Portales Municipal Schools

CURRICULUM MAP

Subject:	Physics	**2009**	**Grade Level 11-12**

ESSENTIAL QUESTIONS:	
STRAND The Content of Science	**BENCHMARK** Understand the motion of objects and waves, and the forces that cause them.
STANDARD Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	

9 weeks	**PERFORMANCE STANDARD**	**CONCEPTS/SKILLS Review/Extend previously introduced skill unless noted** **I = Introduce** **R= Review AND Extend** **M = Master**	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
1	8. Apply Newton's Laws to describe and analyze the behavior of moving objects, including: • displacement, velocity, and acceleration of a moving object • Newton's 2nd Law, *F = ma* (e.g., momentum and its conservation, the motion of an object falling under gravity, independence of a falling object's motion on mass) • circular motion and centripetal force.	**Speed**	**Student will predict the speed of a constant motion car.**	Verbal Response	**Constant motion car** **Flat table**
		Velocity	**If the speed of a constant motion car is known then the student will predict the velocity**	**Lab report** **Class discussion** **Teacher Generated Test**	**Constant motion car** **Meter stick** **Stopwatch**
		Acceleration	**Student will predict the acceleration of a constant motion car.**	**Lab report** **Class discussion** **Teacher Generated Test**	**Constant motion car** **Meter stick** **Stopwatch**
		Projectile Motion	**Student will compare and contrast the range of projectile using velocity and time.**	**Lab report** **Class discussion** **Teacher Generated Test**	**Projectile (steel marble)** **Ramp** **Meter stick** **Photogate and Computer**
		Force/Acceleration	**Student will analyze the relationship of force and acceleration using a dynamics cart.**	**Lab report** **Analysis Questions**	**Computer, motion detector, ramp, dynamics cart**
		Mass/Acceleration	**Student will analyze the relationship of mass and acceleration by changing the mass of a dynamics cart.**	**Lab report** **Analysis Questions**	**Computer, motion detector, ramp, dynamics cart, variable masses**

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1	8. Apply Newton's Laws to describe and analyze the behavior of moving objects, including: • displacement, velocity, and acceleration of a moving object • Newton's Second Law, $F = ma$ (e.g., momentum and its conservation, the motion of an object falling under gravity, the independence of a falling object's motion on mass) • circular motion and centripetal force.	**Friction** **Free fall** **Momentum** **Impulse** **Conservation of momentum**	**Student will explain why objects with different surface textures exhibit different motion** **Student will analyze the motion of a free falling body with a photogate.** **Student will compare and contrast the momentum change in dynamics carts** **Student will analyze the effect of force on momentum using an elastic cord** **Student will explain why momentum is conserved in an elastic collision using dynamics carts.**	Lab report **Teacher Generated Assessment** **Lab report** **Analysis Questions** **Teacher Generated Assessment** **Lab report** **Analysis Questions** **Lab report** **Analysis Questions** **Lab report** **Analysis Questions** **Post-Lab Discussion**	**Inclined plane, blocks with smooth and rough sides, spring scales, string** **Computer, photogate, free fall object (picket fence).** **Computer, ramp, dynamics carts, photogates** **Computer, elastic cord, force sensor, dynamics cart** **Computer, ramp, dynamics carts, photogates, different masses**

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1	9. Describe relative motion using frames of reference.	**Frames of reference**	**Student will identify various frames of reference and observe motion in these reference frames**	Verbal response	**Different frames of reference** **Video display**
	2. Know that every object exerts gravitational force on every other object, and how this force depends on the masses of the objects and the distance between them.	**Mass—measure of inertia**	**Student will predict the effect the mass of an object has on the inertia of the object**	**Lab report** **Teacher Generated Assessment**	**Object with various masses, ramp, spring scale**
		Net Force	**Student will evaluate net force as a function of all forces on an object using opposing and complimentary forces.**	**Lab report** **Verbal response** **Problem solving response**	**Object, spring scales, string**
	4. Understand the relationship between force and pressure, and how the pressure of a volume of gas depends on the temperature and the amount of gas.	**Pressure**	**Student will predict the relationship of force and pressure using force sensors.**	**Lab report** **Analysis questions**	**Force sensor, computer**

