School District of Marshfield Course Syllabus

Course Name: AP Physics 2 PS
Length of Course: Year
Credit: 1 Credit

Program Goal:

The School District of Marshfield K-12 Science Program will prepare and motivate learners to explore, problem solve and collaborate with their classmates to interpret science and explain the world around them. Learners will acquire knowledge and evidence that promotes creative solutions through the evaluation and understanding of scientific theories and evidence. Learners will collect, analyze and reason with scientific data through investigations that ultimately allow for the generation of scientific explanations. Critical thinking skills will elevate natural curiosity, make sense of scientific data and promote scientific literate citizens.

Course Description:

AP Physics 2 is an algebra-based, introductory college-level physics course that explores topics such as fluid statics and dynamics, thermodynamics with kinetic theory, PV diagrams and probability, electrostatics, electrical circuits with capacitors, magnetic fields, electromagnetism, physical and geometric optics and quantum, atomic and nuclear physics. Through inquiry-based learning, students will develop scientific critical thinking and reasoning skills. Also study

interactions among science, technology and society. Students can elect to take the AP Physics 2 Exam for college credit in May (check with your university for college credit you can attain). This course requires that 25% of the instructional time will be spent in hands-on laboratory work, with an emphasis on inquiry-based investigations that provide students with opportunities to apply the science practices.

AP Physics 2 PS

Resources

During the year, we will review mechanics and explore new concepts from fluid and thermal systems, electricity and magnetism, light waves and optics, and nuclear physics.[Serway, Raymond A, and Jerry S. Faughn.College Physics-6th Edition.Pacific Grove, CA: Brooks/Cole Thomson Learning publish year 2003. Chapters 9-12, 15-20, 22-24, 27-30]

Physics Simulations Colorado State University
https://phet.colorado.edu/en/simulations/category/physics

NASA Earth Observatory
http://earthobservatory.nasa.gov/

Materials

You need to have one three ring binder and one notebook, exclusively for Honors Physics.

All class notes, homework, and reading notes go in your NOTEBOOK.

All handouts and labs go in your THREE RING BINDER.

This is a convenient way to organize material as it is presented to you. Being organized will certainly improve your chances of success!

You will be expected to have method/place to store your lab work. Most labs will be turned in on loose-leaf paper. Labs need to be stored together after they are turned in and graded. A three ring binder is one great way to store these. Colleges may use your lab records to make a final decision to award or not award you college credit for those you who will continue into AP Physics next year. Please keep lab reports neat and well organized.

Grades

You will be graded on the following categories:

5% HOMEWORK
5% QUIZZES
30% LAB ACTIVITIES - written by you as we work
60% EXAMS - at the end of each major unit designed to simulate the AP exam as much as

possible combining multiple choice and free-response style questions

You will be graded on the following categories:

Homework:
Problems will be assigned an average of 3 nights a week. ALL HOMEWORK PROBLEMS ARE TO BE COMPLETED IN YOUR PROBLEMS NOTEBOOK. Please label each assignment and use plenty of space for each one. Questions will be taken on homework problems the day before they are due. On the day they are due, a homework quiz may be given. Problems should be written completely and neatly. Show each step clearly, and be sure to consistently use units with numerical values.

Homework quizzes:
These quizzes will be 1 or 2 problems taken directly from the textbook. The quizzes are usually OPEN TEXTBOOK, meaning a calculator and textbook can be used, but your problem notebook may not be used. A limited amount of time will be allowed on each quiz. Keeping up to date on problem sets will make the quizzes very reasonable to complete. Problems will be graded on four areas: setup and equations, numerical values put into equations, numerical solution, and use of units throughout the problem. Missed homework quizzes will not be made up. Rather, a set number of quiz scores will be dropped at the end of each grading period.

Lab Activities are at the core of understanding physics! **Students will spend a minimum of 25 percent of instructional time engaging in hands-on laboratory work with an emphasis on inquiry-based investigations.** They will be usually completed in groups of 2 people. Working cooperatively together is critical to the success of everyone in the class. Each student must hand in their own lab report. Computers and Vernier Technology will be used often in this course. Plan to store all of your computer work on the hard drive using a folder with your name. Each lab group should use the same computer for each lab.

