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PHYSICS A/P 1
2022-2023

Document: APPhysics1SyllabusDocument.odt

Curricular Requirements (College Board)[1]

No.	Requirement	Applicable portions of Syllabus
CR1	Students and teachers have access to college-level resources including a college-level textbook and reference materials in or electronic format	Course Materials, p 4.
CR2	The course provides opportunities to develop student understanding of the required content and related big ideas outlined in each of the units described in the AP Course and Exam Description (CED)	Course Content | Course Topics, pp 9-13
CR3	The course provides opportunities for students to develop the skills related to Science Practice 1: Modeling	In an extremely large number of homework problems; for a specific example, See Chapter 4 Dynamics, Note on modeling (Course Content | Course Topics, page 9) and in many of the Laboratories, including at least: Gravitational Constant, Horizontal Projection, Circular Motion, Generator Efficiency, Collisions, Coefficient of Friction, Spring Constant, Simple Harmonic Motion.
CR4	The course provides opportunities for students to develop the skills related to Science Practice 2: Mathematical Routines	In a large portion of homework problems (see Student Practice, footnote, p6) as well as many of the Laboratories, including Gravitational Constant, Horizontal Projection, Circular Motion, Generator Efficiency, Block and Tackle, Collisions, Coefficient of Friction, Simple Harmonic Motion

1 These requirements are explicitly listed in the College Board AP document, "AP Physics 1: Algebra Based / Syllabus Development Guide" along with 3 examples of supporting evidence required to meet each of the twelve requirements (after gaining professional access, see: https://apcourseaudit.inflexion.org/start/vault/download/v1/MTI4MjQ0OQ==/t/1/d/1/base/c6b1a38cc443481fecfc945134f17daa The ------------ AP Physics I Syllabus must conform not only to our ------------- requirements, but also to the College Board AP requirements.

CR5	The course provides opportunities for students to develop the skills related to Science Practice 3: Scientific Questioning	Laboratories including Circular Motion, Generator Efficiency, Collisions.
CR6	The course provides opportunities for students to develop the skills related to Science Practice 4: Experimental Methods	Laboratories including Gravitational Constant, Horizontal Projection; Generator Efficiency, Block and Tackle, Collisions, Coefficient of Friction, Spring Constant and Simple Harmonic Motion.
CR7	The course provides opportunities for students to develop the skills related to Science Practice 5: Data Analysis	Laboratories including Gravitational Constant, Horizontal Projection, Circular Motion, Generator Efficiency, Collisions, Coefficient of Friction, Spring Constant, Simple Harmonic Motion.
CR8	The course provides opportunities for students to develop the skills related to Science Practice 6: Argumentation	Laboratories including Gravitational Constant, Horizontal Projection, Circular Motion, Block and Tackle, Collisions, Coefficient of Friction, Spring Constant, Simple Harmonic Motion.
CR9	The course provides opportunities for students to develop the skills related to Science Practice 7: Making Connections	Course Content | Course Topics, Real World Scenario and also Laboratories, including: Horizontal Projections, Circular Motion, Collisions, Coefficient of Friction, Simple Harmonic Motion.
CR10	The course provides students with opportunities to apply their knowledge of AP Physics concepts to real-world questions or scenarios to help them become scientifically literate citizens.	Course Content | Course Topics, Real World Scenario, Laboratory Horizontal Projections.
CR11	Students spend a minimum of 25 percent of instructional time engaged in a wide range of hands-on laboratory investigations with an emphasis of inquiry-based labs to support the learning of required content and development of science practice skills throughout the course.	See Laboratory Experience, below, where this is explicit.
CR12	The course provides opportunities for students to record evidence of their scientific investigations in a portfolio of lab reports or a lab notebook (print or digital format)	Lab Notebook, see below, where explicitly required.