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1	6. Represent the magnitude and direction of forces by vector diagrams.	**Force vectors**	**Student will explain why vectors are good representatives of force using problem solving activities**	Problem solving solutions Teacher assessment	**Problem sets, protractors, rulers,**
		Momentum vectors	**Students will explain why momentum can be represented by vectors for predicting change in momentum.**	Problem solving solutions Analysis questions Teacher generated assessment	**Problem sets, protractors, rulers**
	7. Know that when one object exerts a force on a second object, the second object exerts a force of equal magnitude and in the opposite direction on the first object (i.e., Newton's Third Law).	**Newton's Third Law**	**Students will apply the principle of action/reaction using spring scales and force sensors.**	Lab Report **Analysis questions**	**Computer, force sensors, spring scales**

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1	1. Identify different forms of energy, including kinetic, gravitational (potential), chemical, thermal, nuclear, and electromagnetic	**Mechanical energy**	**Student will evaluate a form of energy and predict its nature using simple machines**	**Lab Report** **Verbal response in class discussion**	**Various simple machines (levers, inclined planes, pulleys**
		Potential energy	**Student will apply the principle of potential energy using various objects and their position.**	**Lab Report** **Analysis questions**	**Various objects with different masses placed at many positionsthe**
		Kinetic energy	**Student will predict the kinetic energy a spring will have using a Hooke's Law Apparatus.**	**Lab Report** **Teacher Assessment**	**Hooke's Law Apparatus, various springs**
	3. Understand that energy can change from one form to another (e.g., changes in kinetic and potential energy in a gravitational field, heats of reaction, hydroelectric dams) and know that energy is conserved in these changes.	**Conservation of energy**	**Student will analyze how energy is conserved using dynamics carts in collisions.**	**Lab Report**	**Computer, motion detectors, ramps,**

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1	6. Understand that the ability of energy to do something useful (work) tends to decrease (and never increases) as energy is converted from one form to another.	**Work**	**Student will analyze the work output of a machine using an Atwood apparatus.**	**Lab Report**	**Atwood apparatus, masses, computer with graphical analysis software**
		Power	**Student will distinguish between power and work using masses and change in elevation of objects.**	**Lab Report**	**Masses (weightlifting weights), stairs, stopwatch, meter stick**
		Machines & Efficiency	**Student will distinguish between the efficiency of simple machines by using measuring instruments.**	**Lab Report**	**Pulleys, levers, various masses, meter stick, balance**

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ESSENTIAL QUESTIONS:	
STRAND Scientific Thinking and Practice	**BENCHMARK** Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.
STANDARD Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	

9 weeks	**PERFORMANCE STANDARD**	**CONCEPTS/SKILLS Review/Extend previously introduced skill unless noted I = Introduce R= Review AND Extend M = Master**	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
1	5. Use mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis).	**Velocity vectors**	**Student will discover why vectors allow velocity to be physically represented by using right triangle trigonometry algorithms.**	Problem Solving solutions **Teacher assessment**	**Problem sets, ruler, protractor**

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9 weeks	**PERFORMANCE STANDARD**	**CONCEPTS/SKILLS Review/Extend previously introduced skill unless noted** **I = Introduce** **R= Review AND Extend** **M = Master**	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
2	1. Know that there are four fundamental forces in nature: gravitation, electromagnetism, weak nuclear force, and strong nuclear force.	**Gravity**	**Student will infer that gravity is a force by jumping in the air.**	Lab activity and verbal response	**None required**
	2. Know that every object exerts gravitational force on every other object, and how this force depends on the masses of the objects and the distance between them.	**Center of gravity**	**Student will explain why mass and distance influence gravity using the inverse square law.**	**Lab report** **Teacher assessment**	**Masses, ramp**
		Center of Mass	**Student will compare and contrast the center of mass of several irregular shaped objects by balancing the objects on a fulcrum**	**Lab report** **Class discussion** **Teacher Generated Test**	**Irregular shaped objects, fulcrum (pencil eraser)**
		Stability	**Student will compare and contrast stability of an object using objects with varying bases.**	**Lab report**	**Pencils, wood block, dowel rod**
		Newton's Law of Universal Gravitation	**Student will explain why Newton's Law of Universal Gravitation infers the universality of gravity.**	**Verbal response** **Teacher assessment**	**None required**

