Scoring Rubric for Skills Practice Labs

The following rubric describes six levels of student performance in the laboratory. To use this 5-point scale, read the description of each level and decide which description most accurately reflects each report you grade.

EXPERIENCED LEVEL (5 points)

- Excellent technique was used throughout the lab procedure. Procedures were well-planned and well-executed.
- Data and observations were recorded accurately, descriptively, and completely, with no serious errors.
- Calculations and data analyses were performed clearly, concisely, and accurately, with correct units.
- Graphs, if necessary, were drawn accurately and neatly and were clearly labeled.
- Students recognized the connections between their observations and the related physics concepts; this understanding was expressed clearly and completely.
- Answers to questions were complete and were written correctly and accurately.

COMPETENT LEVEL (4 points)

- No errors in technique were observed during the lab procedure. Procedures were well-planned and were carried out in an organized fashion.
- Data and observations were recorded accurately, descriptively, and completely, with only minor errors.
- Calculations and data analyses were performed accurately, with correct units and properly worked-out calculations, but the work may have been slightly unclear or disorganized.
- Graphs, if necessary, were drawn accurately and neatly.
- Students effectively expressed their recognition of the connections between their observations and the related physics concepts.
- Answers to questions were written correctly and accurately but may have revealed minor misunderstandings.

INTERMEDIATE LEVEL (3 points)

- Only minor errors in technique were observed during the lab procedure. Procedures were carried out well but may have been slightly disorganized.
- Data and observations were recorded accurately, with only minor errors or omissions.
- Calculations and data analysis were performed accurately, but some minor errors were made either in calculations or in applying correct units.
- Graphs, if necessary, were drawn accurately and neatly.
- Students satisfactorily expressed their recognition of the connections between their observations and the related physics concepts.
- Reasoning was occasionally weak in the report, but only in a few places.
- Answers to most questions were correct, but there are some misunderstandings or minor errors.

Scoring Rubric for Skills Practice Labs *continued*

TRANSITIONAL LEVEL (2 points)

- Only a few errors in technique were observed during the lab procedure, but they may have been significant. Procedures may not have been well-planned, or they may have been carried out in a disorganized fashion.
- Data and observations were recorded adequately, with only minor errors or omissions.
- Calculations and data analysis were performed accurately, but minor errors were made both in calculations and in applying correct units.
- Graphs, if necessary, were drawn adequately.
- Students recognized connections between their observations and the related physics concepts, but this understanding was very weakly expressed.
- Reasoning was generally weak throughout the report.
- Some answers to questions were incorrect because of misunderstandings, minor errors, or poor data.

BEGINNING LEVEL (1 points)

- Several serious errors in technique were observed during the lab procedure. Procedures were not well-planned and were carried out in a disorganized fashion.
- Most data and observations were recorded adequately, but with several significant errors or omissions.
- Calculations and data analysis were performed inaccurately, but correct units were used most of the time.
- Graphs, if necessary, were drawn adequately.
- Students may not have recognized connections between their observations and the related physics concepts; no expression of understanding was evident in the report.
- Errors in logic were made in the report. The report may have been disorganized and unclear.
- Some answers to questions were incorrect or poorly written.

UNACCEPTABLE LEVEL (0 points)

- All work was unacceptable.
- No responses were relevant to lab.
- Major components of lab were missing.

Scoring Rubric for "Design Your Own" Labs

For labs in which students are directed to develop their own procedures, it is essential for them to work in an organized and logical manner. Students must submit an initial plan for your approval before they begin work in the lab.

The following scoring rubric describes six levels of student performance in the laboratory to help you evaluate your students' lab work. Each level describes the organization and safety requirements for the initial plan, the methods and skills required in the lab, and the quality of analysis expected in the written lab report.

EXPERIENCED LEVEL (5 points)

- Plan showed careful and thorough planning with good reasoning and logic. Students expressed a clear understanding of the science concepts to be investigated through the plan.
- Plan was complete, appropriate, and safe.
- Proposed data tables were complete and clearly indicate all measurements that must be made to solve the problem.
- Excellent technique was used throughout the lab procedure.
- The final report followed the prescribed format. All apparatus was described in detail. All necessary diagrams, equations, and graphs were correctly labeled. The procedure and results were described clearly and in an organized fashion. Writing was clear, concise, and well-organized, with few grammatical or stylistic errors. The connection between the initial problem and the results of the lab was clearly expressed.
- Students were successful at solving the problem presented by the lab. Percentage error for quantitative answers was less than 15%.