COURSE MATERIALS[2] (CR1)

We will be using multiple textbooks. These include:

PRIMARY TEXTBOOK
College Physics for AP(R) Courses, Irina Lyublinskaya, Greg Wolfe, Douglas Ingram, Liza Pujji, Sudhi O Beroi, Nathan Czuba. OpenStax, Rice University 6100 Main Street MS-375 Houston, Texas 77005, current web version (c) 2017 Rice University. Students will be using both print versions purchased through Amazon, and the downloadable PDF.

Physics, 3rd Edition. R. Terrance Egolf CDR USN(Retired), Rachel Santopietro. BJU Press, Greenville SC. copyright 2016; for reference.

Physics Lab Manual, 3rd Edition, R. Terrance Egolf, Richard A. Seeley. BJU Press, Greenville SC, copyright 2010.

Princeton Review AP Physics 1 Premium Prep, 2021 (or 2022, or 2023). Princeton Press. Copyright 2021 or 2022 or 2023. This text provides terse overview of the required principles, and will provide abundant problems at the appropriate level for homework as well as tests. Students should be aware that this is a COLLEGE level course and all test problems will be at the college level. Students should be able to work any applicable problem from these review texts, presented more likely as an open-ended, "show all your work" problem, or possibly as the concise multiple-choice problem. Students should be aware that the Instructor has a much larger pool of questions from which to draw, so a complete grasp of the **principles** is required.

Physics Laboratory Experiments, ----------------, *unpublished*.[3] From my notes and files of teaching this course successfully more than a decade previously.

Additional research sources and instructional materials from suitable internet sources, as appropriate for each section.[4]

2 These texts meet the level of college-level algebra-based Physics, and thus meet the requirements of Curricular Requirement 1 (CR1).
3 Just as our Chemistry laboratories are now published as a formal textbook, material from this course may also be eventually published for wider usage.
4 Because classical education is *integrative*, our students will be observing the process of scientific development of these theories, models and applications, using additional material as appropriate. This will better prepare them for future academic or scientific service.

COURSE OUTLINE

The ------------- AP Physics I course is an extremely advanced and accelerated course that provides selected students who have already proven their advanced abilities in either Honors or AP Chemistry, the chance to pursue the entire curriculum of Physics I in an accelerated two-quarter (1 semester) course. Recognizing that this course is expected normally to be taught as an advanced, five-days-a-week full year course, we provide greatly enlarged opportunities for instruction for our specially chosen students:

Monday 0800-1100	Advanced problem solving and/or Laboratory
Tuesday	50-minute regular class period
Wednesday	50-minute regular class period
Thursday	50-minute regular class period
Friday	50-minute regular class period

Additional instructional time by appointment as needed. Because of our very small class size, we can be more flexible...

The course includes abundant inquiry-based experience for our students as well as teacher-oriented lecture, including derivations of equations, demonstrations of physical phenomena, vocabulary related to the content, and most importantly, probing of the students' grasp of the material and the problem solution techniques. The content of the course addresses the following 6 "Big Ideas"[5]:

Big Idea 1 -- Objects and systems have properties such as mass and charge. Systems may have internal structure.

Big Idea 2 -- Fields existing in space can be used to explain interactions.

Big Idea 3 -- The interactions of an object with other objects can be described by forces

Big Idea 4 -- Interactions between systems can result in changes in those systems

Big Idea 5 -- Changes that occur as a result of interactions are constrained by conservation laws.

Big Idea 6 -- Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.

5 These BIG IDEAS are an important component of the College Board AP Course, and Course Audit. They provide our students with an overview lens of looking at the universe from the viewpoint of a physicist.