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2	2. Know that every object exerts gravitational force on every other object, and how this force depends on the masses of the objects and the distance between them.	**Inverse Square Law**	**Student will explain why the inverse square law is fundamental to many force interactions by using an inverse law apparatus.**	Lab Report	**Inverse Square Law Apparatus, Light source, meter stick**
		Satellite Motion	**Student will infer from knowledge of gravitational attraction why satellites continue in an orbital path using Newton's Laws.**	**Problem Solving Solutions**	**Problem sets**
	4. Understand the relationship between force and pressure, and how the pressure of a volume of gas depends on the temperature and the amount of gas.	**Boyle's Law**	**Student will discover the relationship of gas volume and pressure using Boyle's Law Apparatus**	**Lab Report**	Boyle's Law Apparatus , several equal Masses.
		Bernoulli's Principle	**Student will explain why a closed wind sock will inflate with a single gentle breathe.**	**Verbal Response Analysis questions from activity**	Wind Sock

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2	8. Apply Newton's Laws to describe and analyze the behavior of moving objects, including: • displacement, velocity, and acceleration of a moving object • Newton's Second Law, $F = ma$ (e.g., momentum and its conservation, the motion of an object falling under gravity, the independence of a falling object's motion on mass) • circular motion and centripetal force	**Rotation and Revolution** **Centripetal Force** **Torque** **Rotational Inertia**	**Student will analyze the motion of a bicycle wheel to determine the nature of rotational motion** **Student will predict the relationship between angular velocity and force using a simple centripetal force apparatus** **Student will analyze the force required to hold a mass at several distances from a pivot point using a "torque feeler".** **Student will classify the rotational inertia of different objects as a function of their shapes and the location of a pivot point.**	Lab Report **Analysis questions** **Lab Report** **Verbal response** **Activity questions** **Problem set solutions**	**Bicycle wheel with rim knob attached, poster board** **Centripetal force apparatus** **Torque feeler** **Problem sets**

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2	8. Apply Newton's Laws to describe and analyze the behavior of moving objects, including: • displacement, velocity, and acceleration of a moving object • Newton's Second Law, *F* = *ma* (e.g., momentum and its conservation, the motion of an object falling under gravity, the independence of a falling object's motion on mass) • circular motion and centripetal force.	**Angular momentum** **Conservation of angular momentum**	**Student will analyze angular momentum using mathematical algorithms applied to rotational motion.** **Student will compare and contrast angular momentum conservation with linear momentum conservation using mathematical algorithms.**	Problem Solving solutions Verbal response **Problem Solving solutions** **Teacher assessment**	**Problem sets** **Problems sets**

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STRAND **The Content of Science**	**BENCHMARK** Understand the properties, underlying structure, and reactions of matter.

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9 weeks	**PERFORMANCE STANDARD**	**CONCEPTS/SKILLS** Review/Extend previously introduced skill unless noted I = Introduce R= Review AND Extend M = Master	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
2	1. Classify matter in a variety of ways (e.g., element, compound, mixture; solid, liquid, gas; acidic, basic, neutral	**Solids**	**Student will evaluate the structure of a solid using the Kinetic Molecular Theory**	Problem Set solutions	**Problem sets**
	2. Identify, measure, and use a variety of physical and chemical properties (e.g., electrical conductivity, density, viscosity, chemical reactivity, pH, melting point).	**Crystals**	**Student will recognize the structure of crystals and their characteristics using the geometrical assessment of their shapes.**	**Analysis question Problem set solutions Student drawings**	**Problem sets**
		Density	**Student will speculate on the density of an object using mass and volume relationship**	**Verbal response Analysis questions**	**Objects of various densities and sizes**
		Elasticity	**Student will evaluate the elasticity of objects using tactile and visual observation.**	**Verbal response Analysis questions**	**Objects with varying degrees of elasticity**
		Buoyancy	**Student will analyze the buoyancy of several objects using a hands-on activity involving liquids and solids.**	**Lab report Analysis questions Teacher assessment**	**Solid objects, water tank, spring scales**

