An essential part of science is the ability to analyze other’s experiments and build off of their successes and mistakes. In reality, in a science-related career (or major, in college) before you can design an experiment to solve a specific problem, you must read up on the experiments that have already been done in that field. That way, you can design your experiment to solve a problem that hasn’t been done before, while capitalizing on what others have already found out.

**Your Mission:**

1. **You will use all resources available to you to create a well-rounded research paper presenting background information on a topic of your choice.**
2. **You will then design or create an idea using the physics knowledge you now possess. The idea should build off of the research you performed.**
3. **You will present your ideas at our “conference” during the final period for your class.**

Part I: Literature review

* Papers should be a *minimum* of 3 pages long. Many good papers will be longer than this.
* You must present material from *at least* **four** sources.
* *At least* two of those sources must be an **academic journal**.
* ALL sources must be **reliable** – IE, NOT Wikipedia (although, Wikipedia is a good place to get primary sources from!)
* Grammar counts. Proofread!
* Your goal is to provide all necessary background information so that the viewer understands the original idea you will present in part II.

Part II: Design element

* Using the background information you discovered, identify an area on the subject where you can add to or improve the field
* Create a design for your idea. This design can be presented as:
  + A 3D Prototype model
  + A virtual 3D image
  + A series of sketches detailing what your idea would entail.
* If you choose to create a 3D prototype, it does not have to be functional, but it should get your idea across as well as possible, given time/material constraints.
* In addition to your design, in this section you will also include a short write-up including:
  + What your design entails (in detail – sizes, materials, etc.)
  + How it was/will be created
  + Why it is an improvement from the status quo

Part III: Presentation

* During the Final Exam period for your class, we will hold a “conference” where you will present your idea. The structure of your presentation is your own, but the following are suggestions:
  + Spend 1/3 of your time filling the audience in on your background information. Spend 2/3 of your time describing your ideas
  + Run your presentation by an unsuspecting friend or family member. Make sure they understand the concept with the background that you’ve given them. Then make sure they have the information they need to understand your idea.
  + Use visual aides to assist you in conveying your ideas (but don’t overwhelm!)
* You will have a maximum of ***six minutes*** due to the time constraints of the period. I WILL cut you off after six minutes.
* Seniors with an A- or higher average across all four marking periods will be exempt from the presentation (but not parts I or II)
* Special arrangements can be made to present privately to me upon request.

Suggestions:

1. Pick a specific topic. While the task seems daunting, there is an overwhelming amount of information out there in the world – if you narrow it down to a specific topic, you will have less to cover, and you can analyze it more in depth.
2. Start broad. Introduce your reader to the topic and provide background information. Assume your reader knows very little about what you will be talking about.
3. Analyze the science others have performed. Look for ways their ideas can be improved upon, or areas they didn’t’ discuss.
4. Pick something that’s interesting to you! You’re going to be stuck with the topic for a while.

A few starting places for topic ideas:

http://www.hesston.edu/academics/departments/physics/research-projects/  
http://physics.uchicago.edu/research/

Part I: Lit review (40pts)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Excellent | Satisfactory | Fair | Needs Improvement | Points Received |
| Quality of Research  (10pts) | ∙Sources reliable  ∙All information relevant to topic  ∙Sufficient information provided to support all elements of topic.  ∙Research in-depth and the beyond the obvious, revealing new insights gained. | ∙Sources mostly reliable.  ∙Most information relevant to topic.  ∙Sufficient information provided  ∙Research of sufficient depth. | ∙Source reliability questionable.  ∙Some information relevant to thesis.  ∙Information provided to support some elements of topic  ∙ “Surface research” | ∙Sources not reliable  ∙Too much "quoting"  ∙Did not research the questions that needed to be answered.  ∙Incomplete or no analysis of information |  |
| Content  (15pts) | ∙Support for topic is complex, complete, & in-depth.  ∙Writer involved with subject, not merely doing an assignment.  ∙Clear and appropriate organization, with effective transitions, introduction, and conclusion  ∙Gave a complete analysis of topic. Reader was not left wondering on any aspect | ∙Support for topic sufficient, but lacking in depth or complexity.  ∙Organization, transitions, introduction, and conclusion slightly lacking clarity and/or appropriateness.  ∙Mostly complete analysis. Reader may have some questions/lacking some detail. | ∙Support for topic barely sufficient, and/or greatly lacking in depth & complexity  -Organization, transitions, introduction, and conclusion lacking clarity and/or appropriateness.  ∙Reader left with several questions/very little detail. | ∙Insufficient support & lacking depth of topic research.  ∙No or very little organization. Transitions, induction & conclusion are absent or have no clarity.  ∙Little to no detail. Reader has many questions |  |
| Citations  (10pts) | ∙All sources properly cited in works cited.  ∙No more than 1 error in format or punctuation.  ∙4 or more sources listed. | ∙All sources properly cited in works cited.  ∙2 errors in format or punctuation.  ∙3 sources listed. | ∙Not all sources properly cited in works cited.  ∙ More than 3 errors in format or punctuation.  ∙2 sources listed. | ∙No citations. 0-1 sources.  ∙Excessive errors in punctuation. |  |
| Writing Style  (5pts) | ∙Consistent and appropriate voice.  ∙Sophisticated and precise word choice.  ∙Less than 1 spelling error/ error in agreement, pronouns, tense, punctuation or capitalization.  ∙Met all style and min/max page requirements (3+ pages) | ∙Voice mostly consistent and appropriate; fairly effective word choice.  ∙No more than 3 spelling errors/ errors in agreement, pronouns, tense, punctuation or capitalization.  ∙Met style and min/max page requirements (3+ pages) | ∙Voice somewhat consistent and appropriate.  ∙Correct word choice.  ∙More than 4 spelling errors/errors in agreement, pronouns, tense, capitalization or punctuation.  ∙Met some style and/or min/max page requirements (at least 2 pages) | ∙Voice not consistent or appropriate.  ∙Little correct word choice.  ∙More than 5 spelling errors/errors in agreement, pronouns, tense, capitalization or punctuation.  ∙Failed to meet style and/or min/max page requirements (less than 1 1/2 pages) |  |