STUDENT PRACTICE

Throughout each unit, students will get a list of important TOPICS and key understanding that must be achieved. There will be presented via the weekly/biweekly "packets" of course scheduling and course problems. *In our course, students will normally have homework questions to answer after every lecture and experience*.[6] Our students are very familiar with this process from their time in Chemistry. These questions will begin or reach at the A/P level, every question based, in one way or another, on published A/P Exams--setting the *rigor* of the course is easy-- all work must be at college level! It is our policy that all student work is graded absolutely as soon as possible, and *almost always* returned the very next class period so that the students get **immediate and pointed feedback of their progress**. Our work will generally involve multi-step calculations and logical steps. It is our policy that student work is carefully reviewed LINE BY LINE so that very detailed corrections can be made to A/P students' work. While many of the problems of an AP Test involve immediate application of principle and experience from addressing problems and a multiple-choice answer, in general this is not a multiple choice class. Students are very familiar with the requirement that they must be able to provide a logical flow of all solutions, starting from fundamental principles and proceeding step-by-step with all units and conversions demonstrated.

At the end of each Unit or at key points, students will have some form of a Personal Progress Check which may be a homework assignment, or an examination, to allow them to measure and evaluate their performance. These are graded as soon as possible and generally returned the very next period, during which there is extensive review of all the problems. It has not been a significant issue that this caliber of students enrolled in this A/P class would fall behind, but in that event, individualized tutoring can be provided to bring that student back up to speed.

6 In a large percentage of the homework problems, selection of a valid mathematical routine to solve the problem will be a key portion of the problem. (SP2.1) The mathematical routine must be applied properly (SP2.2) and in many problems there may be a degree of estimation of reasonable quantities (SP2.3). These will provide many opportunities to satisfy Course Requirement 5 (CR4)

COURSE CONTENT

The College Board emphasizes the following Scientific Practices that are widely referenced (sometimes with minor variations) in the literature of scientific advancement and education:[7] [8] [9]

SCIENTIFIC PRACTICES

No.	Topic	Description
1	Modeling	Use representations and models to communicate scientific phenomena and solve scientific problems.
	1.1	The student can **create** representations and models of natural or man-made phenomena and systems in the domain.
	1.2	The student can **describe** representations and models of natural or man-made phenomena and systems in the domain.
	1.3	The student can **refine** representations and models of natural or man-made phenomena and systems in the domain.
	1.4	The student can **use representations and models** to analyze situations or solve problems qualitatively and quantitatively.
	1.5	The student can **express key elements of natural phenomena across multiple representation in the domain.**
2	Mathematical Routines	Use mathematics appropriately
	2.1	The student can *justify* the **selection of a mathematical routine** to solve problems.
	2.2	The student can **apply mathematical routines** to quantities that describe natural phenomena
	2.3	The student can **estimate quantities** that describe natural phenomena.
3	Scientific Questioning	Engage in scientific questioning to extend thinking or to guide investigations within the context of the AP Course
	3.1	The student can **pose** scientific questions

7 From "Science Practices," AP Physics 1: Algebra-Based Course and Exam Description. Accessed 8/5/2022 at: https://apcentral.collegeboard.org/courses/ap-physics-1

8 The Eight Science and Engineering Practices You Need to Know, Elizabeth Chapman, accessed 8/5/2022 at: https://medium.com/@egchapma/the-eight-science-and-engineering-practices-you-need-to-know-cf813c206879

9 NGSS 8 Science Practices - Definitions and Examples. Instructional leadership for science practices (ILSP). Accessed 8/5/2022, at http://www.sciencepracticesleadership.com/uploads/1/6/8/7/1687518/8_practices_v4.pdf

No.	Topic	Description
	3.2	The student can **refine** scientific questions.
	3.3	The student can **evaluate** scientific questions.
4	Experimental Methods	Plan and implement data-collection strategies in relations
	4.1	The student can justify the **selection of the kind of data needed** to answer a particular scientific question.
	4.2	The student can **design a plan for collecting data** to answer a particular scientific question.
	4.3	The student can **collect data** to answer a particular scientific question.
	4.4	The student can **evaluate sources of data** to answer a particular scientific question.
5	Data Analysis	Perform data analysis and evaluation of evidence
	5.1	The student can **analyze data** to identify patterns or relationships.
	5.2	The student can **refine observations and measurements** based on data sources
	5.3	The student can **evaluate the evidence** provided by data sets in relation to a particular scientific question.
6	Argumentation	Work with scientific explanations and theories.
	6.1	The student can **justify claims with evidence**
	6.2	The student can **construct explanations of phenomena based on evidence** produced through scientific practices.
	6.3	The student can **articulate the reasons that scientific explanations and theories are refined or replaced**.
	6.4	The student can **make claims** and predictions about natural phenomena based on scientific theories and models.
	6.5	The student can **evaluate alternative scientific explanations**.
7	Making Connections	Connect and relate knowledge across various scales, concepts, and representations in and across domains.
	7.1	The student can **connect phenomena and models across spatial and temporal scales**.
	7.2	The student can **connect concepts in and across domain(s)** to generalize or extrapolate in and/or across enduring understandings and/or big ideas.