COMPETENT LEVEL (4 points)

- Plan showed careful planning, although the reasoning and logic behind it may not have been clearly expressed. Plans reflected some understanding of the science concepts to be investigated through the lab.
- Plan was appropriate, safe, and nearly complete.
- Proposed data tables indicated all measurements that must be made to solve the problem, but there may have been some minor errors or omissions.
- No errors in technique were observed during the lab procedure.
- The final report followed the prescribed format. All apparatus was described in detail. All necessary diagrams, equations, and graphs were correctly labeled. The procedure and results were described clearly and in an organized fashion. Writing was clear, concise, and well-organized, with few grammatical or stylistic errors. The connection between the initial problem and the results of the lab was clearly expressed.
- Students were essentially successful at solving the problem presented by the lab. Percentage error for quantitative answers was less than 25%.

Scoring Rubric for "Design Your Own" Labs *continued*

INTERMEDIATE LEVEL (3 points)

- Plan showed some logic, but the reasoning could have been more careful, more thorough, or more clearly expressed. Plans reflected understanding of the science concepts to be investigated through the lab, but not clearly.
- Plan was appropriate and safe, but there were some omissions.
- Proposed data tables indicated all measurements that must be made to solve the problem, but no provision was made for multiple trials.
- Only minor errors in technique were observed during the lab procedure.
- The final report followed the format. All necessary diagrams, equations, and graphs were included, but they may not have been complete. Apparatus was vaguely described. The procedure and results were described, but the writing was not clear or organized. There may have been serious grammatical or stylistic errors. Students understood the connection between the initial problem and the outcome of the lab.
- Students were somewhat successful at solving the problem presented by the lab. Percentage error for quantitative answers was less than 35%.

TRANSITIONAL LEVEL (2 points)

- Plan showed some logic, but not enough to completely solve the problem. Plan reflected understanding of the science concepts to be investigated through the lab, but not clearly.
- Plan was safe, but it included inappropriate procedures or omitted necessary steps. Plan may not have directly addressed the problem presented. Planned procedure will probably not work as written. The plan was poorly written or disorganized.
- Proposed data tables may not have included all measurements that must be made to solve the problem.
- Procedures may not have been well planned, or they may have been carried out in a disorganized fashion.
- The final report followed the format, but each section may not have been completely addressed. There were serious grammatical or stylistic errors. Students may have understood the connection between the initial problem and the outcome of the lab, but this understanding was not expressed in the report.
- Students' results only approximately addressed the problem presented by the lab. Percentage error for quantitative answers was less than 50%.

Scoring Rubric for "Design Your Own" Labs *continued*

BEGINNING LEVEL (1 point)

- Plan showed very little logic or understanding of what is required to solve the problem. Plan did not reflect understanding of the science concepts to be investigated through the lab.
- Plan may not have been completely safe. The plan was poorly written.
- Proposed data tables did not include all measurements that must be made to solve the problem.
- Several serious errors in technique were observed during the lab procedure. Students attempted to solve the problem by trial-and-error.
- The final report followed the format, but there may have been several omissions. There were serious grammatical or stylistic errors. Students did not understand the connection between the initial problem and the outcome of the lab.
- Students' results may not have adequately addressed the problem presented by the lab. Percentage error for quantitative answers was less than 65%.

UNACCEPTABLE LEVEL (0 points)

- All work was unacceptable.
- Major components of the plan were missing. The plan was completely illogical, unsafe, or completely irrelevant to the problem.
- Major components of lab were missing.
- Data and observations were incomplete and did not address the problem presented in the lab.
- The report did not address the problem presented in the lab. Percentage error for quantitative data was more than 80%.

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Basic Rubric for Written Work

Possible Points	Criteria
90–100	All portions of the assignment have been completed. Clear and complete explanations demonstrate a complete understanding of subject matter. Scientific vocabulary is used properly and effectively. Clear examples, models, graphs, diagrams, charts, and other support are provided.
80–89	All portions of the assignment have been completed. Clear language demonstrates a good understanding of the key concepts, but explanations could be more detailed. Scientific vocabulary is used well. Examples, models, graphs, diagrams, charts, and other support are provided.
70–79	Most of the assignment has been completed. Writing style is adequate but sometimes indicates confused thinking about a concept. Examples, models, graphs, diagrams, charts, or other support is included but is not always used effectively or appropriately.
60–69	Incomplete or inadequate responses indicate confused thinking about topic. Writing style is often unclear, and scientific terms are not used or are not used properly. Support data or visuals are not provided or are not used correctly.
10–59	Inadequate and incomplete responses indicate poor understanding of the subject matter. Scientific terms are not used or are not used properly. Attempts to communicate information are not very successful. No examples or visual support has been provided.
0	No work was completed.

