Sequoia Union High School District

PHYSICS

Description: Major topics in the first semetser include measurements, kinematics, dynamics, work and energy, momentum, fluids, and heat. In the second semester of Physics we will cover selected materials including properties of waves, soud, light, electricity, and magnetism.

Grade Level:	10, 11, 12
Length of Course:	1 Year
Units:	10

Meets Requirements for:
* SUSHD Graduation
* UC "a-g" Requirements

Prior-Learnings/Prerequisites;
Algebra I

Teacher Participants

Deborah Berlin
Christopher Reese
Gregory Fung

Course Texts

(HP) Holt Physics, Holt Rinehart, and Winston
(CP) Conceptual Physics by Paul Hewitt, 3rd Edition, Scott Foresman/Addison-Wesley

Content Standards and Benchmarks	Curriculum Instruct. Materials	Depth 0 to 5	Sample Performance Activities
PHYSICS SCIENCE AS INQUIRY **<u>Standard 1</u> Students understand and demonstrate the skills necessary to do scientific inquiry.** **Description:**			* Perform a journal activity each day. * Perform demonstrations such as mystery water bowl and draw hypotheses as to how it is done.
1. Understand that scientific investigations follow a pattern of logical thinking.	HP: Chpt 1 CP: Labs, Chapter 1	3	
2. Recognize that hypotheses are used in science for choosing what data to collect and for guiding the interpretation of the data.	HP: Chpt 1 CP: Labs	3	
3. Formulate a testable hypothesis.	HP: Chpt 1 CP: Labs	3	
4. Design and conduct scientific investigations by: - Identifying method, controls and variables - collecting and recording data - organizing and analyzing data (I.e., creating and interpreting graphs) - evaluating hyopothesis and starting conclusions - making applications to the world	HP: On going CP: Labs	3	
5. Justify the selection and use of appropriate equipment and SI measurements in scientific investigations.	HP: On going CP: Labs	3	
6. Understand that conceptual principles and knowledge guide scientific inquiries.	HP: On going CP: Labs	4	
7; Demonstrate teamwork skills in planning and carrying out investigations and in generating and evaluating ideas.	HP: On going CP: Labs	3	

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SCIENTIFIC PRACTICES AND SKILLS **<u>Standard 2</u> Students demonstrate scientific skills in a lab setting.** **Description:**			* Demonstrate proper use of equipment * Assign a fafety monitor for each group. * Assign a safety portion to lab grade.
1. Select and safely use appropriate techniques and instruments when participating in scientific and technological activities.	HP: On going CP: Labs	3	* Appropriately use hot plates and thermometers.
2. Demonstrate a concern for safety and awareness of the direct and indirect consequences of their actions to self and others.	HP: On going CP: Labs	3	

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PERSPECTIVES **<u>Standard 3</u> Students can analyze and discuss topics using a scientific perspective.** **Description:**			* Students discuss daily implication of current events related to science.
1. Understand and be able to critique the roles of science and technology in meeting personal and societal needs.	HP: Chapt 5 CP: Chapter 1	3	* In each lab report, tie concepts with their daily life.
2. Understand the relationships among science, technology and society.	HP: Chapt 5 CP: Chapter 5	3	
3. Demonstrate scientific literacy and have the confidence to pursue further investigations and readings.	HP: Chapt 5 CP: Term paper, project	2	

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MOTION AND FORCES **<u>Standard 4</u> Students understand that the motion of objects is generally predictable using Newton's laws.** **Description:**			* Given stopwatches and a moving object, determine the object:s speed. * Pull tablecoloth from underneath place to demonstrate Newton's first law of motion.
1. Solve problems in volving constant speed and averagse speed.	HP: Chapt. 2 CP: Ch 2, lab, Bowling ball	5	* Apply the equation F-ma to determine the weight of an object on the surface of the earth.
2. Demonstrate that when forces are balanced no acceleration occurs, and thus an object continues to move at a constant speed or stays at rest (Newton's First Law).	HP: Chapt. 4 CP: Ch 4, friction lab	5	* Given a cart with constant mass and varying force, derive the relationship bsetween acceleration and force.
3. Apply the law F=ma to solve one-dimensional motion problems involving constant forces (Newton's Second Law).	HP: Chapt. 4 CP: Concept developer, lab	5	* Construct and demonstrate racing balloons to show Newton's third law. * Determine the force of gravitational attraction between two celestial bodies based on their masses and the distance between their centers using Newton's law of universal gravitation.
4. Demonstrate that when one object exerts a force on a second object, the second object always exerts an equal magnitude but oppositely directed force back on the first. (Newton's Third Law)	HP: Chapt. 4 CP: Chapter 6	5	
5. Understand the relationship between the universal law of gravitation and the force of gravity on an object at the surface of the earth.	HP: Chapt. 7 CP: Chapter 12, C.D. 12-1	3	* Determine the relationship between centripetal force, linear velocity, and direcstion by spinning a rubber stopper on a string counter balanced by washers.