Labs reports are to be concise, organized accounts of the work which you have done. Most lab reports will be written in a formal style, according to guidelines we will work through together while others will involve oral presentations of your research. Lab reports may be typed or handwritten. Physical relationships will be discovered using Guided Inquiry-**GI** and Open Inquiry-**OI** techniques. For each lab, students are expected to present their findings to the class and defend the conclusions they have made based on their lab results. Students have the option to redesign the experiment and redo it. Often we will use computers and Vernier Labpro Technology to collect data and build graphs. Data analyses include identification of the sources and effects of experimental uncertainty, calculations, results and conclusions, and suggestions for further refinement of the experiment as appropriate.

Exams will cover each major unit...often over two or more chapters. Exams are intended to model the AP exam itself. They will be a combination of multiple choice questions and free

response problems. You will be provided with a set of conceptual questions for each unit we work with. These are to be used to help you assure you have mastered the appropriate concepts in each unit. Exams may also contain review material from previous units.

We need to approach this course as a team. Our goal is to help each person to become a confident physics problem solver and thinker. Working as a team, we can achieve great success.

I look forward to getting to know you this year. I want this course to be rewarding, challenging and fun for you. We will work hard (AND HAVE FUN!!) together. Please speak with me or email me about any comments or concerns that may arise during the course of the year.

In the event you miss a lab, test, or quiz, arrangements will made for you to make those up in room 37 or the testing center.

Text Assignments:

Chapter	Conceptual Questions	Problems
9	1,2,3,4,5,6,7,8,9,12,14,17	13-15,18-20,25-30,37,40,41,45,46,49,78
10	4,5,8,10,11	1,2,10-13,15,20,21
11	3, 4, 5, 8, 9	1-9, 13-15, 20-22
12	5,6,7,11,12	3-10,26,32
15	1,2,4,6,13,16,17,18	1,6,7,11,20,21,23,29,30,34,41,48,50,57
16	5,9,10,12,13,15	1,3,6,7,10,16,22,23,25,31,35,38,47
17	4,5,7,8,9,10,11,12,13,14	1,4,5,7,8,10,11,12,15,17,21,24,27,31,33,34, 38,39,42,52,57,60
18	2,3,4,5,6,8,9,12,13,18,19	1-8,13,30-33
19	2,3,5,6,7,8,10,11,12,14,17,19	1-16,22,24,29,30,31,35,36,41,57
20	2,4,7,8,16	1,2,6,7,8,9,13,14,18,20,21,23,24 27,28,30,31,35,59
22	1,4,6,7,8,10,13,16,17	1,4,5,6,7,9,10,13,17,21,24,27,29,31,33,36,41,43
23	6,7,8,9,10,12,14,15,16,17	3,4,5,8,11,13,16,21,22,23,26,27,29,34,35,43,45
24	2,3,5,8,9,13,14,16,17,18	1,2,3,7,12,14,15,20,22,26,29,34,46,48
27	7,9,10,12	1-7,10-18

28	1,2,3,4,6,7,17	1-5,12-20,27-32
29	2,3,4,9,12,14,17	7,9,10-16,21-30
30	2,4,12,14,16,18,19	1-19

Curricular Requirements Page(s):

CR1 Students and teachers have access to college-level resources including college-level textbooks and reference materials in print or electronic format. **1, 4**

CR2a The course design provides opportunities for students to develop understanding of the foundational principles of thermodynamics in the context of the big ideas that organize the curriculum framework. **9, 10**

CR2b The course design provides opportunities for students to develop understanding of the foundational principles of fluids in the context of the big ideas that organize the curriculum framework. **8, 9**

CR2c The course design provides opportunities for students to develop understanding of the foundational principles of electrostatics in the context of the big ideas that organize the curriculum framework. **11, 12**