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2	2. Identify, measure, and use a variety of physical and chemical properties (e.g., electrical conductivity, density, viscosity, chemical reactivity, pH, melting point).	**Archimedes Principle**	**Student will design a "boat" that will carry the greatest load (marbles) using displacement principles.**	Activity Assessment Load capacity	**Aluminum foil** **Water tank** **marbles**

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3	2. Explain how thermal energy (heat) consists of the random motion and vibrations of atoms and molecules and is measured by temperature.	**Temperature/Heat**	**Student will compare and contrast the relative amount of heat in various foods using a thermometer to measure the change in temperature of water.**	Lab Report Analysis questions	**Various foods, reaction vessel, thermometer, water**
		Specific Heat Capacity	**Student will compare and contrast the relative heat capacities of different metals using a calorimeter apparatus**	Lab Report Analysis questions Teacher assessment	**Metal samples, calorimeter, water, heat source**
	4. Understand. how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators.	**Conduction**	**Student will analyze the ability of various substance to transfer heat using a conductive heat apparatus**	**Lab Report** **Analysis questions**	**Various substances, heat transfer apparatus, heat source**
		Convection	**Student will explain why heat is moved in a gas or solid from one area to another using temperature measurements.**	**Lab Report** **Analysis questions** **Student chart**	**Thermometer, heat source**
		Radiation	**Student will analyze the heat absorption of a source using contrasting heat vessels.**	**Lab Report** **Verbal response** **Analysis questions**	**Black and silver cans, thermometers,**

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9 weeks 3	4. Understand how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators.	**First Law of Thermodynamics**	**Student will explain the relationship of heat and work in a system using mathematical algorithms of thermodynamics.**	**Problem Solving Solutions Verbal response Teacher assessment**	**Problem sets**
	5. Explain how heat flows in terms of the transfer of vibrational motion of atoms and molecules from hotter to colder regions.	**Second Law of Thermodynamics**	**Student will analyze the entropy of a system using both mathematical algorithms and observation of the system**	**Problem Solving Solutions Verbal response Teacher assessment**	**Problem sets Various objects**
	6. Understand that the ability of energy to do something useful (work) tends to decrease (and never increases) as energy is converted from one form to another.	**Heat Engines**	**Student will explain how heat engines provide usable work using computational evidence**	**Problem solving solutions Verbal response**	**Problem sets**

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9 weeks 3	9. Understand how the type and arrangement of atoms and their bonds determine macroscopic properties (e.g., boiling point, electrical conductivity, hardness of minerals).	**Boiling**	**Student will predict the boiling point of a substance using barometric pressure and vapor pressure of the substance.**	**Problem solving solutions Verbal response**	**Problem sets**
		Freezing	**Student will analyze the effect of solutes on the freezing point of solutions using colligative property algorithms.**	**Problem solving solutions Lab report**	**Problem sets Solutions, solutes, thermometer**
		Evaporation	**Student will predict the evaporative property of substance using vapor pressure and volatility of the substance**	**Verbal response Lab report**	Evaporation dishes, various substances
		Condensation	**Student will hypothesize why a gas will condense using environmental parameters of the gas system.**	**Verbal response Lab report**	Containers, thermometers, various gases

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9 weeks 3	8. Describe the characteristics of electromagnetic waves (e.g., visible light, radio, microwave, X-ray, ultraviolet, gamma) and other waves (e.g., sound, seismic waves, water waves), including: • origin and potential hazards of various forms of electromagnetic radiation • energy of electromagnetic waves carried in discrete energy packets (photons) whose energy is inversely proportional to wavelength.	**Characteristics of Electromagnetic Waves** **a. sound waves** **b. light waves** **c. color**	**Student will compare and contrast sound and light waves using the observable characteristics of each type of wave.** **Student will compare and contrast the color of visible light using frequency and wavelength characteristics.**	**Student response** **Teacher Assessment** **Student response** **Activity solutions**	**Problem sets** **Problem sets** **Color spectrum**

