Breadth Project Proposal

Name: _____ Date: _____ Period: _____

The Breadth Project represents 10% of the course grade this term. It is designed to give you the opportunity to work on something of interest to you. The Breadth Project is not intended to be a burden to you – it is intended to help you broaden your horizons in a way that you feel is useful. There are 4 options for fulfilling this assignment:

Option 1: Research Paper
This option involves writing a well-documented research paper on a topic related to this class. The paper must have at least 5 sources, two of which must be printed (i.e. not internet sources). None of the 5 sources may be encyclopedias. The paper must be a minimum of 6 pages double-spaced. **The final edited, proof-read, version must be turned in along with your research notes and rough draft**. Your paper will not be accepted without these items! All students must do this option at lease once during the year, unless they can show that they have already completed a fully-documented research paper sometime during their high school career.

Option 2: Career Investigation
This option involves investigation a career which you find interesting and that is related to science or engineering. It must include a description of the high school and college educational requirements, as well as an in-depth look at what the career actually entails. There must be at least 3 sources, only 2 of which may be internet sources. Ideally you will make contact with someone who has the career you are investigating. The report must be a minimum of 4 pages long.

Option 3: Children's Book
This option involves writing a children's book which demonstrates or explains some physics concept (or application of a concept) we have not studied yet. The book should have both pictures and words which teach about the concept in a clear and interesting manner. You must first produce a sketched story-board which you will submit to your editor (Mr. Ronneberg) for feedback, before producing the final version. You will turn in both products on the due date. Your book will be graded on the accuracy of your explanations as well as on the quality of the story/illustrations and how well the language fits with the target audience (e.g. would it be readable by a 9 year old?).

Option 4: Physical Demonstration and Explanation
This option involves two parts:
1) building a device which demonstrates a physics concept (or multiple concepts). You may choose concepts we have covered in class or something from outside of class.
2) Writing a report on how you chose the concept, research you did while planning the device, how you built the device, and most importantly, how the device is an example of the physics concept(s) it demonstrates. For example, a potato cannon may be used to demonstrate gas laws, projectile motion, the effects of air friction, combustion, etc…

Complete the questions below and return to Mr. Ronneberg. He will approve your idea, give feedback if necessary, and return this form to you.

1) Which option have you chosen?

2) What topic/career/concept will your project focus on?

3) Why did you make the choice you did?

Due dates:

Proposal:_____

1st check: _____

2nd Check:_____

Project Due:_____

Mr. Ronneberg's approval: _____

Some Possible Topics for Research Papers in Physics (these are only a few ideas, please feel free to come up with your own)

1. What is absolute zero? How close can we get to it and, exactly how is this accomplished in the laboratory?
2. What is Einstein's theory of special relativity and how has it been tested experimentally?
3. In what way do the Gas Laws apply to the operation of a car engine. How ideal are the gases in the engine?
4. What is the difference between ideal gases and real gases? In what physical systems, or under what condition does the distinction matter?
5. How are the current estimates of dark matter made, and how do they influence our understanding of the evolution of the universe?
6. What are the various important methods for determining the age of old objects? What physical principles underlie those methods?
7. What are the acoustical properties of a particular musical instrument? How are those properties measured? What physical principles determine those properties.
8. What mathematical modeling schemes are used to represent 3-D objects with computer graphics?
9. What are the main types of lasers? What are the physical principles that determine their useful properties?
10. What physical principles are needed for a good understanding of speaker systems, including acoustic waveguide systems? How is it possible to make small, high quality speaker systems?
11. How was radar first developed? How does it work? In what ways did the development of radar contribute to the outcome of WWII?
12. What is the early history of the computer? Some key figures would be Charles Babbage, Alan Turing, and John von Neumann. In what ways does the Manhattan Project figure in this history? What conceptual and technological challenges needed to be overcome to make the development of modern computing possible?
13. What is the difference between AM and FM radio broadcasting? Why is the broadcast quality so much higher for FM? In what ways do atmospheric conditions influence one more than the other and why?
14. What specific physical principles govern the behavior of lightning? How is lightning research conducted?
15. What geologic structures and physical principles contribute to the frequency of earthquakes in California and around the Pacific Rim?
16. What physics principles govern the behavior of buildings during an earthquake? How does the type and size of an earthquake determine the type of damage done. How are those principles employed to design safer buildings?
17. When a satellite or space probe is launched, what physics principles are employed to determine its orbit or path?
18. What is Chaos Theory? In what ways has it contributed to a better understanding of long standing research problems, for example, turbulent flow in fluids?
19. Why can airplanes fly? In what ways is the simple explanation (air flowing faster over the top of the wing than the bottom) not able to explain flight? For example, why can planes fly upside down? What other principles and models are used to explain flight besides the simple explanation?
20. All physical systems possess a natural frequency of vibrations, for example, a pendulum. How do the properties of an object contribute to tits natural frequency? Why do some systems have only one frequency of vibration and others have many? What are important examples of systems with particular natural frequencies?
21. There are several main methods of commercial water purification. What physical principals lie at the heart of each of these methods? What are some methods of desalination?
22. Before 1985, most cars employed carburetors. Most modern cars employ either fuel injection or a turbocharger. What physics principles govern the behavior and determine the effectiveness of these 3 intake system. Why are carburetors no longer used?
23. Before 1985, most cars employed a distributor with points and a condenser to supply the electrical current to the sparkplugs. Now, all cars use some form of electronic ignition. How do these two systems differ, and why is the old system no longer used?
24. What is fire? When you observe a flame, what are you actually seeing? How is the quality of the flame related to the material that is burning? What other factors contribute to the properties of the flame that you observe?
25. How do physics principles determine the design and behavior of amusement park rides? What different principles are needed to explain rides like roller-coasters as opposed to rotational rides like the tilt-a-whirl? What do ride designers have to consider in order to design rides that are thrilling, but not actually dangerous?
26. How does a telephone work? How can you talk to someone across the country and hear their reply almost immediately? Something must travel along the wires or optic cables at a great speed-what is it? In the optic cables, how do they keep the messages from getting mixed up?
27. A few A few years ago, California suffered a serious electrical power crisis that continues to this day. What kind of power is actually delivered to homes and businesses? How is it produced? How is it distributed? How is the power grid set up? If the grid is inadequate, how does that contribute to the occurrence of blackouts or brownout? What is a brownout, exactly?
28. What physical principles make it possible design and manufacture refrigerators, freezers, and air conditioners? How are they alike? How are they different?