Reflection and Mirrors Notebook - Scoring Rubric

Your notebook will be collected at the end of class on _____, _____ _____. The following items should be in your notebook. They should be clearly organized and easy to find. *Auxilliary items* should be taped, glued or stapled into the notebook in the appropriate location; they should not be *hanging loose*. Use an organizational system and label all work. Each lab will be graded separately. Eleven Reflection and Mirrors lab grades will be entered into the gradebook. An overall notebook grade will be determined based on your use of the notebook as an organized and effective record-keeping tool which documents your engagement in the learning cycle during classtime and labtime.

Name: _____ Period: _____

Item		Score
RM1.	**Reflection Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section includes provided graphic with incident and reflected rays for several paths (at least two); rays are clearly labeled or color-coded to indicate which reflected ray corresponds to which incident ray. ____ Conclusion provides a clear statement of how light reflects; written in own words; general enough to be applied to any angle of incidence. ____ Discussion of Results explains how the data logically support the conclusion. Specific results are referenced in the discussion. Reasons are given for why any results inconsistent with the conclusion can be *ignored*.	_____/3 (Lab score)
RM2.	**Rough versus Smooth Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section includes a wealth of observations pertaining to reflection of light off a mirror, dry paper and wet paper (diagrams would be useful); observations are labeled to distinguish between the surfaces observed; observations are clear, pertinent and understandable. ____ Conclusion/Discussion describes the differences in reflection off the three types of surfaces. An accurate, reasonable and thorough explanation of the differences is provided.	_____/4 (Lab score)
RM3.	**Plane Mirror Image Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section includes a clear communication of how light from a single point reflects off mirror AND extension lines to show that the image location is where reflected rays seem to come from AND clearly-stated measurements of image and object distance. Class data for object and image distances are recorded and labeled. Object and image locations are labeled; arrowheads are placed on all rays. Results are reasonably accurate. ____ Conclusion states the relationship between the object and image distance. ____ Discussion of Results discusses the experimental evidence which supports the conclusion. It includes an error analysis in which the results are evaluated for accuracy. A percent difference calculation is shown as a part of the error analysis; calculation is accurate; work is shown.	_____/6 (Lab score)
RM4.	**What Portion ...? Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section includes the provided diagrams; both diagrams accurately show light paths from the feet and the head to the eye; arrowheads are included on the rays. Relevant measurements are included on the diagram. Class data is included and labeled. ____ Conclusion states the relationship between the person's height and the amount of mirror needed to view his/her image. ____ Discussion of Results uses the experimental evidence and logic to support the	_____/6 (Lab score)

	conclusion which is drawn. Reasoning is thorough and accurate. Accuracy of individual results are evaluated; some form of percent error or percent difference calculation is used in the evaluation.	
RM5.	**Right Angle Mirror Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section included provided diagram with two sets of incident and double-reflected rays originating from the object location (included arrowheads). Each of the second reflected rays are extended backwards to identify the secondary image location. Measurements were included for individual results. Ray construction and image location is accurate. ____ Conclusion describes the location of the secondary image relative to the object and mirrors; a general rule which could be used to locate it is clearly stated. ____ Discussion of Results describes how the general rule stated in the Conclusion is consistent with the experimental evidence. Individual results were evaluated; possible causes of error were suggested (where appropriate).	_____/6 (Lab score)
RM6.	**Infinity Derivation** ____ Included, labeled and organized all parts of the lab report. ____ Data section includes diagram with two parallel mirrors, object and the several images to the left and to the right of the mirrors. Image distances are stated. The process used to determine the equation is documented and logical. A clear effort to derive an equation is documented; unsuccessful attempts may be shown and ruled ineffective. Logic and reasoning are evident; the final equation(s) is(are) consistent with distances stated in the diagram. Equation(s) is/are accurate and works; process of finding it is thoroughly documented. ____ Conclusion states the equation or equations which relate(s) the distance between the n^{th} image and the rightmost mirror in terms of pertinent variables; definition of variables are clearly stated. ____ Discussion of Results shows how the equation can predict the first five image distances to the right of the right-most mirror. Work is shown and labeled.	_____/5 (Lab score)
RM7.	**Improving Your Image Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section includes a table of **Θ** - **N** data; column headings and angle units are stated. Includes a graph of **N** vs. **Θ**; axes are labeled. Logical progression from data to conclusion is documented; the progression may involve linear regression analysis, power regression analysis, or a trial-and-error process of equation-writing. The process of linking the data to the equation is documented and *explained*; cross-outs of and scribbles on top of wrong paths and failed attempts are wholly scientific. ____ Conclusion states the equation which relates the number of images (N) to the angle between the mirrors (**Θ**).	_____/5 (Lab score)
RM8.	**Exploring Curved Mirrors Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section included observations of how the image appeared for various object locations for both types of mirrors. Observations are organized, accurate, clear and thorough. ____ Conclusion uses sentences to describe the changes in the relative size and orientation of the image as an object moves from very close to a concave mirror to a more distant location. Description is accurate.	_____/4 (Lab score)
RM9.	**Finding Smiley Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section includes a table of data; columns are labeled; units are stated. A plot of image distance vs. object distance is included; axes are labeled; best fit line is drawn. Strategic locations on the graph are labeled (for example, the m=1 line, the two asymptotes, etc,). Locations are used in the Discussion section. ____ Conclusion/Discussion section describes the relationship between the two quantities. Seemingly hidden information is extracted from the graph and	_____/8 (Lab score)

	described clearly and accurately. Writing is clear and organized. All conclusions are supported by constructions made on the graph in the Data section; the logical connections between data and conclusions are explained.	
RM10.	**Magnification Ratio Lab** ____ Included, labeled and organized all parts of the lab report. ____ Data section included a complete table with the <u>measured</u> data for determining the magnification and the focal length (d_{object} and d_{image}). At least one focal length calculation is shown. The table is organized, clear, and includes the stated unit. Data appear accurate. Calculations are organized and accurate. Demonstrated a clear understanding of how to investigate the question. ____ Conclusion states the object distances (expressed in terms of f) required for each of the three magnification values. The average focal length is stated. ____ Discussion of Results section describes how the focal length was determined; an error analysis is performed (perhaps even a percent error for each trial using the average f value as the theoretical value). The manner in which the object distances - expressed as a multiple of focal length - was determined is discussed. Provided the logical link between experimental data and conclusion statements.	_____/8 (Lab score)
RM11.	**Mirror Equation Derivation** ____ Included, labeled and organized all parts of the lab report. ____ Data section included provided and completed graphic; two sets of similar triangles are identified, labeled and subsequently used in a derivation. Derivation is annotated and briefly explained. Algebraic steps are shown in systematic manner leading up to the final equation relating object distance, image distance and focal length. ____ Conclusion states the equation relating the object distance, image distance and focal length.	_____/4 (Lab score)
RM12.	**Use of Notebook as a Record-Keeping Tool** Ideally, a student would use the notebook to record notes from class lectures, post-lab sections, textbook readings, etc. Answers and discussions of opening questions are provided. The notebook is a record of the involvement of a scientist/student in both class and lab. A blank or even sparsely-used notebook with little evidence of involvement in class is not a sign of a student who has used the notebook to document and record their involvement in class. A diligent student keeps careful records which subsequently become an effective and useful learning tool.	_____/10 (HW score)