Course materials/topics flow:

Major Topic	Science Practice	Big Ideas
Chapter 1: Introduction: The Nature of Science and Physics		
Chapter 2: Kinematics	SP1.5, 2.1, 2.2; 4.2, 5.1	Big Idea 3 E. U. 3.A E. K. 3A
Chapter 3: Two-Dimensional Kinematics	S.P. 1.5, 2.1, 2.2, 4.2, 5.1	Big Idea 3 E.U. 3.A E.I. 3.A.1

Major Topic	Science Practice	Big Ideas
Chapter 4: Dynamics: Force and Newton's Laws of Motion	S.P. 1.1, 1.4, 1.5, 2.2,5,3 6.1,6.2, 6.4, 7.1, 7.2,	Big Idea 1 E.K. 1.C.1 Big Idea 2 E.U. 2.A E.K. 2.A.1 E.K. 2.A.2 E.U. 2.B E.K. 2.B.1 Big Idea 3 E.U. 3.A E.K. 3.A.2 E.K.3.A.3 E.K 3.A.4 E.U. 3.B E.K. 3.B.1 E.K. 3.B.2 E.U. 3.C E.K. 3.C.1 E.K.3.C.4 3.U. 3.G E.K. 3.G.1 E.K. 3G.2 Big Idea 4 E. U. 4.A. E. K. 4.A.1. E.K. 4.A.2 E.K. 4.A.3 Big Idea 5 E.U. 5.A E.K. 5.A.1

Major Topic	Science Practice	Big Ideas
Chapter 5: Further Applications (Friction, Drag, Elasticity)	SP 6.1, 6.2	Big Idea 3 E.U. 3.A E.K. 3.A.2 E.K.3.A.3 E.K.3.A.4 E.U. 3.B E.K. 3.B.1 E.K. 3.B.2 E.U. 3.C E.K. 3.C.4
Chapter 6: Gravitation and Uniform Circular Motion	S.P. 2.2, 6.1, 6.4	Big Idea 1 E.U. 1.C E. K. 1.C.2 E. K. C.3 Big Idea 2 E.U. 2.B.A E.K. 2.B.2 Big Idea 3 E.U. #.A E.K.3.A.1 E.K. 3.A.3 E.U.3.B E.K. 3.B.1 E.K.3.B.2 E.U. 3.C E.K. 3.C.1

Major Topic	Science Practice	Big Ideas
Chapter 7: Work, Energy and Energy Resources	S.P 1.4, 1.5, 2.1, 2.2, 6.4, 7.2	Big Idea 3 E.U. 3.E E.K. 3.E.1 Big Idea 4 E.U. 4.C E.K. 4.C.1 E.K. 4.C.2 Big Idea 5 E. U. 5.A E.K.5.A.2 E.K. 5.A.3 E.U. 5.B E.K. 5.B.1 E.K. 5.B.3 E.K. 5.B.5
Chapter 8: Linear Momentum and Collisions	S.P. 1.4, 2.1, 2.2, 3.2, 4.1, 4.2, 5.1, 5.3, 6.4, 7.2	Big Idea 3 E. U. 3.D E.K. 3.D.2 Big Idea 4 E.U. 4.B E.K. 4.B.1 Big Idea 5 E. U. 5.A E.K. 5.A.2 E.K. 5.D.1 E.K. 5.D.2
Chapter 9: Statics and Torque	S.P 1.4, 2.3, 4.1, 4.2, 5.1	Big Idea 3 E.U. 3.F E.K.3.F.1