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9 weeks 3	10. Describe wave propagation using amplitude, wavelength, frequency, and speed.	**Vibrations and Waves** **a. Wave Motion** **b. Wave Description**	**Student will analyze the characteristics of wave motion using a slinky and a coil spring.**	**Verbal response** **Analysis solutions**	**Slinky, coil spring**
		Wave Speed	**Student will compare and contrast the speed of different kinds of waves using a ripple tank, a spring, tuning fork.**	**Lab Report**	**Ripple tank, spring, tuning fork, computer, sound sensor, tube.**
		Transverse/Longitudinal Waves	**Student will classify waves as transverse or longitudinal using the characteristics of propagation of observable waves.**	**Verbal response**	**Slinky, coil spring, ripple tank**
		Speed of Sound Waves	**Student will analyze the speed of sound waves using a tuning fork and a resonance tube.**	**Lab Report** **Teacher assessment**	**Computer, sound sensor, resonance tube, tuning fork**
		Wave Characteristics **a. wavelength** **b. frequency** **c. amplitude**	**Student will analyze the relationship between wavelength and frequency and amplitude using a sound sensor and tuning forks of different frequencies.**	**Lab Report** **Problem solutions** **Analysis responses**	**Computer, sound sensor, tuning forks**

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9 weeks 3	11. Explain how the interactions of waves can result in interference, reflection, and refraction.	**Interference**	**Student will analyze the patterns produces by using a single and double slit barriers in a ripple tank and in a light diffraction box.**	**Lab report Teacher assessment**	**Ripple tank, single and double slit barrier, light source**
		Resonance	**Student will discover the resonant frequency of a tuning fork using a resonance tube and a meter stick.**	**Lab report**	**Resonance tube, tuning forks, large cylinder, water.**
		Reflection	**Student will compare and contrast the reflective properties of various mirrors using image production of an object.**	**Lab report Problem Set solutions Teacher Assessment**	**Mirrors (convex, concave, flat), object,**
		Refraction	**Student will compare and contrast the refraction properties of various lenses using image production of an object**	**Lab report Problem Set solutions Teacher assessment**	**Lenses (convex, concave), optics kit**
		Diffraction and Interference	**Student will discover interference patterns using a ripple tank and in a diffraction grating**	**Lab report Student observation response Teacher assessment**	**Ripple tank, diffraction grating, light source,**

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STANDARD Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	

	PERFORMANCE STANDARD	**CONCEPTS/SKILLS** **I = Introduce R= Review & Extend M = Master**	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
9 weeks 3	12.Describe how waves are used for practical purposes (e.g., seismic data, acoustic effects, Doppler effect).	**Standing Waves** **Doppler Effect**	**Student will discover the change in standing waves using different frequencies.** **Student will explain the Doppler Effect using a Doppler Effect apparatus and mathematical algorithms.**	**Verbal Response** **Teacher Assessment** **Verbal Response** **Problem Set Solutions** **Teacher Assessment**	**Rope or string, slinky, coil spring** **Doppler Effect Apparatus**

Portales Municipal Schools

CURRICULUM MAP

Subject:	Physics	**2009**	**Grade Level 11-12**

ESSENTIAL QUESTIONS:

STRAND The Content of Science | **BENCHMARK** Understand the transformation and transmission of energy and how energy and matter interact.

STANDARD Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.