CR2d The course design provides opportunities for students to develop understanding of the foundational principles of electric circuits in the context of the big ideas that organize the curriculum framework. **10, 11, 12, 13, 17**

CR2e The course design provides opportunities for students to develop understanding of the foundational principles of magnetism and electromagnetic induction in the context of the big ideas that organize the curriculum framework. **13, 14**

CR2f The course design provides opportunities for students to develop understanding of the foundational principles of optics in the context of the big ideas that organize the curriculum framework. **14,15**

CR2g The course design provides opportunities for students to develop understanding of the foundational principles of modern physics in the context of the big ideas that organize the curriculum framework. **17, 18**

CR3 Students have opportunities to apply AP Physics 2 learning objectives connecting across enduring understandings as described in the curriculum framework. These opportunities must occur in addition to those within laboratory investigations. **8, 17, 18**

CR4 The course provides students with opportunities to apply their knowledge of physics principles to real world questions or scenarios (including societal issues or technological innovations) to help them become scientifically literate citizens. **8, 18**

CR5 Students are provided with the opportunity to spend a minimum of 25 percent of instructional time engaging in hands-on laboratory work with an emphasis on inquiry-based investigations**. 2,8,10,11,12,13,14,15,16,17,18**

CR6a The laboratory work used throughout the course includes a variety of investigations that support the foundational AP Physics 2 principles. **8,9,10,11,12,13,14,15,16,17,18**

CR6b The laboratory work used throughout the course includes guided-inquiry laboratory investigations allowing students to apply all seven science practices.
8,9,10,11,12,13,14,15,16,18

CR7 The course provides opportunities for students to develop their communication skills by recording evidence of their research of literature or scientific investigations through verbal, written, and graphic presentations. **2,7,8,10,11,12,13,14,15,17,18**

CR8 The course provides opportunities for students to develop written and oral scientific argumentation skills. **2,7,10,11,12,13,14,15,17,18**

Topics/Content Outline- Units and Themes:

Week 1	
Course Description & Policies Review Mechanics and AP Physics 1 topics	
Week 2	
Fluids [CR2b] Properties of fluids—gases and liquids Hydrostatic Pressure and Pascal's Principle Buoyancy (Archimedes' Principle) Fluid Flow Continuity (Conservation of Mass) Conservation of Energy and Bernoulli's Principle	Big Ideas: 1, 3, and 5 LO 5.B.10.2 (SP 2.2) LO 3.C.4.1 (SP 6.1) LO 3.C.4.2 SP 6.2) LO 5.F.1.1 (SP 2.1, 2.2, and 7.2) LO 5.B.10.1 (SP 2.2) LO 5.B.10.2 (SP 2.2) LO 5.B.10.3 (SP 2.2) LO 5.B.10.4 (SP 6.2)
Hydrostatic Pressure Lab-Students use Vernier pressure sensors and graphical analysis to discover relationship between Water Depth and Pressure.GI **SP 2.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class.	

Chapter 9 Examples Assign Chapter 9
Correct 1st half of Ch 9 homework
Quiz chapter 9
Finish examples

Archimedes Lab-Students use graphical analysis to discover relationship between Weight in Cup and Water Volume Displaced-OI **SP 1.1,1.4,2.1,2.2,3.1,4.1,4.2,4.3,5.1,5.3,6.1,6.4,7.2**
Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class.

Week 3

Bernoulli Lab-Students discover relationship between Water Height and Water Stream Velocity from Opening in Bottom of Plastic Bottle. Conservation of Energy and Trajectory will be used to provide analysis data to determine relationship between fluid height and water exit velocity - OI **SP 1.1,1.4,2.1,2.2,3.1,4.1,4.2,4.3,5.1,5.3,6.1,6.4,7.2**
Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class.