Total Points Received: \_\_\_\_\_\_\_\_\_

Part II: Design Element (40pts)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Excellent | Satisfactory | Fair | Needs Improvement | Points Received |
| Original Idea  (10pts) | -Idea is related to and supported by what is discussed in the literature review ∙Student’s idea “builds” from the research  -Idea is original (not a recreation of things already discussed/ discovered) | -Idea is related to what is discussed in the literature review  -The link between the student’s idea and what has been discussed may not be totally clear  -Idea is original (not a recreation of things already discussed/discovered) | -Idea is related to what is discussed in the literature review but may not be explicitly detailed.  -The link between the student’s idea and what has been discussed may not be clear  -Idea may not be original. | -Unclear how the idea relates to the background information provided  - Link between information discussed and idea is not clear.  -Idea is not original. |  |
| Design/ Prototype  (15pts) | -Design element clearly details what the student is envisioning  -All necessary and feasible calculations & measurements are detailed  - Materials to be used are detailed and explained. | ∙Design element clearly details what the student is envisioning.  -Most calculations/ measurements are included  -Most materials to be used are detailed and explained. | ∙Design element details what the student is envisioning, but some questions may arise.  -Some calculations/ measurements are included  -Some materials to be used are detailed and explained. | ∙Design element leaves many questions to what the student is envisioning.  -Many missing calculations/ measurements  -Many missing materials to be used are |  |
| Write-up  (10pts) | ∙Design is described in detail. Reader has a complete understanding of what the student envisioned.  -Reader has a complete understanding of how it will be created  -Reader can clearly see how the idea improves upon the status quo | ∙Design is described in detail. Reader mostly understands what the student envisioned.  -Reader mostly understands of how it will be created  -Reader mostly understand how the idea improves upon the status quo | -Reader has several questions about what the student envisioned  -Reader has questions about how it will be created  -Reader has questions about how the idea improves upon the status quo | ∙Reader does not understand what the student envisioned.  -Reader does not understand how it will be created  -Reader does not understand how it improves upon the status quo. |  |
| Neatness/ Presentation  (5pts) | ∙Consistent and appropriate voice.  ∙Sophisticated and precise word choice.  ∙Design is well thought out and put together  -Obvious effort and care has been put into the creation of the final project. | ∙Consistent and appropriate voice.  ∙3-5 errors in writing.  ∙Design is well thought out and put together  -Obvious effort and care has been put into the creation of the final project.  -Some neatness issues | ∙Voice somewhat consistent and appropriate.  -5-10 errors in writing ∙Additional effort/thought needed in design creation  -Significant neatness issues | ∙Voice not consistent or appropriate.  ∙10+ Errors in writing  -Additional effort/thought needed in design creation  -Neatness issues detract significantly from design |  |

Total Points Received: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part III: Presentation (20pts)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Excellent | Satisfactory | Fair | Needs Improvement | Points Received |
| Background Information  (6pts) | -Student conveys all necessary background information  -Student completely conveys the need for the design/idea | -Student conveys most necessary background information. Viewer may have some questions.  -Student completely conveys the need for the design/idea | -Student conveys some necessary background information. Viewer has questions about the topic.  -Student conveys the need for the design/idea, but viewer has some questions/ misunderstandings on the topic. | -Student conveys little necessary background information. Viewer has many questions about the topic.  -Student does not convey the need for the design/idea |  |
| Design Presentation  (7pts) | -Design element is clearly detailed by the student. Viewer understands the student’s idea,  - Student completely explains the role of their design to improve upon their topic of choice | -Design element is mostly detailed by the student. Viewer understands most of the student’s idea,  - Student completely explains the role of their design to improve upon their topic of choice | -Design element is detailed by the student, but the viewer has some questions about the student’s idea.  - Student attempts to explains the role of their design to improve upon their topic of choice | - Design element is poorly detailed by the student and not understood by the viewer  - Student does not explain the role of their design |  |
| Presentation Style  (7pts) | -Student speaks clearly and audibly  -Student uses visual aides to supplement their presentation  -Student’s presentation is professional and engaging | -Student speaks clearly and audibly, though some ”um’s” and “uh’s” may occur  -Student uses visual aides to supplement their presentation  -Student’s presentation is professional and engaging | -”um’s” and “uh’s” are frequent, student may be too quiet occasionally.  -Student uses visual aides to supplement their presentation  -Improvements could be made to create a more professional or engaging presentation | -”um’s” and “uh’s” pervade the presentation. The student is often inaudible.  -Student does not use visual aides to supplement their presentation  -Student’s presentation is unprofessional or unengaging |  |

Total Points Received: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Part II: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Part III: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Final Grade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_