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Rubric for Performance Assessment

Possible Points	Criteria
90–100	Successfully completes task and extends it for a greater understanding of topic. Solution is clearly stated with well-supported documentation (such as charts, graphs, or diagrams). Solution reflects imaginative thinking. Technical and scientific principles are well understood.
80–89	Successfully completes task. Solution is clearly stated and supported. Technical and scientific principles are understood and communicated effectively.
70–79	Task is generally complete, with a few minor flaws in the understanding of concepts or processes. Solution is clearly stated and attempts to support explanations with examples and graphics are made, but data may not always be accurate or appropriate.
60–69	Task only partially completed. Solution reveals one or more significant errors in the understanding of concepts or processes. Solution and supporting details are provided but are unclear or incomplete. Use of visuals is incorrect, inappropriate, or missing.
10–59	Although attempted, task not completed with successful results. Inadequate or inappropriate attempts to communicate information show a complete misunderstanding of concepts and processes. Few, if any, support materials provided.
0	No work was attempted.

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Rubric for Writing Assignment

Possible Points	Criteria
90–100	The assignment is engaging, concise, and polished. An attention-grabbing headline and a clear topic sentence in the first paragraph introduce the reader to the subject. Factual details, visual elements, quotations, and/or the proper use of scientific terminology add clarity and interest to the assignment.
80–89	The assignment is well written. An attention-grabbing headline and a clear topic sentence in the first paragraph introduce the reader to the subject. Factual details, visual elements, quotations, and/or the proper use of scientific terminology add clarity and interest to the assignment. Sometimes the writing is slightly repetitive or unclear, but the writer does demonstrate a good understanding of the subject matter.
70–79	The assignment is fairly well written and clear, but several errors indicate that the author may not have a complete understanding of the subject. Factual details, visual elements, quotations, and/or the proper use of scientific terminology are used.
60–69	The assignment has several significant problems in style and content. The topic is never clearly stated, scientific terms are misused, and misspelled words are present. Inadequate or incorrect use of factual details, visual elements, or quotations seem to indicate that the author does not have a solid understanding of the subject.
10–59	Although attempted, the author has clearly not put forth much effort. The writing is unclear, unfocused, and vague. A topic sentence is not given or is not adequately supported with details. The author has not used scientific terminology correctly and has introduced false statements and errors in writing style that make reading this work very difficult.
0	No work was completed.

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Rubric for Portfolio Assessment

Possible Points	Criteria
90–100	All required materials are included, with a significant number of additional entries. Work demonstrates noticeable progress in the understanding of scientific concepts and in the ability to apply scientific concepts outside the classroom. Clear, well-organized, and creative entries demonstrate a building enthusiasm for the project.
80–89	All required materials are included, with a number of additional entries. Work demonstrates progress in the understanding of scientific concepts and in the ability to apply scientific concepts outside the classroom. Entries are clear and well-organized, and they increase in number from beginning to end.
70–79	Most of the required materials are included. Work demonstrates a general understanding of scientific concepts and their applications, but it has not improved significantly from beginning to end of course. Organization and clarity of Portfolio is acceptable.
60–69	Key portions of required materials are missing. Portfolio is not well-organized, and attempts to communicate information often show the misunderstanding of concepts and their applications. Progress of student from beginning to end of course is not clearly evident.
10–59	Large portions of required materials are missing. Existing materials are disorganized, and Portfolio is confusing to view. Difficult to monitor progress of student from beginning to end of course.
0	No work was attempted.