Tidal Energy Exploration-Students will research articles on hydroelectric dams and select a new location for their proposed hydroelectric dam project. Students will present pros and cons of their project in the area selected as classroom presentations. **LO5.F.1.1, LO5.B.10.1, LO5.B.10.2, LO5.B.10.3, LO5.B.10.4**

Correct 2nd half of Ch 9 homework
Quiz Ch 9

Thermodynamics [CR2a]	Big Ideas: 1, 4, 5, and 7
Temperature	LO 4.C.3.1 (SP 6.4)
	LO 5.B.6.1 (SP 1.2)
	LO 7.A.3.1 (SP 6.4 and 7.2)
Pressure	LO 7.A.1.1 (SP 6.4 and 7.2)
	LO 7.A.1.2 (SP 1.4 and 2.2)
Heat/Energy Transfer	LO 4.C.3.1 (SP 6.4)
	LO 5.B.6.1 (SP 1.2)
Ideal gases	LO 7.A.3.1 (SP 6.4 and 7.2)
	LO 7.A.3.2 (SP 3.2 and 4.2)
	LO 7.A.3.3 (SP 5.1)
Kinetic Theory	LO 7.A.2.1 (SP 7.1)
	LO 7.A.2.2 (SP 7.1)
Laws of Thermodynamics	LO 5.B.7.1 (SP 6.4 and 7.2)
Entropy	LO 7.B.2.1 (SP 7.1)
PV Diagrams	LO 5.B.7.2 (SP 1.1)
	LO 5.B.7.3 (SP 1.1, 1.4, and 2.2)
	LO 5.B.5.6 (SP 4.2 and 5.1)
Probability and Thermal Equilibrium	LO 7.B.1.1 (SP 6.2)

Chapter 10 examples Temperature and Pressure
Assign Temperature and Pressure Homework

Chapter 10 examples Heat Energy Transfer and Laws of Thermodynamics Assign Heat Energy Transfer Homework Chapter 10 examples Kinetic Theory Ideal Gases and Entropy Assign Chapter 10 HW Kinetic Theory Ideal Gases and Entropy	
Week 4	
Chapter 10 examples PV Diagrams Assign PV homework Chapter 10 homework due Review Test Chapters 9-10 Chapter 11 examples Assign chapter 11 homework	
Week 5	
Lab: Ideal Gas Equation-Using pressure and temperature sensors on a confined sample of gas, students will determine how the internal energy of a heat energy system is affected by the exchanges of energy between the system and the surrounding area.GI **SP 1.1, 1.4, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.4, 7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Chapter 11 homework due Quiz chapter 10	
Week 6	
Chapter 12 Entropy Examples Assign chapter 12 homework Quiz chapter 11 Lab: Entropy-Students will explore energy and entropy changes on the earth from the absorption of solar radiation. Conservation of Energy and Entropy ideas will be used. Data will be analyzed from NASA's Goddard Center website.-GI **SP 1.1, 1.2, 2.2, 3.1, 4.1, 4.2, 5.1, 5.3, 6.1** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Correct chapter 12 Review	
Week 7	
Test Chapters 11-12 Test give back	
ELECTRICITY AND MAGNETISM [CR2c] [CR2d] [CR2e] Elementary Charges and Fundamental Particles	Big Ideas: 1, 2, 3, 4 and 5 LO 1.A.2.1 (SP 1.1 and 7.1) LO 1.A.5.2 (SP 1.1, 1.4, and 7.1) LO 1.B.2.1 (SP 6.2) LO 1.B.2.2 (SP 6.4 and 7.2) LO 1.B.2.3 (SP 6.1) LO 1.B.3.1 (SP 1.5, 6.1, 7.2)

