Physics

Textbooks: *Conceptual Physics*, Hewitt & *Physics*, Giancolli

Physics Topics: Trigonometry, Vectors, 1-D Motion, 2-D Motion, Newton's Laws, Forces, Work, Energy, Conservation of Energy, Gravitation, Kepler's Laws, Rotational Dynamics, Waves, Thermodynamics, Electricity and Magnetism, Optics and Special and General Relativity, Quantum Mechanics.

Requirements

Assessments	Max # of assignments	Points per assignment	Min. Points each student needs	Max. Points each student is allowed
Classwork/Homework	30	25	650	750
Physics Notebook	1	200	200	200
Physics Lab Reports	10	50	400	500
Physics Article Reports	8	25	100	200
Physics Projects	5	100	200	400
Quizzes	12	25	250	300
Tests	3	100	200	300
Final Test	1	200	200	200
		Total Points	**2200**	**2850**

Students will be allowed to choose assignments according to their strengths. If you complete more than the minimum number assignments in any category, I will include only those scores that help your overall grade. In other words if you get a 70/100 on one of three tests that you took, I will include that score if it helps your overall score. Remember that any assignment over the minimum will count both in class points as well as earned points. Completing more assignments is NOT extra credit.

Grading

A	B	C	D	F
87%	73%	60%	48%	below 48%

General Schedule

Students need to turn in work according to the schedule below. This schedule indicates the maximum number of assignments allowed in any given grading period. A student cannot make up work that has already passed. For example: If a student did not turn in any Article Reports in Grading Period 1 than the student can turn in only a maximum of 6 Article Reports instead of 8. This schedule will keep students on track and prevents jamming at the end of the semester.

Grading Period 1 2/8/10 - 3/5/10	Grading Period 3/8/10 - 4/15/10	Grading Period 3 4/18/10 - 5/20/10	Grading Period 5/20/10 - 6/25/10
7 HW assignments	7 HW assignments	8 HW assignments	7 HW assignments
2 Lab Reports	3 Lab Reports	2 Lab Reports	3 Lab Reports
2 Article Reports	2 Article Reports	2 Article Reports	2 Article Reports
1 Project	2 Projects	2 Projects	2 Projects
4 Quizzes	4 Quizzes	4 Quizzes	4 Quizzes
1 Unit Test	1 Unit Test	1 Unit Test	1 Final Test
			1 Physics Notebook

a. Homework Assignments will be given out as we proceed throughout the semester.
b. Lab Reports must be typed and formatted as required. Experimental Question, Materials, Procedure, Data Collection, Data Analysis, Error Analysis, and Conclusion.
c. Article Reports must be written up on provided form and the article must be turned in along with the form provided. Articles must be physics related.
d. There will be 3/4 suggested projects and one student chosen project. Projects are graded on provided rubric. All projects, must demonstrate, creativity, completeness, organization, structural design integrity, neatness and must work.
e. You will take class notes in a Physics Notebook (5x5 grid composition book). The Physics Notebook is graded on; **concept completeness 100 pts, organization 50 pts, neatness and creativity 50 pts**. Are all the physics concepts completely developed? Are they connected to the standards? Are the concepts done in a neat, colorful fashion and are useful diagrams included? Are examples provided? Is the notebook organized? Have you added pictures, diagrams, tables and useful information to enhance your learning? Be neat, creative, complete, colorful, concise, useful and organized. Lab notebooks can be used on quizzes and tests. Examples are provided in class.

Article Report Form

Name ____________________________

Class ______________ Period ____

Name of Article ____

Author(s) ____

Source ____

Article Summary (Abstract)

____

____

____

____

____

Physics Concepts

1. ____
2. ____
3. ____
4. ____

Standards Connection to the Article

1. ____
2. ____
3. ____

What did you like about the article?

Possible Class Projects

1. King of the Hill (100 pts) - February 19, 2010

Build a car to travel up a ramp and fight for the top.

Requirements: The car must make it to the top of the hill by itself. It must have both a defensive and offensive mechanism. Car must be less the 12 inches long and 12 inches high. No slingshots!

Structural Integrity (Is the construction of the car sound?)	25
Design (propulsion/defensive/offensive mechanisms)	15
Did the car get to the top of the hill? (Your car must make it to the top)	20
Does the car have a Defensive Mechanism?	15
Does the car have an Offensive Mechanism?	15
Did the defensive and offensive mechanisms operate as planned?	10
Did your car win? (Extra Credit)	20

2. Science Fair Project (100 pts) - March 2, 2010

Choose a topic in which you are genuinely interested. The topic may be one related to a longtime hobby or something entirely new for which you would like to have a better understanding.
Some scientific displays like collections, illustrations or models are NOT science fair projects.

