Kolbe Academy
Home School

HIGH SCHOOL
PHYSICS WITH LAB
Kinetic Books Conceptual Physics

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♦ SYLLABUS ♦

Physics
High School

COURSE TITLE: Physics with Lab

COURSE TEXTS:

- *Conceptual Physics*, Digital Text only, Kinetic Books (T5500), **OR** *Conceptual Physics*, Textbook and Digital Text, Kinetic Books (T5500B)
- *Conceptual Physics* Solutions Manual*, Kinetic Books (T5500A), Optional
- *Virtual Physics Labs*, Kinetic Books (T5502)
- *Virtual Physics Lab* Solution Manual*, Kinetic Books, (T5502A), Optional
- *Kolbe Academy Guide to Writing a Lab Report* (T5140), Optional

*Kinetic Books Solution Manuals available to registered families per the request of Kinetic Books publishing.

Supplemental:

- *Practical Physics Labs* by Peter Goodwin may be used as an alternative to Virtual Physics Lab if hands-on lab work is preferred. (T5304)

COURSE DESCRIPTION:

This course is designed to give an understanding of classical physics. Physics is the science of the natural laws of the physical universe, which, like the natural moral law, flow through creation, having as their origin the goodness of God. "The beauty of creation reflects the infinite beauty of the Creator and ought to inspire the respect and submission of man's intellect and will" *(New Catechism of the Catholic Church* 342).

This course is conceptual in nature and includes a limited number of math-based physics problems to work within the course plans. It is designed to give the student a general understanding of the concepts in classical physics, but is not appropriate for those students aiming to take the Advanced Placement test for college credit. However, the course will give an appropriate background for a student planning on taking a basic physics class at a university. Kolbe Academy recommends that Physics be taken by the high school student in 11th or 12th grade after the successful completion of *Intro to Physics and Chemistry* in 8th or 9th, *Biology* in 9th or 10th, and *Chemistry* in 10th or 11th.

SCOPE AND SEQUENCE:

1. Mechanics (Exam I and II)
   a. Motion in one, two, and three dimensions
   b. Force and Newton's Laws
   c. Work, Energy and Power
   d. Momentum
   e. Uniform Circular Motion
   f. Rotational Mechanics
   g. Gravity and Orbits
2. Thermodynamics (Exam III)
   a. Temperature and Heat
   b. Kinetic Theory of Gases
   c. Laws of Thermodynamics
3. Mechanical Waves (Exam IV)
   a. Oscillations and harmonic motion
   b. Wave motion
   c. Sound
   d. Wave superposition and interference
4. Electricity and Magnetism (Exam V)
   a. Electric Charge and Coulomb's Law
   b. Electric Fields
   c. Magnetic Fields
5. Light and Optics (Exam VI)
   a. Electromagnetic Radiation
   b. Reflection
   c. Refraction
   d. Lenses

DIPLOMA REQUIREMENTS:

Summa Cum Laude diploma candidates are required to follow the Kolbe Core course (K) as outlined in the course plan, and are required to fulfill the laboratory component with this physics course (see page 5). ***Magna Cum Laude*** and ***Standard*** diploma candidates may choose to pursue the (K) designation, but are not required to do so, and instead have the option of altering the course plan as they choose. ***Summa*** students must complete 4 years of science during their high school course of study including Biology with Lab, Chemistry with Lab, Physics with Lab, and a pre-approved science elective. ***Magna*** students must complete 3 years of science during their high school course of study including Biology, Chemistry, and a physical science. ***Standard*** diploma students must complete 2 years of science including a biological and physical science. Note that this physics course fulfills the physical science requirement for both the *Magna* and *Standard* diplomas. For a student pursuing the ***Magna Cum Laude*** diploma, the science requirement dictates that lab work is incorporated into two of the following three courses: Biology, Chemistry or Physics. There is no lab requirement for the ***Standard*** diploma. Please see below for specific course titles, quarterly reporting requirements and transcript designations for physics.

REQUIRED SAMPLE WORK:

Designation*			**K**	**K**
Course Title	**Physics**	**Physics w/ Lab**	**Physics**	**Physics w/ Lab**
Quarter 1	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam I with "Core" sections answered fully	1. Exam I with all sections fully answered 2. 1 lab report
Quarter 2	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam II 2. Exam III Each with all sections fully answered	1. Exam II 2. Exam III Each with all sections fully answered 3. 1 lab report
Quarter 3	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam IV with all sections fully answered	1. Exam IV with all sections fully answered 2. 1 lab report
Quarter 4	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam V 2. Exam VI Each with all sections fully answered	1. Exam V 2. Exam VI Each with all sections fully answered 3. 1 lab report

***Designation refers to designation type on transcript. K designates a Kolbe Academy Core course.**

If the student wishes to have the course distinguished on the transcript with a (K) as a Kolbe Academy Core course, please be sure to send the correct exams and components each quarter for verification as specified above. **If no designation on the transcript is desired, parents may alter the lesson plan and any written sample work is acceptable to receive credit for the course each quarter.** If you have any questions regarding what is required for the (K) designation or diploma type status, please contact the academic advisory department at 707-255-6499 ext. 5 or by email at advisors@kolbe.org.

COURSE PLAN "AT A GLANCE" OUTLINE:

Core Physics (K)

Quarter 1

Weeks 1-5: Chapters 1-5
Week 6: Exam I
Week 7-9: Chapters 6-7

Quarter 2

Week 1-3: Chapter 8-12
Week 4: Exam II
Week 5-8: Chapters 18-21
Week 9: Exam III

Quarter 3

Week 1-4: Chapters 14-17
Week 5: Exam IV
Week 6-9: Chapters 22-25

Quarter 4

Week 1-3: Chapters 25 (cont), 27-28
Week 4: Exam V
Week 5-8: Chapters 30-33
Week 9: Exam VI

Please note that many chapters are not covered in their entirety. Be sure to refer to the course plan that follows for specific guidance.