Charging and Redistribution of Charge	LO 4.E.3.1 (SP 6.4) LO 4.E.3.2 (SP 6.4 and 7.2) LO 4.E.3.3 (SP 1.1, 1.4, and6.4) LO 4.E.3.4 (SP 1.1, 1.4, and6.4) LO5.C.2.1
Electric Force (Coulomb's Law) and Electric Field	EK 2.A.1 LO 2.C.1.1 (SP 6.4 and 7.2) LO2.C.1.2 (SP 2.2) EK 2.C.2 LO 2.C.2.1 (SP 2.2 and 6.4) LO 3.C.2.1 (SP 2.2 and 6.4) LO 3.C.2.2 (SP 7.2) LO 3.C.2.3 (SP 2.2) LO 2.C.3.1 (SP 6.2) LO 2.C.4.1 (SP 2.2, 6.4, and 7.2) LO 2.C.4.2 (SP 1.4 and 2.2) LO 2.C.5.1 (SP 1.1 and 2.2) LO 2.C.5.2 (SP 2.2) LO 2.C.5.3 (SP 1.1, 2.2, and 7.1)
Electric Potential, Potential Difference, and Potential Energy	EK 2.A.2 LO 2.E.3.1 (SP 2.2) LO 2.E.3.2 (SP 1.4 and 6.4) LO 5.B.2.1 (SP 1.4 and 2.1)
Equipotentials	LO 2.E.1.1 (SP 1.4, 6.4, and 7.2) LO 2.E.2.1 (SP 6.4 and 7.2) LO 2.E.2.2 (SP 6.4 and 7.2) LO 2.E.2.3 (SP 1.4)
Chapter 15 Demos and Coulomb Examples Assign Chapter 15 Homework	
Week 8	
Finish Chapter 15 Demos and Examples Lab: Electrostatics-Students will determine the # of electrons on a charged balloon using static equilibrium and Coulomb force equation-GI. **SP 1.1, 1.2, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.4, 7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Correct Chapter 15 Quiz	
Week 9	
Chapter 16 Capacitor Examples Demo: Discharging a Capacitor Assign Chapter 16 Homework Finish Chapter 16 Examples Lab: Capacitors-Students will measure and record charge and discharge graphs for a capacitor and determine the physical relationship between Voltage and time as well as Current and time.-GI **SP 1.2, 1.4, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.2, 6.4, 7.2**	

Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class.	
Week 10	
Correct Chapter 16 HW Review for Test Test Chapters 15-16 Give back Test	
Week 11	
Electric Dipoles Electric Current Simple DC Circuits (Ohm's Law/ Kirchhoff's Laws) Steady-State RC Circuits	LO 2.C.4.1 (SP 2.2, 6.4, and 7.2) LO 4.E.5.1 (SP 2.2 and 6.4) LO 4.E.5.2 (SP 6.1 and 6.4) LO 4.E.5.3 (SP 2.2, 4.2, and 5.1) LO 5.B.9.5 (SP 6.4) LO 5.B.9.8 (SP 1.5) LO 5.C.3.1 (SP 6.4 and 7.2) LO 5.C.3.2 (SP 4.1, 4.2, and 5.1) LO 5.C.3.3 (SP 1.4 and 2.2) LO 5.C.3.4 (SP 6.4 and 7.2) LO 5.C.3.5 (SP 1.4 and 2.2) LO 5.C.3.6 (SP 1.4 and 2.2) LO 5.C.3.7 (SP 1.4 and 2.2)
Magnetism and Sources of Magnetic Fields	EK 1.E.6
Magnetic Forces	LO 2.C.4.1 (SP 2.2, 6.4, and 7.2) LO 2.D.2.1 (SP 1.1) LO 2.D.3.1 (SP 1.2) LO 2.D.4.1 (SP 1.4) LO 4.E.1.1 (SP 1.1, 1.4, and 2.2)
Charged Particles Moving in Magnetic Fields	LO 2.D.1.1 (SP 2.2) LO 3.C.3.1 (SP 1.4) LO 3.C.3.2 (SP 4.2 and 5.1)
Electromagnetic Induction (Faraday and Lenz's Laws)	LO 4.E.2.1 (SP 6.4)
AC Circuits (introduction with transformers and other practical applications)	LO 4.E.2.1 (SP 6.4)
Lab: Determine Resistivity of Playdo-Students will determine the physical relationship between Resistance vs. Area and Resistance vs. Length by measuring resistance of different playdo shapes they design experimentally-GI.**SP 1.2, 1.4, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.1, 6.2, 6.4, 7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Chapter 17 Circuit Demos and Examples Assign Chapter 17 Homework Lab: Ohm's Law Discover I=V/R relationship-Students will discover Ohm's Law using experimental data of Voltage and Resistance measurements from a an electric circuit.-GI **SP 1.2,1.4,2.1,2.2,3.1,4.1,4.2,4.3,5.1,5.3,6.1,6.2,6.4,7.2**	

Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class.
Week 12
Correct Chapter 17 HW Chapter 18 Demos (Circuits) and Examples Assign Chapter 18 Homework Quiz Chapter 17 Finish Chapter 18 Examples
Week 13
Lab: Series and Parallel Circuits-Students will construct series and parallel circuits to determine the resistance relationship from voltage and current measurements.-GI **SP 1.2,1.4,2.1,2.2, 3.1,4.1,4.2,4.3,5.1,5.3,6.1,6.2,6.4,7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Correct Chapter 18 Homework Review for Test
Week 14
Test Chapter 17-18 Give back Test Chapter 19 Magnetic Field Demos and Examples Assign Chapter 19 Homework
Week 15
Chapter 19 Charged Particle in a Magnetic Field Demo Lab: Sources of Magnetic Fields-Students will explore the magnetic field strength of a permanent magnet and a coil of wire carrying a current. Students will discover the relationship of magnetic field strength vs. displacement of a permanent magnet. Students will also discover the relationship between the number of wire turns vs. magnetic field strength and current vs. magnetic field strength of an electromagnet.-GI **SP1.4,2.1,2.2,3.1,4.1,4.2,4.3,5.1,5.3,6.1,6.4,7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Correct Chapter 19 HW Chapter 20 Electromagnetic Induction Demos and Examples Assign Chapter 20 Homework Lab Electromagnetic Induction: Students move a bar magnet in and out of a solenoid and observe the deflection of the galvanometer. They examine the effects of a changing magnetic field by observing currents induced in a solenoid and determine whether the observations agree with the theory of electromagnetic induction and Lenz' Law.-GI **SP 1.1, 1.2, 1.4, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.2, 6.4, 7.2**
Week 16
Quiz Chapter 19 Finish Chapter 20 Examples
Week 17

Correct Chapter 20 Homework Review for Test Test Chapter 19-20 Give back Test	
Optics (CR2f)	
Nature of Light and Electromagnetism	LO 6.B.3.1 (SP 1.5) LO 6.F.1.1 (SP 6.4 and 7.2) EK 6.F.2 LO 6.F.2.1 (SP 1.1)
Reflection, Mirrors, and Critical Angle	LO 6.E.1.1 (SP 6.4 and 7.2) LO 6.E.2.1 (SP 6.4 and 7.2) EK 6.E.3 LO 6.E.4.1 (SP 3.2, 4.1, 5.1, 5.2, and 5.3) LO 6.E.4.2 (SP 1.4 and 2.2)
Refraction and Lenses	LO 6.E.1.1 (SP 6.4 and 7.2) LO 6.E.3.1 (SP 1.1 and 1.4) LO 6.E.3.2 (SP 4.1, 5.1, 5.2, and 5.3) LO 6.E.3.3 (SP 6.4 and 7.2) LO 6.E.5.1 (SP 1.4 and 2.2) LO 6.E.5.2 (SP 3.2,4.1,5.1,5.2, and 5.3)
Total Internal Reflection	LO 6.E.1.1 (SP 6.4 and 7.2) LO 6.E.4.2 (SP 1.4 and 2.2)
Thin Film Interference	LO 6.C.1.1 (SP 6.4 and 7.2) LO 6.C.1.2 (SP 1.4)
Polarization	LO 6.A.1.3 (SP 5.1 and 6.2) LO 6.E.1.1 (SP 6.4 and 7.2)
Interference and Diffraction	LO 6.C.2.1 (SP 1.4, 6.4, and7.2) LO 6.C.3.1 (SP 1.4 and 6.4) LO 6.C.4.1 (SP 6.4 and 2.2)
Chapter 22 Demos and Examples Assign Chapter 22 Homework Finish Chapter 22 Demos	
Week 18	
Lab: Mirror Reflection-Students will discover the properties of plane mirror reflection, concave mirror reflection and convex mirror reflection. Magnification, object distance, and image distance will be used to determine f and R.-GI **SP 1.1,1.4,1.5,2.1,2.2,3.1,3.2,4.1,4.2,4.3,5.1,5.2,5.3,6.1,6.4,7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Correct Chapter 22 HW Chapter 23 Demos (Optical Devices) and Examples Assign Chapter 23 Homework	
Week 19	
Quiz Chapter 22 Finish Chapter 23 Examples	

