. Murphy your sketch. On poster paper construct a 2-D model of your design; use directional arrows to predict light behavior. This design must also be labeled and use captions with unit vocab to describe what is happening. Use one color for your rough draft and make a key on your poster paper.

\_\_\_3. Raise your hand and ask Ms. Murphy for the materials. Set up your 3-D model using yarn to predict the behavior of light.

\_\_\_4. Test your design with the laser; if it works show Ms. Murphy

\_\_\_5. Make any necessary changes on your poster in a different color than your rough draft. Retest your design and show Ms. Murphy if it works. (All corrections should be done in a different color, add this color to your key)

\_\_\_6. Complete the following questions as your individual reflection

**Individual Reflection**: Answer the following questions on a separate piece of paper (or on the back of the rubric) using complete sentences with a restate. This should be done on your own. Select the questions you would like to answer, you must earn at least 10 points any extra will be considered extra credit. Each answer should be supported with textual evidence from a credible source. (If you use a lab, activity or video you must use a direct quote or describe in detail with the lab or video title)

1. You used a laser as your light source for your alarm system model. Using the knowledge you have acquired from this unit and with as much scientific detail as possible, describe how light travels. (3 points)

2. Define frequency and describe how it relates to light (2 points)

3. What would happen to your laser if the frequency of the wave was dramatically increased? (3 points)

4. List and define the four major types of light behavior. (4 points)

5. Which types of light behavior did you observe while constructing your laser alarm system? Describe one example for each type of light behavior on your laser alarm system. (5 points)

6. Construct a colored, labeled model to illustrate and explain what happens when light rays from the sun hit a convex magnifying glass lens. Use scientific vocabulary from this Light Unit. (7 points)

|  |  |  |  |
| --- | --- | --- | --- |
| **Rough draft** | Check when completed | Points Possible | Points  earned |
| Labeled |  | 2 |  |
| Use ray diagrams (arrows) to demonstrate how you predict light rays will behave on your laser alarm system design. Number the order in which your laser will travel. Rough draft color \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  | 2 |  |
| Annotate your design with key features of the system and scientific concepts/ unit vocab. (underline at least 4 vocab words) |  | 2 |  |
| Ms. Murphy signature of approval \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  | 4 |  |
| **Final Blue print** |  |  |  |
| Label and color all key features of the system and number the order your laser will travel in. |  | 4 |  |
| Illustrates how parts of the system work together |  | 4 |  |
| Describes the relationship between the parts of the system in **depth** |  | 4 |  |
| Explains the systems vocabulary (underline at least 4 vocab words) |  | 3 |  |
| Explains the limitations of the model (sources of error) |  | 1 |  |
| Signature showing Ms. Murphy that your system worked |  | 4 |  |
| **Group work** |  |  |  |
| All members were respectful, safe, positive and on task |  | 4 |  |
| Group used time wisely (turned in on time) |  | 4 |  |
| **Individual Reflection** |  |  |  |
| Answered questions using complete sentences with a restate |  | 5 |  |
| Answered questions using evidence, cited correctly and underlined in your answers. |  | 5 |  |
| Answered 10 points of questions fully |  | 5 |  |
| Overall score | | 53 |  |