AP Physics 2 – Geometric Optics Lab Presentation Assignment

Each team of four students (***that Mr. Lawson will pick!***) will pick one of the following investigations to perform. Each team will then prepare and present a lesson for the rest of the class in which they explain the experiment(s) performed, share the data with the class, and lead the class toward conclusions regarding the experiment(s). This will include mathematical model(s) consistent with the data. Each team will also present to the class a diagrammatic “ray model” of light that would account for all observations made in the experiment.

Group A – Reflection and Refraction

* Law of Reflection - using plane mirrors to investigate relationship between angle of incidence and angle of reflection, image distance and object distance, and image height and object height.
* Snell's Law: Investigate the relationship between angle of incidence and angle of refraction for an air-plastic interface.
* Snell's Law: Investigate the relationship between angle of incidence and angle of refraction for an air-water interface.

Group B – Pinhole Cameras and Image Formation

* Pinholes - Using a pinhole "camera" with a screen you will investigate relationship between object distance and image height, and image distance and image height.
* Using a pinhole "camera" with a screen you will investigate relationship between object height and image height. This group will also investigate the effect of multiple pinholes, and the effect of making the pinhole increasing larger.

Group C – Concave Spherical Mirrors

* Converging Mirrors-Relationship between object distance and image distance in a concave spherical mirror.
* Converging Mirrors-Relationship between object height and image height for real images for in a concave spherical mirror.
* Converging Mirrors-Relationship between object distance and image height for real images for in a concave spherical mirror.

Group D – Converging Lenses

* Relationship between object distance and image height.
* Converging Lenses - Relationship between object distance and image distance for real images produced by a converging thin lens.
* Converging Lenses - Relationship between object height and image height for real images produced by a converging thin lens.
* Converging Lenses - Relationship between object distance and image height for real images for a converging thin lens.

**Requirements for lab investigation/class presentation**

1. Each member of the team will be involved in the process of designing and setting up the experiment, performing the experiment, and gathering/preparing visual aids necessary for presenting the experiment/results/models to the class.
2. Each team will be required to develop a presentation of its investigation and the results. This presentation must include (but is not restricted to) a “Google Sheets” type presentation as part of their presentation to the class. The presentation must include:
   1. A statement of the purpose of the experiment(s)
   2. A hypothesis to be tested with the experiment(s)
   3. A detailed description/explanation of the equipment used in the investigation
   4. Appropriate diagrams and/or photos which illustrate the equipment used, the equipment setup, and what the experimenter might see while performing the experiment. This could be supplemented by actually demonstrating the equipment used in the investigation.
   5. All graphs with appropriate mathematical analyses

The presentation should lead students through the experiment, results, and conclusions so that, as well as possible without actually performing the experiment, each student in class will understand the experiment(s), the results and what conclusions can be drawn from the investigation. The presentation should also include the presentation of a light ray (or stream of particles) based model that can account for all of the observed results and calculations. ***You will need to teach the class to make appropriate ray diagrams which will allow the student to locate the image produced by the optical system using ray tracing***.

1. Each team must have a handout prepared to give each student in the class which includes:
   1. A statement of the purpose of the experiment(s)
   2. A hypothesis to be tested with the experiment(s)
   3. A detailed description of the equipment used in the investigation
   4. Appropriate diagrams and/or photos which illustrate the equipment used, the equipment setup, and what the experimenter might see while performing the experiment.
   5. Raw data
   6. Formal data table(s) with sample calculations
   7. All graphs with appropriate mathematical analyses

This handout, in both print and electronic form, must be given to Mr. Lawson before no later than 8:00 am on the day of the scheduled presentation. I will make enough photocopies for all members of the class. This handout should not include the conclusions section of a lab report. You should also include appropriate materials that will allow students to follow your light ray model explanation well enough that they could use it to describe an optical situation related to your presentation.

1. Each team will be required to be ready to present at the appropriate juncture of the geometric optics unit. ***Failure to have all materials ready when they are needed in the optics unit will result in a zero on the project for each of the team members***.