Major Topic	Science Practice	Big Ideas
Chapter 10: Rotational Motion and Angular Momentum	SP1.2, 1.4, 2.1, 2.2, 3.2, 4.1, 4.2, 5.1, 5.3, 6.4, 7.2,	Big Idea 3 E. U. 3.F. E.K. 3.F.2 E.K. 3.F.3 Big Idea 4 E.U. 4.D E.K. 4.D.1 E.K. 4.D.2 E.K. 4.D.3 Big Idea 5 E.U.5.A E.K. 5.A.2 E.U. 5.E. E.K. 5.E.1 E.K. 5.E.2
REAL-WORLD SCENARIO [In fulfillment of Curricular Requirement 9 (CR9) and 10 (CR10)] At this point in the curriculum students will be confronted with the real-world problem of moving a 150 kg commercial safe up a carpeted wood staircase from 1st floor to 2nd floor. Movement is to be accomplished by two elderly persons of limited strength, using simple machines. Students will need to assess friction, readily available simple machines, typical force creation by elderly Americans, and construct a mathematical explanation of how to accomplish the movement. The resulting report is to be presented in hard-copy format with all necessary references, using APA format where appropriate.	SP1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3 7.1, 7.2	Big Idea 1 Big Idea 3 Big Idea 4 Big Idea 5

LABORATORY EXPERIENCE

Laboratories are extremely important to the development of the physics education. Our students already have very significant exposure to physical laboratory practices because of the advanced nature of our Chemistry course, which all have completed very successfully.

As explicitly required by the College Board, labs will occupy at least 25% of our instructional time, and may incorporate more time.[10] (CR11) In a 20 week accelerated program of Physics 1, this means that the laboratory effort will subsume on the order of 35 total hours -- **or 1.75 hours PER WEEK**. [11] Adding scientific inquiry to lecture results in significantly more effective physics education.[12] This is why the College Board so strongly urges double-sessions for laboratories. Inquiry and measurement will be key characteristics of our laboratories. Setting up laboratories requires quite significant effort and time. Our students will need to be joining in at time to help bring about the required laboratory. There is no time to be reading the laboratory during the allotted time for completion -- **students must have adequate time to prepare adequately for the required laboratories so that they can move with agility through the paces of the lab and even assist in the work to bring it about.** This is part of the effort of understanding the scientific process.

LAB NOTEBOOK (CR12)

All students are required to maintain a LAB NOTEBOOK including a record of all their laboratory work.[13] They may utilize provided paperwork or their own design, but each laboratory report, when submitted, must include

- Title
- Object/Problem
- Design of the Experiment ("Methods")
- Data ("Results")
- Calculations, Graphs other analysis including any references to mathematical methods with full reference as in in a scientific paper.
- Conclusions, including weaknesses and strengths of the work, and recommendations for improvements.

Students may provide advanced electronic presentation in addition, but if so, they must be maintained on an available electronic medium, accessible for at least the subsequent 3 years, and providing sufficient privacy for the student. URLs or other identifiers for electronic presentation must be properly provided in their paper laboratory report.

10 This is in compiance with AP Course Requirement 11 (CR11)
11 The Sample Syllabus for an A/P Course has more than twenty laboratories.
12 See: Hussain A, Azeem M, Shakoor A, Physics Teaching Methods: Scientific Inquiry Vs. Traditional Lecture. http://www.ijhssnet.com/journals/Vol_1_No_19_December_2011/28.pdf
13 This is in compliance with AP Course Requirement 12 (CR12)

Inquiry

The AP College Board emphasizes the need to develop certain Scientific Practices, skills important to scientific inquiry. As our students gain more grasp of techniques, we can move labs from more Guided Inquiry (where more structure is provided by the Instructor) to more Open Inquiry, where the students take on more and more of the tasks of defining the goals, techniques, and refinements on the way to data gathering, interpretation and conclusions.