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6. Demonstrate that a force on an object perpendicular to the direction of its motion causes it to change direction but not speed (uniform circular motion).	HP: Chapt. 7 CP: Ch 9, Lab	2	
7. Demonstrate the motion in a circle requires force that is always directed toward the center of the circle.	HP: Chapt. 7 CP: Ch 9, Lab	2	
8. * Newton's Laws are not exact but they provide very good approximations unless an object is moving close to the speed of light or is small enough that the quantum effects are important.	HP: None CP: Chapter 35	1	
9. * Understand how to solve two-dimensional trajectory problems.	HP: None CP: Ch 3, lab	1	
10. * Understand how to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.	HP: None CP: Ch 3, vector hunt	1	
11. * Understand how to solve two-dimensional problems involving balanced forms (statics).	HP: None CP: Ch 3, Giarcoli (AP)	1	
12. * Understand how to solve problems in circular motion, using the formula for centripetal acceleration in the following form: a=v2/r.	HP: None CP: Round & round lab	1	
13. * Understand how to solve problems involving the forces between two electric charges at a distance (Coulomb's Law) or the forces between two masses at a distance (Universal gravitation).	HP: None CP: Ch 16, Ch 32	1	

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CONSERVATION OF ENERGY AND MOMENTUM **<u>Standard 5</u> Students will understand that the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.** **Description:**			* Using a marble, inclined plane, and a meter stick, predict the final velocity of the marble after rolling down the plane from a given height (starting at rest). Then perform the experiment and compare the theoretical prediction with the measured result.
1. Demonstrate how to use $KE=1/2mv^2$ and $PE=mg\Delta h$ to solve problems involving conservation of energy in sample systems such as falling objects.	HP: Chapt. 5 CP: C.D. 8-1, project	5	* Predict the final velocity of an inelastic collision for two carts. Then conduct an experiment with known starting masses and velocities (in the experiment they will measure starting and ending velocities and compare them to theoretical expectations.
2. Demonstrate how to calculate momentum as product mv and that momentum is a separately conserved quantity, different from energy.	HP: Chapt.6 CP: Chapte 8	5	* Using an impulse providing device of known force and time, student will predict the resulting final velocity of an obvject of known mass starting at rest.
3. Demonstrate that momentum is conserved, is the product of mass and velocity, and that a net force on an object causes a change in momentum.	HP: Chapt. 6 CP: Momentum problems	5	* Solve problems that cause them to employ the principle of conservation of momentum for elastic and inelastic collisions. (Air carts…)
4. Solve problems involving elastic and inelastic collisions in one dimension unsing the principles of conservation of momentum.	HP: Chapt. 6 CP: Chapter 7	2	
5. * Ssolve problems involving conservation of energy in simple systems incorporating a variety of sources of potential energy, such as capacitors and springs.	HP: None CP: Chapter 6, Ch 17	1	

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HEAT AND THERMODYNAMICS **<u>Standard 6</u> Students understand that energy cannot be created or destroyed, but in many processes, energy is transformed through the ordered and disordered motion of atoms in the form of heat.** **Description:**			
1. Demonstrate that heat flow and work are two forms of energy transfer between systems.	HP: Chapt. 10 CP: Ch 24, engines	5	* Student will determine the work done on an eggbeater by measuring the heat transferred to a known mass of water. (This activity covers both benchmark I and 2.)
2. Explain how the work done by a heat engine is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature (First Law of Thermodynamics) and why it is an example of the law of conservation of energy.	HP: Chapt. 11 CP: Ch 24, journals	3	* Student will demonstrate linear expansion measuring the change in length of a metal sample rod as it undergoes a temperature change.
3. Understand that thermal energy causes molecules to change speed.	HP: Chapt. 10 CP: Ch 21-24, lab, heat	5	
4. Understand that most processes tend to decrease the order of the systems involved so that everything tends to become less organized and less orderly over time. Thus, in all energy transfers, the overall effectp is that the energy is spread out unformly.	HP: Chapt. 11 CP: Chapter 24	3	
5. Understand that entropy is a quantity that measures the order or disorder of a system, and is larger for a more disordered system.	HP: Chapt. 11 CP: Chapter 24	3	
6. * Understand the statement "entropy tends to increase" is a low of statistical probability that governs all closed systems (Second Law of Thermodynamics).	HP: None CP: Ch 15, Ch 24	1	
7 * Understand how to solve problems involvipng heat flow, work, and efficiency in a heat engine and know that all real engines have some heat flow out.	HP: None CP: Ch 13-15, Ch 24	1	

