

2008 PHYSICAL SCIENCE CLASS AT PAI

Class Meeting Time: Tuesday Afternoons, 1:30 – 3:00

CLASS DESCRIPTION

In this class we will investigate several physical phenomena, including motion, statics, light, and sound. Computer modeling employing spreadsheets and analytical and problem-solving techniques will be stressed, and the class will begin with an emphasis on measurement, basic statistics, and dimensional analysis intuition and proficiency. Scientific perspective and literacy will be addressed from an historical perspective (outlined in our astronomy text), and by discussing current scientific topics.

We will meet formally once each week. Students will employ laboratory notebooks throughout the class for keeping notes and experimental data, and a small lab fee will be assessed to cover the costs of student supplies. Students will need to have access to a computer at home, and must bring a basic scientific calculator to every class. We will not use a textbook, but there will be several handouts and homework assignments, including formal lab reports.

Dr. Frank has been the Math/Science Chair at the Schilling School for Gifted Children since its inception, and has a reputation for '*changing the way students see the world.*' He has mentored large and small home-school groups for several years, and is a popular speaker. He stresses the cultivation of scientific intuition over memorization of facts (science as a *process*), and mathematics as a language instead of merely a collection of arithmetic skills.

HOMEWORK EXPECTATIONS: Students will be expected to spend at least one hour per day working on their assignments. During the first quarter, I will grade the homework. Subsequently, homework from the text will be graded at home, and homework scores will be emailed to Dr. Frank or reported in class. Late work will be handled on a case-by-case basis.

WORKSHEETS: Worksheets will be distributed in class, are to be completed in class and at home, and will be collected for credit.

CHALLENGE EXAMS: After the first quarter, a challenge exam will be given each quarter. Students may use all resources at their disposal to address the problems...except someone else!

LAB REPORTS: One or two formal lab reports will be completed each quarter. They will be graded by Dr. Frank.

COURSE GRADES: Although I teach and have taught at accredited institutions from 4th grade through graduate level courses, this course is not accredited. However, I will recommend grades to the parents based upon student performance in class and on the assignments.

TEXT: Kuhn, "In Quest of the Universe, 2nd ed."

This document is expected to evolve over the course of the class...

TENTATIVE DATES AND THEMES

Experience has shown that this schedule changes week-to-week, depending upon a variety of factors, including student ability and attendance. Expect it to change often!

	Date	Themes	HW Due	Handouts / Assignments
1	9/23/2008	<i>Focus Topics:</i> Class Intro; Lab Notebooks; Dimensional Analysis Intro; Fermi Calculations; The Scientific Method <i>Seeing with new eyes:</i> What is gravity? Plato's Cave	Read Text: Prologue	<i>Handouts:</i> Lab Notebook Protocol, Conversion Tables, The Scientific Method, Fundamental Constants <i>Assignments:</i> Read handouts, Tape tables in lab notebook, Dimensional Analysis Worksheet #1 <i>Text:</i> Chapter 1
2	9/30/2008	<i>Focus Topics:</i> Dimensional Analysis, <i>Seeing with new eyes:</i> Bambi, and The Scientific Method	Chapter P: Study Guide, Ques to Ponder, & Calcs (I will grade) Dim. Anal. <i>first attempt</i>	<i>Handouts:</i> 'Feynman Rules of the Game,' Quantifying Phenomena <i>Assignments:</i> Redo Dimensional Analysis #1 <i>Text:</i> Chapter 1
	(10/7/2008)	(no class)	Chapter 1: Study Guide (I will grade)	
3	10/14/2008	<i>Focus Topics:</i> Feynman's Rules, Fundamental vs. Derived Quantities <i>Experiment:</i> Inertial Pendulum <i>Seeing with new eyes:</i> The Moon	Chapter 1: Ques to Ponder & Calcs (I will grade) Dim. Anal. #1 <i>turn in</i> (I will grade)	<i>Handouts:</i> Lab Report Format <i>Assignments:</i> Graph data, work on lab report, Dimensional Analysis Worksheet #2 <i>Text:</i> Chapter 2
4	10/21/2008	<i>Focus Topics:</i> Dimensional Analysis Worksheet #2, Review first drafts of lab report in class <i>Seeing with new eyes:</i> Perspective: 'Flying Through the Universe'	Chapter 2: Study Guide (I will grade) Inertial Pendulum Lab Report <i>Draft</i>	<i>Assignments:</i> Redo Dimensional Analysis #2, work on lab report <i>Text:</i> Chapter 2
5	10/28/2008	<i>Focus Topics:</i> Dimensional Analysis Worksheet #2 <i>Experiment:</i> Swinging Pendulum <i>Seeing with new eyes:</i> What are dimensions?	Chapter 2: Ques to Ponder & Calcs (I will grade) Inertial Pendulum Lab Report <i>Final</i>	<i>Assignments:</i> Graph data, begin lab report. <i>Text:</i> Chapter 3
6	11/4/2008	<i>Focus Topics:</i> Data Analysis and pendulum modeling, Kinetic and Potential energy <i>Seeing with new eyes:</i> Orbits are pendulums	Dimensional Analysis Worksheet #2	<i>Assignments:</i> Work on lab report. <i>Text:</i> Chapter 3
7	11/11/2008	<i>Focus Topics:</i> Review first drafts of lab report in class <i>Seeing with new eyes:</i> Newton's Laws of Motion	Swinging Pendulum Lab Report <i>Draft</i>	<i>Handouts:</i> Lab Report Format <i>Assignments:</i> Work on lab report. <i>Text:</i> Chapter 3
8	11/18/2008	<i>Focus Topics:</i> Review 1st quarter <i>Experiment:</i> Rolling Ball <i>Seeing with new eyes:</i> What is Acceleration?	Chapter 3: Study Guide (I will grade) Swinging Pendulum Lab Report <i>Final</i>	<i>Assignments:</i> Graph data, begin lab report. <i>Text:</i> Chapter 3
	2 nd Quarter	<i>Focus Topics:</i> Modeling Phenomena, Laws of Motion		<i>Experiments:</i> New York Balance, Rolling Ball
	3 rd Quarter	<i>Focus Topics:</i> Light & Sound		<i>Experiments:</i> Spectrometer, Harmonics
	4 th Quarter	<i>Focus Topics:</i> Electricity & Magnetism		<i>Experiments:</i> Ohm's Law, RC Circuit