	PERFORMANCE STANDARD	**CONCEPTS/SKILLS** I = Introduce R= Review & Extend M = Master	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
9 weeks 4	7. Understand that electromagnetic waves carry energy that can be transferred when they interact with matter.	**Electric Circuits** **a. series circuits** **b. parallel circuits** **c. schematics**	**Students will compare and contrast series and parallel circuits using simple bulb and dry cell schemes.** **Student will draw simple schematic diagrams of series and parallel circuits using proper symbols.**	**Verbal Response** **Lab Report** **Teacher assessment** **Student diagrams**	**Dry cells, bulbs, wire, switches** **Paper, pencil, ruler**
	4. Understand how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators.	**Conductors and Insulators**	**Student will compare and contrast the conductive and insulative characteristics of different substances using a dry cell circuit.**	**Lab Report**	**Paper, wood, wire, plastic, pencil lead, glass, dry cell**

Portales Municipal Schools

CURRICULUM MAP

Subject:	Physics	**2009**	**Grade Level 11-12**

ESSENTIAL QUESTIONS:

STRAND **The Content of Science**	**BENCHMARK** Understand the motion of objects and waves, and the forces that cause them.

STANDARD Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.

	PERFORMANCE STANDARD	**CONCEPTS/SKILLS** I = Introduce R= Review & Extend M = Master	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
9 weeks 4	1. Identify different forms of energy, including kinetic, gravitational (potential), chemical, thermal, nuclear, and electromagnetic	**Electric Fields**	**Student will analyze the effects of objects placed in an electric field using and electric field sensor.**	**Lab Report**	**Computer, electric field sensor,**
		Electric shielding	**Student will discover the effects of electric shielding using shielded and unshielded cable that is carrying a charge.**	Lab Report	**Shielded and Unsheilded cable, electric source, sensors**
		Electric Potential Energy	**Student will compare and contrast the differences in potential energy using dry cells in series and parallel.**	Student Response Lab Report	**Dry cells, multimeter**
		Electric Potential	**Student will analyze the electric potential of a circuit using voltage probes.**	Lab Report Teacher Assesment	**Voltage probes, circuits, computer**

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	PERFORMANCE STANDARD	**CONCEPTS/SKILLS** I = Introduce R= Review & Extend M = Master	**STUDENT ACTIVITIES AND INSTRUCTIONAL STRATEGIES**	**ASSESSMENTS**	**STUDENT MATERIALS AND RESOURCES**
9 weeks 4	3. Know that materials containing equal amounts of positive and negative charges are electrically neutral, but that a small excess or deficit of negative charges produces significant electrical forces.	**Electric forces and charge**	**Student will analyze the charge produced in an electric circuit using a voltage probe and a current probe.**	**Lab report** **Analysis responses**	**Voltage probes, current probes, computer**
		Coulomb's Law	**Student will discover the relationship between charge and distance using the mathematical algorithms.**	**Problem set solutions** **Analysis responses** **Teacher assessment**	**Problem sets**
		Electrostatic charging by: **a. friction** **b, contact** **c. induction**	Student will evaluate and compare and contrast the charge produced in a rubber rod by friction, by contact and by induction using an electroscope.	**Lab report** **Student verbal response**	**Rubber rod, fur, electroscope**
		Electric current **a. voltage** **b. resistance** **c. Ohm's Law** **d. Direct and Alternating Current**	Student will evaluate the relationship between voltage, resistance and current (Ohm's Law) using changing voltages and resistances in an electric circuit.	**Lab Report** **Analysis responses** **Teacher assessment**	**Resistors, dry cells, bulbs, current probe, voltage probe, computer**
		Electric Power	Student will use mathematical algorithms to determine the electric power used by some small appliances.	**Problem Set solutions** **Analysis responses**	**Problem sets**

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9 weeks 4	5. Explain how electric currents cause magnetism and how changing magnetic fields produce electricity (e.g., electric motors, generators).	**Magnetic Fields and Electric Currents** **Magnetic Forces on:** **a. moving charged particles** **b. current-carrying wires** **Motors** **Electromagnetic induction** **a. Faraday's Law** **b. Generators** **c. Transformers** **d. Power Transmission**	**Student will analyze the effect of a magnet on an electric current using a closed circuit.** **Student will discover the effect of a magnetic force on an moving charged particles using a cathode-ray tube.** **Student will explain why a compass is deflected when a current-carrying wire is placed over the compass.**	**Student verbal response** **Analysis response** **Lab Report** **Verbal Response** **Analysis response** **Lab report**	**Electric circuit, magnet** **Magnet, CRT,** **Compass, electric circuit**