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Rubric for Reports and Presentations

Possible Points	Scientific Thought (40 points possible)
40–36	Complete understanding of topic; topic extensively researched; variety of primary and secondary sources used and cited; proper and effective use of scientific vocabulary and terminology
35–31	Good understanding of topic; topic well researched; a variety of sources used and cited; good use of scientific vocabulary and terminology
30–26	Acceptable understanding of topic; adequate research evident; sources cited; adequate use of scientific terms
25–21	Poor understanding of topic; inadequate research; little use of scientific terms
20–10	Lacks an understanding of topic; very little research, if any; incorrect use of scientific terms
Possible Points	**Oral Presentation (30 points possible)**
30–27	Clear, concise, engaging presentation, well supported by use of multisensory aids; scientific content effectively communicated to peer group
26–23	Well-organized, interesting, confident presentation supported by multisensory aids; scientific content communicated to peer group
22–19	Presentation acceptable; only modestly effective in communicating science content to peer group
18–16	Presentation lacks clarity and organization; ineffective in communicating science content to peer group
15–5	Poor presentation; does not communicate science content to peer group
Possible Points	**Exhibit or Display (30 points possible)**
30–27	Exhibit layout self-explanatory, and successfully incorporates a multisensory approach; creative use of materials
26–23	Layout logical, concise, and can be followed easily; materials used in exhibit appropriate and effective
22–19	Acceptable layout of exhibit; materials used appropriately
18–16	Organization of layout could be improved; better materials could have been chosen
15–5	Exhibit layout lacks organization and is difficult to understand; poor and ineffective use of materials

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Rubric for Experiments

Possible Points	Scientific Thought (40 points possible)
40–36	An attempt to design and conduct an experiment or project with all important variables controlled
35–5	An attempt to design an experiment or project, but with inadequate control of significant variables
Possible Points	**Originality (16 points possible)**
16–14	Original, resourceful, novel approach; creative design and use of equipment
13–11	Imaginative extension of standard approach and use of equipment
10–8	Standard approach and good treatment of current topic
7–5	Incomplete and unimaginative use of resources
4–2	Lacks creativity in both topic and resources
Possible Points	**Presentation (24 points possible)**
24–21	Clear, concise, confident presentation; proper and effective use of vocabulary and terminology; complete understanding of topic; able to arrive at conclusions
20–17	Well-organized, clear presentation; good use of scientific vocabulary and terminology; good understanding of topic
16–13	Presentation acceptable; adequate use of scientific terms; acceptable understanding of topic
12–9	Presentation lacks clarity and organization; little use of scientific terms and vocabulary; poor understanding of topic
8–5	Poor presentation; cannot explain topic; scientific terminology lacking or confused; lacks understanding of topic
Possible Points	**Exhibit (20 points possible)**
20–19	Exhibit layout self-explanatory, and successfully incorporates a multisensory approach; creative and very effective use of materials
18–16	Layout logical, concise, and can be followed easily; materials used appropriate and effective
15–13	Acceptable layout; materials used appropriately
12–11	Organization of layout could be improved; better materials could have been chosen
10–6	Layout lacks organization and is difficult to understand; poor and ineffective use of materials

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Rubric for Technology Projects

Possible Points	Scientific Technical Thought (40 points possible)
40–36	An attempted design solution to technical problem; the problem is significant and stated clearly; the solution reveals creative thought and imagination; underlying technical and scientific principles are very well understood
35–31	An attempted design solution to a technical problem; the solution may be a standard one for similar problems; underlying technical and scientific principles are recognized and understood
30–26	A working model; underlying technical and scientific principles are well understood; model is built from a standard blueprint or design
25–21	Model is built from a standard blueprint or design or from a kit; underlying technical and scientific principles are recognized but not necessarily understood
20–10	Model is built from a kit; underlying technical and scientific principles are not recognized or understood
Possible Points	**Presentation (30 points possible)**
30–27	Clear, concise, confident presentation; proper and effective use of vocabulary and terminology; complete understanding of topic; able to extrapolate
26–23	Well-organized, clear presentation; good use of scientific vocabulary and terminology; good understanding of topic
22–19	Presentation acceptable; adequate use of scientific terms; acceptable understanding of topic
18–16	Presentation lacks clarity and organization; little use of scientific terms and vocabulary; poor understanding of topic
15–5	Poor presentation; cannot explain topic; scientific terminology lacking or confused; lacks understanding of topic
Possible Points	**Exhibit (30 points possible)**
30–27	Exhibit layout self-explanatory, and successfully incorporates a good sensory approach; creative and very effective use of material
26–23	Layout logical, concise, and easy to follow; materials used in exhibit appropriate and effective
22–19	Acceptable layout of exhibit; materials used appropriately
18–16	Organization of layout could be improved; better materials could have been chosen
15–5	Layout lacks organization and is difficult to understand; poor and ineffective use of materials

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Make Your Own Rubric

Possible Points	Criteria