Laboratories[14]

No.	Laboratory	Detail	Science Practices	Course Requirements
1	Gravitational Constant Lab 1A (Guided Inquiry)	Setup and collect data for acceleration of gravity by electronic or photographic means. (Eg. tennis ball from 2nd story balcony)	1.1,12, 1.3, 1.4, 4.1, 4.2, 4.3, 4.4	CR6
2	Gravitational Constant Lab 1B (Guided Inquiry)	Analyze the data to determine the acceleration of a free-fall object (photographic/electronic)	1.1, 5.1, 5.2, 5.3.	CR3, CR4, CR7, CR8,
3	Horizontal projection Lab 2A (Guided Inquiry)	Measure the initial velocity of a subsonic or supersonic projectile being launched horizontally; assess minute errors in trajectory	4.1, 4.2, 4.3, 4.4. 5.1, 5.2, 5.3,	CR6
4	Horizontal Projection Lab 2B (Guided Inquiry)	Measure the gravitational constant from the path of a horizontal projection of a projectile at a considerable distance.	5.1, 52, 53, 6.1, 6.2, 6.3, 6.4, 6.5.	CR2, CR3, CR4, CR7, CF8, CR9, CR10[15]
5	Circular Motion Lab 1A (Open inquiry)	Measuring angular motion and centripetal forces I: initial measurements on simple mass in uniform circular motion.	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 1.4, 4.1, 4.2, 4.3, 4.4.	CR7, CR8, CR9

14 These labs may not be carried out in exactly this sequence.

15 The Horizontal Projections Laboratory provides a chance to provide REAL WORLD application to long distance projectile aiming. This can augment the larger Real World Problem of moving a 150kg commercial safe that is a significant project for the students.

No.	Laboratory	Detail	Science Practices	Course Requirements
6	Circular Motion Lab 1B (Open Inquiry)	Measuring angular motion and centripetal forces II: Analyzing data and assessing theory This is another example of a laboratory where proper selection of one or more mathematical routines is involved. Students must select a proper mathematical routine to solve the problem (SP2.1) Apply that mathematical routine (SP2.2) and from past common experience in life, estimate quantities of the forces and angular velocities (SP2.3) Thus this and many other assignments invokes and satisfies Course Requirement5 (CR5)	5.1,5.2,5.3, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2	CR2, CR3, CR4, CR5, CR7, CR8, CR9
7	Generator Efficiency (Open Inquiry)	Find techniques and measure overall efficiency of gas-powered electrical generator over a finite time span of electrical power production. Option: Operate generator in power saving mode, compare, generate hypotheses for changes.	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 3.1, 3,2, 3.3. 4.1, 4.2, 4.4, 5.2, 5.3, 6.5	CR3, CR4, CR5, CR6, CR 7
8	Block and Tackle (Open Inquiry)	Block and Tackle-- real equipment, heavy weight. Collection of data, analysis and assessment of theory	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 22, 2.3, 5.1, 5.2, 5.3,6.1	CR2, CR4, CR6, CR7, CR8,