3 Electric Motor - Radio - Electronic Kit (100 pts) - March 12, 2010

4. Rube Goldberg (150 pts) - June 7, 2009

5. Physics Demonstration Model (150 pts)

Science Fair Project
up to 150 Points

Science begins with wonderment. Students should make a list of things they are curious about. This will start the thinking process toward selecting a topic.

Choose a topic in which you are genuinely interested. The topic may be one related to a longtime hobby or something entirely new for which you would like to have a better understanding. Some scientific displays like collections, illustrations or models are NOT science fair projects.

Listed below are five types of science fair projects.

Demonstrations show scientific principles but are not research projects or projects that extend applications. Demonstrations seldom receive even an Honorable Mention Award.

A Science Research Project seeks to find new knowledge. A science project is one way of asking a question and answering it via the scientific method. One recent winning project asked, "What frequency of sound wave would travel through water with the least intensity?"

An Engineering Project uses scientific principles to improve or create new applications. The project may be theoretical or an experimental study on a model.

Computer Projects may deal with a unique method of programming. An existing program may be improved to run faster and use less memory.

A Mathematics Project deals with math not usually covered in the classroom. The project should represent a new point of view of a known topic.

KEEP IT SIMPLE. It is NOT necessary to use elaborate equipment or technology. Remember that our wealth of scientific information was built by many men and women discovering small and simple facts over a long period of time.

As Alex R. Balian says in "Is Science Fair?", remember . . .

GOOD is better than BIG!
SIMPLE is better than COMPLEX!
BRIEF is better than LENGTHY!
SPECIFIC is better than GENERAL!

Developing a Hypothesis

Science begins with a refined testable question. The “If..then” statement designs the experiment. With a well-stated hypothesis the rest of the experiment follows easily. The hypothesis tells you what data to look for and what it will mean when it is found.

The form is: If...(Followed by a statement of the hypothesis) then...(followed by a logical cause and effect statement that will be true if the hypothesis is correct).

For example: If the work done in drawing a compound bow is greater than that required for a simple bow or slingshot, then the arrow shot from the compound bow should travel further than an arrow shot from a single bow or slingshot.

An additional negative statement is frequently helpful in defining the control: Bean sprouts with no nitrogen in the soil will not grow as fast or as high as normal.

Selecting a Title

Now that you have laid all the groundwork, you can select a working title for your project. The title should describe the project in less than ten words. For example “The Effect of Nitrogen Fertilizers on Bean Sprout Growth.”

Experimenting

Materials

Make an exact list of the amount and type of materials needed. Items may be purchased from hardware, drug, or variety stores. Some items may need to be ordered from science supply companies; therefore, planning ahead is necessary. Keep an accurate record of the kind of material and the quality of each used in the experiment. Use metric weights and measures (meters, kilograms, liters, etc.)

Procedure

Plan the list of procedures that will follow in performing the experiment. If there is any question about the safety of any step, ask a knowledgeable adult to review the methods.

The experimental design should include controlled experimentation. In other words, set up an experiment with few variables. The independent variable is the variable changed by the experimenter in performing the experiment. The dependent variable is the variable that changes as a result of the experiment. All other variables must be kept constant so the cause and effect of the two important variables can be noted.

Using the metric system, decide how ant what kind of measurements should be made. Set up log and/or data sheets for recording the anticipated data. Use a camera to take pictures, telling the story of the project and adding interest to the display.

Data Collection

Begin your experimentation/investigation at least two months before the fair to allow yourself enough time to repeat the experimentation if necessary. Keep careful observations in a logbook. Record failures as well as success.

Keep track of all the steps performed and all tests made. Where possible, keep a control group to make comparisons with experimental group. The groups should be identical except for one variable. Repeat the experimentation to remove any doubts over the results. Be sure that measurements are always made in a consistent manner.

Organize the data into charts. Display the numerical results in the way that best summaries and explains the work.

Analysis of Data and Results

Graphs

Graphics provide a pictorial way to show comparisons. It is, therefore, appropriate to convert tabular data into graphic form. Decide whether bar graphs or line graphs are the most effective way to display information. All graphs must further have a descriptive title. Generally, the independent variable is graphed on the vertical axis. Label each axis, the numerical division along each axis, and the units of measurement.

Interpretations

Interpretation should directly accept or reject the hypothesis. Explain the meaning of your observations and numerical results. Support the meaning of experimental results with the data collected. Discuss the shapes of graphs. Be careful in drawing a conclusion only from data. Data needs to be interpreted.

Statistical Analysis

Do a statistical analysis if possible. The arithmetic mean or chi square test can help show the validity of data. Ask the science advisor if there is a method of statistical analysis that can assist in the presentation of a project. Many spreadsheet programs now offer statistical analysis packages.