There is no guarantee that you will actually present on the predicted day, but you are required to be ready by that day. The order of presentations is tentatively scheduled tow be consistent with the group orders (A-D) on the previous page.

1. Each team member will receive a grade for the presentation based on the quality of the materials prepared for the class and the quality of the presentation made to the class. Responsibilities for performing the investigation, preparing the presentation, and making the presentation should be divided equitably between the team members. Each member is responsible for making an equitable contribution to each portion of the presentation.

**ASSESSMENT – Geometric Optics Lab Presentation Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **BEGINNING** | **DEVELOPING** | **ACCOMPLISHED** | **EXEMPLARY** |
| **Presentation** | | | | |
| **Connection to the unit of study** | Connection is not clearly made. | Connection is made but with some major errors or omissions. | Connection is clearly made but, with some minor errors or omissions | Connection is clearly, completely and accurately explained. |
| **Questioning** | No questions asked | One simple question with a simple answer | One or two thoughtful questions with a simple or incomplete answer | Multiple thoughtful questions with thorough answers that help the audience to a deeper understanding of the concept |
| **Clarity** | Although an attempt is made, it is difficult to follow most of the presentation. | Most of the presentation is well organized with clear communication, but some sections are not. | Entire presentation is organized and clear; a few details take effort to decipher, and so could not be used as a teaching tool | Entire presentation is effectively organized with logical flow; can be used as a teaching tool |
| **Presentation Mechanics** | Presentation is unfocused; student demonstrates an understanding that is still in development.  Minimal variety in tone and format. May be difficult to hear or overly casual.  Has significant difficulty answering questions from audience | Presentation is somewhat focused; student demonstrates a basic understanding of their material.  Presentation is adequate volume and mostly professional. Minor variety in tone or format.  May have trouble answering questions from audience. | Presentation is focused; student demonstrates a good understanding of their material  Presentation is clear & professional. Changes in tone or format add variety to presentation.  Has little trouble responding to questions from audience | Presentation is clear & focused; student demonstrates a thorough understanding of their material  Tone, format, and style are varied in an effort to create an authentically engaging presentation.  Responds to audience questions with ease. |
| **Submitted Work** | | | | |
| **Bibliography** | No sources cited, or citations are a simple list of website addresses | Few sources cited  Citations not in APA format | Multiple sources cited  Bibliography in correct APA format with some minor errors | Several sources  Bibliography correctly cited in APA format |

Peer Evaluation – Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Communication Skills** | **Novice** | **Learner** | **Practitioner** | **Expert** |
| Student had **difficulty** using visual media to communicate with the audience. | Student **sometimes** used visual media to communicate with audience, but it may not have been as effective | Student **often** used visual media to communicate with the audience effectively | Student **consistently** and **independently** used visual media to communicate with the audience effectively |
| Student had **difficulty** using different speaking techniques to communicate with my audience. My ability to communicate was limited | Student used **one or two** different speaking techniques to communicate with audience, but it may not have been as effective | Student used **some** different speaking techniques and to communicate with my audience effectively | Student **consistently** and **independently** used a variety of speaking techniques communicate with my audience effectively |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Participation and Cooperation** | **Novice** | **Learner** | **Practitioner** | **Expert** |
| Student **does not** participate in group work | Student participates in group work **some** of the time | Student participates in group work **most** of the time | Student **consistently** participates in group work |
| Student **does not** cooperate with other group members | Students interacts **adequately** within the groups but **does not** respect others | Student interacts **adequately** within the group and respects other group members | Student interacts **well** within the group and respects other group members |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Teamwork** | **Novice** | **Learner** | **Practitioner** | **Expert** |
| Student **does not** perform assigned role within the group | Student adequately performs assigned role **some** of the time | Student adequately performs assigned role on a **consistent** basis | Student **effectively** performs assigned role within the group |
| Student **does not** work towards team goals | Student works toward team goals **some** of the time | Student works toward team goals **most** of the time | Student **consistently** works toward team goals |