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WAVES **<u>Standard 7</u> Students understand that waves have characteristic properties that do not depend on the type of wave.** **Description:**			* Attach a rope to a scale and show that work is transferred.
1. Describe how waves carry energy from one place to another.	HP: Chapt. 12 CP: Chapter 25	5	* Given a variety of waves, identify them as eotjer ;pmgotidoma; pr tramsverse/ * Demonstrate that changing the tension on a spring changes the rate of wavse propagation.
2. Identify transverse and longitudinal waves in various media (water, earth, etc.)	HP: Chapt. 12 CP: Chapter 25	5	* Demonstrate, using multimedia, how rainbows form.
3. Solve problems involving wavelength.	HP: Chapt. 12 CP: Chapter 25-26	5	* Perform wave-tank, light and sound demonstrations.
4. Understand that sound is a longitudinal wave whose speed depends on properties of the medium in which it propagates.	HP: Chapt. 13 CP: Chapter 26	5	
5 .Understand that light occurs in a continuous spectrum and that it's velocity is $3x10^8$ m/s in a vacuum.	HP: Chapt. 14 CP: Chapter 27, 28	5	
6. Identify phenomenon of interference (beat), diffraction, Doppler effect and polarization and will know that these are characteristic wave properties.	HP: Chapt. 12 CP: Chapter 25-27	5	

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ELECTRONIC AND MAGNETIC PHENOMENA **<u>Standard 8</u> Students understand that electric and magnetic phenomena are related and have many practical applications.** **Description:**			
1. Demonstrate using Ohm's law to predict the voltage or current in simple direct current electric circuits constructed from batteries, wires, resistors, and capacitors.	HP: Chapt. 19 CP: Ch 34-35, Ohm's law	4	* Analyze simple circuits. * Use a use a fish-tank heat to measure the heat transfer to the tank's water.
2. Demonstrate that any resistive element in a DC circuit dissipates energy which heats the resistor, the rate of energy dissipation in a circuit is called the power. Students can calculate the power dissipated in any resistive circuit element by using the formula that power = (potential difference IR) times (current I) = 12R.	HP: Chapt. 9 CP: Chapter 34-35, demo	4	* Build an electroscope and demonstrate the effects of the electric field. * Construct a simple DC motor.
3. Demonstrate that charged particles are sources of electric fields and experience forces due to the electric fields from other charges.	HP: Chapt. 18 CP: Chapter 33, demo	4	* Using a compass, determine the direction of the magnetic field around a current carrying wire. * Measure the change in current in a wire coil when a magnetic field is moved over it.
4. Demonstrate that magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and experience forces due to magnetic fields of other sources.	HP: Chapt. 21 CP: Ch 37, Tesla coil	4	* Demonstrate the conduction of electricity through plasma in the air using a Tesla coil.
5. Demonstrate how to determine the direction of a magnetic field produced bys a current flowing in a straight wire or in a coil.	HP: Chapt. 21 CP: Lab	4	
6. Demonstrate that changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.	HP: Chapt. 21 CP: Cja[ter 27	4	

Content Standards and Benchmarks	Curriculum Instruct. Materials	Depth 0 to 5	Sample Performance Activities
6. Demonstrate that changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.	HP: Chapt. 21 CP: Chpetr 23, Chapter 32	4	
7. Understand that plasmas, the fourth state of mater, contain ions and/or free electrons and conduct electricity.	HP: Chapt. 10 CP: Chapter 16	3	
8. * Understand electric and magnetic fields contain energy and act as vector force fields.	HP: None CP: Ch 15 & Ch 17	1	
9. * Understand the force on a chargsed particle in an electric field is qE, where E is the electric field at the position of the particle and q is the charge of the particle.	HP: None CP: Chapter 16	1	
10. * Understand how to calculate the electric field due to a point charge and recognize that static electric fields have as their source some arrangement of electric chargses.	HP: None CP: Chapter 17	1	
11. * Understand the force on a moving particle (with charge q) in a magnetic field is qvB sin(a) where a is the angle between v and B (v and B are the magnitudels of vectors v and B, respectively), and students use the right-hand rule to find the direction of this force.	HP: None CP: Chapter 20-21	1	
12. * Understand how to apply the concepts of electrical and gravitational potential energsy in solvsing problems involving conservation of energy.	HP: None CP: Chapter 16	1	

Core Textbooks and Instructional Material (See attached approved district list.)	Potential Articulation with Other Programs (Community College, Tsech Prep, ROP, Distance Learning, etc.)	Prevention, Intervention and Extension Strategies (Include strategies to address students in ESL, GATE, Special Ed., etc. How is instruction individualized?)
Conceptual Physics - Hewitt Physics - Giancoli (AP)	Engineering programs Robots	Challenging questions for GATE Sheltered learning for ESL AP GATE Communication w/RSP Techs
Possible Correlation to Other Subject Areas (Where could conjtent, skills, resources, teaching strategies overlap?)	**Other Pertinent Information**	**Professional Resources** (Websites, books, consultants, videos, etc.)
English and lab writing Space colony (Social Studies) Math skills	Starting to use microcomputer based labs (MBC)	Hewitt videos Use materials from USDOT and NASA Conceptual developers from Hewitt