No.	Laboratory	Detail	Science Practices	Course Requirements
9	Collisions	Elastic and Inelastic collisions (pool table or equivalent) -- Different masses; measure angles, develop explanations. May include photographic collection of evidence or mechanical. This Laboratory provides the chance for students to develop the skills related to Science Practice 3: Scientific Questioning (CR5) in a very interesting way, by having students use masses of different size/mass and use frame by frame analysis to determine initial and final vector velocities, whether the total momentum of the system is constant and whether the collision was elastic. SP3.1: Before conducting the experiment, students will pose a scientific question about the initial and final velocities in the non-stick collision. SP3.2: After collecting and analyzing the data, the student will refine the scientific questions.	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 22, 2.3, 5.1, 5.2, 5.3, 6.1, 6.2,6.3,6.4,6.5	CR2, CR3, CR4, CR5, CR6, CR7, CR8, CR9
10	Coefficient of Friction (Open Inquiry)	Coefficient of friction (inclined plane(s)), assessing impact of surfaces.	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 22, 2.3, 5.1, 5.2, 5.3, 6.1, 6.2,6.3,6.4,6.5	CR2, CR3, CR4, CR6, CR7, CR8, CR9
11	Spring Constant (Guided Inquiry)	Spring Constant - Evaluation of Hooke's law; determination of model, constants.	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 22, 2.3, 5.1, 5.2, 5.3, 6.1, 6.2,6.3,6.4,6.5	CR2, CR3, CR6, CR7, CR8
12	Simple Harmonic Motion (Open Inquiry)	Simple Harmonic Motion Lab - Pendulum system	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 22, 2.3, 5.1, 5.2, 5.3, 6.1,6.2,6.3,6.4, 6.5	CR2, CR3, CR4, CR6, CR7, CR8, CR9

Classical Christian Science Teaching

We are at a classical Christian school. Traditionally the theory of classical Christian education revolves around a trivium of Grammar, Logic, and Rhetoric. These categorizations apply well to many of the subjects of the humanities. It has been questioned at times, and formally discussed how much difficulty there is in applying these to the Sciences and Mathematics. In my experience, in teaching Che misty and Physics, we are teaching all three levels to each class. The Grammar of Chemistry involves understanding the components of the atom, the fundamental forces that exist in our Universe, the names of elements, their characteristics. Logic and Rhetoric come on top of this background and at the top, the student can answer complicated questions of theoretical interactions between particles. Of note, the brilliant minds that discovered a large number of the authors of the astonishing breakthroughs all the way through those of the atom, were themselves from a Classical educational background.[16]

Susan Bauer[17] has provided a framework for evaluating how Science is taught with the principles of classical Christian concepts. Primary in her analysis is that

> **"Classical education is language-focused; learning is accomplished through words, written and spoken, rather than through images (pictures, videos, and television)."**

My classes are very classical in this sense: we will be primarily teaching through lecture, combined with laboratory, rather than entertaining videos/television -- though they may be used where appropriate.

Bauer continues,

> **"...follows a specific three-part pattern: the mind must be first supplied with facts and images, then given the logical tools for organization of facts, and finally equipped to express conclusions."**

Our class will involve a LOT of facts and images, and an understanding of laws and principles that explain how our Universe works, and will move toward solving problems logically and expressing the conclusions.

Bauer concludes that "to the classical mind, all knowledge is interrelated" She provides explanation:

> **"Astronomy (for example) isn't studied in isolation; it's learned along with the history of scientific discovery, which leads into the church's relationship to science and from there to the intricacies of medieval church history. The reading of the Odyssey leads the student into the consideration of Greek history, the nature of heroism, the development of the epic, and man's understanding of the divine."**

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16 Drake, Paul. Classical Christian Education and the Future of Science. Accessed 8/4/2022, https://societyforclassicallearning.org/classical-christian-education-and-the-future-of-science/

17 Bauer, Susan. What is Classical Christian Education? accessed 8/4/2022 at https://www.classicalchristianmb.org/what-is-classical-christian-education

My classes are VERY classical in this sense. I am constantly trying to help the students understand how these great discoveries of God's universe throughout the course of Physics were accomplished, because ***the process of being part of scientific development is important to understand*** Some of our students will end up in advanced science and will be doing scientific research and publishing in their future. Understanding how we move toward great discoveries of God's universe is very important to our students

We will also frequently be relating the material that we are studying to the decisions and outcomes of world peoples, leaders and nations. In view of the current world situation, Physics is extremely relevant.

Assignments

Assignments will be provided in a **packet** that covers a defined period of time. They will also be posted in lesson plans using the school's online FACTS system. Students are responsible for being up to date with all assignments. Our students are very familiar with this system.