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♦ COURSE PLAN ♦

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COURSE PLAN METHODOLOGY:

The beauty of the Kinetic Books program comes out through the interactive whiteboard applications integrated into the E-book. Their examples, concepts, and equation demonstrations really bring physics to a new level for home schooled students. Though the course could certainly be done just using the paper bound text, it is highly recommended that students take advantage of the computer based E-book and its whiteboard applications. The E-book offers the same benefits that a paper bound text has as students can highlight, enlarge text, and add notes as they read.

The chapters are laid out in the course plan with specific sections assigned. Please pay special care to the assignments, as several topics are skipped because they are beyond the scope of this course. Problems corresponding to each section are also assigned. Some of the problems are strictly conceptual in nature while others do require that the student use basic Algebra I skills to complete them. Students may prefer to do all the reading for a chapter prior to attempting the problems, or they may prefer to alternate between reading and doing problems as the course plan outlines.

Most weeks have lab work assigned by using the Virtual Physics Lab or an Interactive Problem in the E-book. To qualify the course as a lab science, students should spend an average of one hour per week doing some type of lab work. Students may receive lab credit by other means than following the course plan suggestions such as a home school co-op, hands-on lab at home, college lab course etc. A separate grade should NOT be given for the lab work, but should be incorporated into the overall grade given for the course. Parents may determine the weight the lab component will have on the final grade, but typical values range from 15-25% of the total grade.

There are 6 exams incorporated into this physics course. These exams reflect the content of what was assigned in the weekly course plans. If students do the work assigned during the week, they should be adequately prepared for any question that arrives on the exams. The exams consist of many different types of questions including multiple choice, short answer, and problems. Students wishing to receive the Kolbe Core course designation (K) must complete all the sections in the exams. Students may not skip or alter questions except when specified by the directions within the exam itself if they wish to receive the (K) designation for this course. As parents are the primary educator, they may alter the course plan or exams as needed if the student does not desire the (K) designation on the transcript.

♦♦♦ FIRST QUARTER ♦♦♦

KOLBE ACADEMY WELCOME WEEK	
MON	Read pages 2-5 of the syllabus. Open your software and load it onto your computer. Take the time to insure that all of the applications and updates you need have been successfully downloaded on your computer.
TUES	Open to Chapter 0, the Introduction. Go through 0.0 to 0.2.
WED	Go through 0.3-0.5
THUR	Go through 0.5-0.7
FRI	Go through 0.8. Using the "Course Plan at a Glance" section on page 4 of this syllabus, take 20 minutes to browse through the table of contents so you will see what chapters you will be covering during your physics course.

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WEEK 1	
♦♦♦ Chapter 1: Measurement and Mathematics ♦♦♦	
When a section is assigned, students should sure to include all of the whiteboard applications in their studies: Concepts, Equations, and Examples. As a general rule of thumb, each section takes at maximum 10 minutes to read straight through, including doing the white board applications. Students may choose to save all the problem assignments until they have completed reading through the entire chapter, or they may follow a reading schedule as follows with the problems interspersed throughout. The quiz should be taken after the student has completed all the problem assignments for the chapter.	
1.0 – 1.7	Read and do all whiteboard applications.
Problems	2.1-2.3, 2.6; 3.1, 3.4, 5.1
1.8 – 1.11	Read and do all whiteboard applications.
Problems	8.1 – 8.2, 8.4, 8.7, 8.10 – 8.11, 11.1 – 11.3
1.12 – 1.16	Read and do all whiteboard applications.
Problems	C.1-C.6, 12.1 – 12.4, 13.1-13.2
1.17	Use the summary to review this chapter's material.
Quiz	Measurement and Mathematics Quizboard. (Do all questions)

Important Vocabulary and Concepts

metric system unit prefixes scientific notation	SI units physical constant length	time mass	Pythagorean theorem radians

Important Equations

$\sin \theta = \text{opp/hyp}$ $\cos \theta = \text{adj/hyp}$ $\tan \theta = \text{opp/adj}$	Pythagorean Theorem: $a^2 + b^2 = c^2$ Angle = $\theta = s/r$ $360° = 2\pi$ radians

Notes

WEEK 2	
♦♦♦ Chapter 2: Motion in One Dimension ♦♦♦	
2.0-2.5	Read and do all whiteboard applications. In section 2.5, skip whiteboard application Equation 1.
Problems	1.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.2, 4.3, 4.4, 4.6, 5.1, 5.2, 5.3
2.8-2.9	Omit 2.6-2.7. Read and do all whiteboard applications.
Problems	8.1, 8.2, 9.1-9.5
2.10-2.13	Omit the last three paragraphs of 2.10 and only do whiteboard application Concept 1 in this section. Read and do all whiteboard applications in sections 2.11-2.13.
Problems	13.1
2.15-2.17	Omit 2.14. Read and do all whiteboard applications.
Problems	15.1 – 15.4

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Important Vocabulary and Concepts		
position displacement speed	velocity average velocity instantaneous velocity	acceleration average acceleration instantaneous acceleration
Important Equations		
$\bar{v} = \frac{\Delta x}{\Delta t}$ $\bar{a} = \frac{\Delta v}{\Delta t}$	$v_f = v_i + at$ $\Delta x = v_i t + \frac{1}{2} a t^2$	$v_f^2 = v_i^2 + 2a\Delta x$ $\Delta x = \frac{1}{2}(v_i + v_f)t$
Notes		