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

**Laser Alarm System (summative)**

**Task:** You and your engineering group will create, test, and revise a model to show the movement of a laser through a laser alarm system prototype created by your group using the materials provided. 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” (you may want to protect the diamond from every angle.

**Materials**

* Laser -Large lens -1 large convex lens -mirror
* Prism -2 small 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, large convex lens, glass with water , and 2 small convex lenses.
* 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.

**Instructions:**

1. You will first create a rough draft of your plan. Each partner should work independently on their rough draft and each partner needs to turn in their own rough draft.

-All materials should be labeled

- Use ray diagrams (arrows) to demonstrate how you predict light rays will behave on your laser alarm system design.

- Annotate your design with key features of the system and scientific concepts/ unit vocab.

2. Next, you will get with your partner and discuss both rough drafts. Select the best pieces of both and create a final blue print of your design.

-Colored and labeled

- Use ray diagrams (arrows) to illustrate how you the light rays behave on your laser alarm system design.

- Describe the relationship between the parts of the system in **depth.**

- Annotate your design with key features of the system and scientific concepts/ unit vocab. (underline at least 4 vocab words)

3. With Ms. Murphy’s permission you may test your design at least once before the final presentation. After your test make any necessary changes to your design.

4. 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.

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 |  | 3 |  |
| Use ray diagrams (arrows) to demonstrate how you predict light rays will behave on your laser alarm system design. |  | 3 |  |
| Annotate your design with key features of the system and scientific concepts/ unit vocab. (underline at least 4 vocab words) |  | 3 |  |
| **Final Blue print** |  |  |  |
| Labels all key features of the system |  | 5 |  |
| Illustrates how parts of the system work together |  | 5 |  |
| Describes the relationship between the parts of the system in **depth** |  | 5 |  |
| Explains the systems vocabulary (underlined) |  | 4 |  |
| Explains the limitations of the model (sources of error) |  | 2 |  |
| **Group work** |  |  |  |
| All members were respectful, safe, positive and on task |  | 5 |  |
| Group used time wisely (turned in on time) |  | 5 |  |
| **Individual Reflection** |  |  |  |
| Partner 1(fill in name) |  | 10 |  |
| Partner 2(fill in name) |  | 10 |  |
| Partner 3(fill in name) |  | 10 |  |
| Overall score | | 50 |  |
| Partner 1 (fill in name) | |  |  |
| Partner 2(fill in name) | |  |  |
| Partner 3(fill in name) | |  |  |