Lab: Lens Refraction-Students will use image distance and object distance to determine the focal length of various lenses.-OI **SP 1.1,1.4,1.5,2.1,2.2,3.1,3.2,4.1,4.2,4.3,5.1,5.2,5.3,6.1,6.4,7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Correct Chapter 23 Homework	
Week 20	
Chapter 24 Demos (Diffraction) and Examples Assign Chapter 24 Homework Quiz Chapter 23 Finish Chapter 24 Examples Lab: Students will determine hair thickness and CD data spacings using laser diffraction. Geometry from measurements will allow for angle measurements to determine d-thickness, from acquired data-GI **SP 1.1,1.4,1.5,2.1,2.2,3.1,3.2,4.1,4.2,4.3,5.1,5.2,5.3,6.1,6.4,7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class.	
Week 21	
Correct Chapter 24 Homework Review for Test Test Chapter 22-24 Give back Test	
Modern Physics [CR2g]	Big Ideas: 1, 3, 4, 5, 6, and 7
Brief History and Development of Modern Physics in the Late 19th and Early 20th Centuries	
Fundamental Forces	LO 3.G.1.2 (SP 7.1) LO 3.G.3.1 (SP 7.2) EU 3.6
Theory of Photons and Photoelectric Effect	EK 1.A.2 EU 6.F EK 6.F.3 LO 6.F.3.1 (SP 6.4)
Nuclear Physics: Radioactivity, Nuclear Reactions, Radiations, and Half Life	LO 5.C.1.1 (SP 6.4 and 7.2) LO 5.C.2.1 (SP 6.4) LO 5.C.2.2 (SP 4.2 and 5.1) LO 5.C.2.3 (SP 4.1) LO 5.G.1.1 (SP 6.4) LO 7.C.3.1 (SP 6.4)
Mass-Energy Equivalence	LO 1.C.4.1 (SP 6.3) LO 4.C.4.1 (SP 2.2, 2.3, and 7.2) LO 5.B.11.1 (SP 2.2 and 7.2)
Quantized Energy States for Electrons in Atoms	LO 5.B.8.1 (SP 1.2 and 7.2) LO 7.C.2.1 (SP 1.4) LO 7.C.3.1 (SP 6.4)
Energies of Photon Emission and Absorption	LO 5.B.8.1 (SP 1.2 and 7.2) LO 7.C.4.1 (SP 1.1 and 1.2)

Wave Particle Duality, de Broglie Wavelength Electron Diffraction	EK 1.D.2 EU 5.D LO 6.G.1.1 (SP 6.4 and 7.1) LO 7.C.2.1 (SP 1.4) LO 6.G.2.1 (SP 6.1) LO 6.G.2.2 (SP 6.4)
Chapter 27 Demos and Examples Photoelectric Effect Assign Chapter 27 Homework Finish Chapter 27 Demos Phet Simulation Photoelectric Effect-Students will explore relationships between work function frequency and energy of emitted electron.	
Week 22	
Correct Chapter 27 HW Chapter 28 Demos and Examples De Broglie Wavelength and Wave Particle Duality Assign Chapter 28 Homework Lab: Students construct an electric circuit with an LED and use voltage, current, and spectroscopy data to determine Planck's Constant.-GI **SP 1.1,1.4,1.5,2.1,3.1,3.2,4.1,4.2,4.3,5.1,5.2,5.3,6.1,6.4,7.2** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class. Chapter 28 Demos and Examples Electron Diffraction Assign Chapter 28 Homework	
Week 23	
Phet Simulation: Electron Diffraction-Student explore how an electron can behave as a wave and use De Broglie equation to determine electron's energy from diffraction pattern. Quiz Chapter 27 Correct Chapter 28 HW Chapter 29 Demos (Decays) and Examples Assign Chapter 29 Homework Quiz Chapter 28 Finish Chapter 29 Examples	
Week 24	
Correct Chapter 29 Homework Chapter 30 Examples and Nuclear Reactor PPT Assign Chapter 30 Homework Quiz Chapter 29 Finish Chapter 30 Examples	
Week 25	
PhET Simulation Nuclear Reactors: Students will explore mechanisms of a nuclear reactor and their functions	