GRADING

This is an A/P Course. By definition, it is taught, tested, and graded at the College level. Students will be almost continually working A/P / College questions. The exact relationship between raw scores on true AP-level questions, and applicable Cornerstone Grades is subject to adjustment, but begins roughly at this level:

Raw Score	Scaled Score
75%	90% = A
65%	80% = B
45%	70% = C

These levels approximate the "5" "4" "3" levels of AP tests.
Students that consistently score lower than what is appropriate for an A/P Score of 4, should expect to have special discussions with their parents and the Instructor to decide how to proceed.

Homework	25%
Tests and Laboratories *There is a possibility of unannounced quizzes at any time, which will be given the weighting of 1/2 a test, presuming I can make a way to make that happen.*	50%
Final Exam (at the end of this Physics I Course)	25%

Classroom Behavior

I do not anticipate having any difficulties with classroom behavior. The class will be taught as a college level class, with rigorous lecture, debate, probing questions and laboratories.

Make-up Policy

Excused absence/s due to sickness will merit the Make-up Policy. One day of extension is given for each day of absence.

Students who have a scheduled trip or a planned absence are expected to submit completed work upon return to class. This is also true to quizzes or tests. Participation in a sport activity is proof of ATTENDANCE of that day of school per school rules, and therefore does not excuse a student for their responsibilities toward the PRIMARY goal of Christian Education: which is Education.

Early notice and arrangement should be made for convenience and order.

Late Work

- An assignment or homework is to be turned in at the class period and time designated by the teacher, typically at the beginning of the period. Teachers are to designate the venue for receiving the assignment or homework, electronic, hard copy, or other.
- Work not turned in as the manner delineated above will be late. The table below lists the points to be deducted per day late.

Days Late	One Day	Two Days	Three Days	Four or More
Logic & Rhetoric	- 11 percent	- 21 percent	- 31 percent	Not Accepted
	LATE homework cannot be guaranteed to be graded to the same standard as homework turned in on the appropriate day, and cannot be guaranteed to be graded or returned in the same timely fashion as appropriately completed work.			

- As an example, Rhetoric homework assignment turned in one day late, and receiving a grade of 80% will then be reduced to 69% (reduced by 11 percent) for being turned in late.
- There are two exceptions to this standard:
  - If a student has an unplanned, but excused, absence, the due date will be extended by the number of days the student was absent.
  - If a student has a planned, but excused, absence the due date may be extended by <u>half the number of days</u> the student was absent.
  - I reserve the right to extend additional grace in very unusual situations.

Redo Policy

Life does not always provide make-overs for crucial testing events. *There is a trap in allowing students to feel that they will always have the chance to repeat an effort for which they did not devote sufficient planning, effort and time. As a parent, I've observed this work to the detriment of some of my own children.* Therefore, only on **rare occasions** will retakes or repeat work be allowed. In this class, students should expect that any re-do work will be at an accelerated level even for A/P.

Why do we have tests? There is an important Christian answer to this question. It is because of the Fall. Humans are innately flawed as a result of the Fall, and now we must have objective measures of accountability to guarantee performance on required studying.

RECOMMENDATIONS

Students are encouraged to remember me when they need to file letters of recommendation or have character references. With my background I have dealt with tens of thousands of patients and families and many many other professionals. My friends are often leaders in law or public service, or education. It will do our students good to get to know quality examples of Christian Leaders in our community who have stood the test of time and can accurately evaluate the character and performance of aspiring young people who have an entire life ahead them and important choices to make. Everyone deserves a good recommendation for the effort they have put forward, and everyone has their own set of God-given gifts -- we are not the same! Finding the niche for which God developed each and every one of us is part of the Christian walk, and if I can help a student with that, it's great.

By signing below, you are signifying that you understand and agree to the above terms of education at AP Physics 1.

___________________________________ _________________________________

Student Signature Date

___________________________________ _________________________________

Parent(s) Signature Date