Discussion

This is the student’s opportunity to give an honest impression of the project. What were the problems? The student can speculate about how the project results might fit into the greater scheme of things. What are the possibilities for future experimentation?

Written Report

Now that the student has:

- Taken notes on library research
- Written a hypothesis
- Listed the type and amount of materials used
- Recorded step by step procedures
- Maintained a log
- Collected data in tabular form
- Created graphs
- Interpreted the findings
- Discussed the general impressions

The report is almost completed. Organization and transitions between areas are remaining. Technical language may be used, but it is more important to be clear and concise, rather than using too much technical terminology. Label each section of the report clearly. The written report must have correct spelling and grammar, be easy to read (double-spaced typing), and appear neat and well organized. Follow the chart on the next page in planning your report.

The Display

The display communicates the essential parts of the project in a quick, visual way. The display should be sturdy, free standing, colorful, simply illustrated, well labeled, and attractive.

The backboard may be made of pegboard, masonite, or plywood no larger than 76-cm (2.5 ft.) deep, a maximum of 122-cm (4 ft.) wide, and a maximum of 198 cm. (6.5 ft.) high (if placed on table) or 274 cm. (9 ft.) high (if placed on floor). (Of course, the display does not need to be this large). An easy-to-handle folding design is made from pegboard held together by three notebook rings between each section. Scrap wood can be covered with fabric for an attractive display.

Try requesting scraps at lumberyards, construction sites, hardware stores, or yardage stores before spending money. Foam core or folding backboards may also be purchased from science or office supply stores.

If using a computer to generate headings, use a boldface font of at least 18 points. Cut paper strips and frame and/or mount the title of each section. A photocopier can also be used to enlarge text for titles and section headings. The title should have the largest print on the display board and be neatly done.

Enlarge graphs and use color for the different lines or bars. Use photographs that are clear and sharp, with the correct exposure. A 5 x 7 photo creates a better display. There should be an explanation under each photo and graph.

Set the entire display board flat on the floor and arrange the various parts before beginning the final assembly. Be certain all titles, graphs, photos, and text are lined up properly and in place before gluing them down. Use rubber cement instead of glue so pieces can be replaced if necessary. Make sure the edges of the paper are glued down securely to the backing to prevent peeling or drooping later. All this attention to detail will result in a display board that is attractive, easy to read and as neat as possible.

Interview

As part of the judging process, a student may be asked to explain the project to judges and/or his teacher. Organize and plan what will be said to the judges in the personal interview.

The judges will want to know:
• How the topic was selected for the project?
• Did the student receive help and if so, how much?
• What has been known about the general subject area of the project?
• What would the student do if there was additional time to spend on the project?
• What has been learned through investigation?
• If this project was continued, what is the next step?

Give the judges as much information as possible. Be enthusiastic! An interview can be fun! The judges are experts in their fields and the interview may also be an opportunity to learn more about a subject.

Common Mistakes of Science Fair Projects

Before continuing a project, the student should check to avoid common mistakes of science fair projects:

• Jumping to a conclusion based on a single observation or test. There is often a tendency to try something once, see what happens, and draw a conclusion from it. How many times did Jonas Salk test his polio vaccine before it could be used? Results must be verified by repeated experiments.

• Failing to include a control in the experiment design. Part of finding out what will happen to the growth of bean seeds if they are fertilized is to also find out what happens if they are not fertilized. The unfertilized seeds are the control part of the experiment.

• Failing to recognize and/or control variables. Not only must experiments be repeated many times over, but also variables must be controlled in the same way each time if the results are to be reliable.

• Not keeping complete and/or accurate records. Science involves a lot of paperwork. Keeping good records while doing a science project involves reading, writing, spelling, and composition. Teflon was invented a full 30 years after DuPont first created it in a laboratory, because he kept accurate records that were easy to read and understand.

In general, science projects must embody those characteristics that yield reliable results. It must be done carefully with attention to detail.

How Does Your Project Measure Up?

Scientific Thought
- Does the project follow the scientific method?
- Does the project illustrate controlled experimentation and retesting?
- Does it represent real study and effort?
- Does it make appropriate comparisons?
- Does it form conclusions based only on the data gathered?

Originality
- Is the project your own idea?
- Does the project demonstrate your conclusions?

Thoroughness
- Does the project tell a complete story?
- Are the written report and visual display well done?
- Is the project documented by charts, graphs, and/or photos?

Clarity
- Is the hypothesis or problem easily understood by someone who is not technically trained?
- Does the written report explain the project simply and clearly, and show depth of understanding?
- Is the display easy to follow and attractively executed?