Lab: Students will use shock wave data from ICE CUBE neutrino detections and conservation of energy to determine neutrino energy-GI **LO1.D.1.1, LO6.G.1.1** Submit written Lab Report per guidelines on page 7 and present oral summary of analysis in class.
Week 26
Correct Chapter 30 Homework Review for Test Test Chapter 27-30
Week 27-30
Real World Activity-The students are presented with the following scenario: a local company wants to build hydrogen fuel cell cars. The creation of hydrogen will result from the electrolysis of water from Mill Creek. The power for the electrolysis will be generated by a new nuclear reactor constructed along with a Mill Creek reservoir. The town council is hearing arguments to decide on whether to pass an ordinance allowing or forbidding the construction of nuclear power plants and an electrolysis station in city limits. Students will engage in a classroom debate on the merits and drawbacks of nuclear fission reactors as well as the benefits and drawbacks of hydrogen fuel cells to power automotive transportation. The students will be divided into three groups: one group will argue in favor of the nuclear power plant with electrolysis station, one group will argue against the nuclear power plant with electrolysis station, and one group will serve as the town council and hear arguments. Both groups must use scientific-based evidence to construct their arguments. The hydrogen fuel cell car must move an object, travel 3 meters up an incline outside of classroom 37, or generate heat equal to 5 Joules. -GI **LO5.G1.1, LO4.C.3.1, LO5.B.6.1**
Week 31-36
Review past exams and composed practice FRQ’s composed by me.

AP Physics Lab Report Format

NAME: _____

Date of lab: _____

Title: _____

PURPOSE: (1 or 2 sentences)
What is the point of this lab? What are we trying to accomplish?

MATERIALS:
What equipment does this lab require? Sketch the setup if appropriate.

PROCEDURE: (3-7 sentences)
What steps need to be followed to conduct the lab (summarize in your own words what you did in the lab)? Are your directions clear and precise? Is the lab easily repeatable with only your directions? Include sketches or diagrams if helpful.

DATA:
What raw data is collected throughout the lab? All numeric values must have their units stated, though in a table it is acceptable to indicate the units in the table headings. Data should be recorded here as it is first collected. Organize a data table before collecting data. Some labs will include a separate data sheet. In those cases, just put "see data sheet" under this heading.

CALCULATIONS:
What calculations are necessary to arrive at the quantities desired? Show these calculations in step-by-step form. *If there are no calculations, do not include this heading.*

GRAPH:
If appropriate, develop a graph to illustrate relationships between variables. What type of relationship (direct, inverse square...) exists between the variables? There should be a statement following each graph summarizing what it indicates about the information it shows. **Be sure to label all graphs with appropriate units.** *If there are no graphs, do not include this heading.*

QUESTIONS: Answer any applicable or assigned questions. If questions are on a separate sheet included in the handout just staple those to your writeup and put "see question sheet" under this heading.

CONCLUSIONS: (3-5 sentences) What are the major findings of the lab? What happened as you ran the lab? Did everything go as expected? What particular things are important to watch for?

- Respond to the purpose. What concepts does the lab illustrate?
- How do your results compare to what theory predicts should happen?
- What are possible sources of error in the data? Comment on how one might minimize or eliminate this error.