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Physical Science, Grade 9				
Learning Standards	**Objectives**	**Resources**	**Time Allotment**	**SHS Student Expectations**
Learning Standard #1 Motion and Forces				
Learning Standard #1.1 Vector and Scalar Quantities	The student will be able to: • Distinguish between vector and scalar quantities. • Provide examples of vector and scalar quantities. • Apply an understanding of vectors to velocity, acceleration and momentum.	Unit Force and Motion • Lesson 1 • Activity…Speed Trap • worksheets • Concepts and Challenges in Physical Science, Lesson 4-1	3 days	1, 3, 4, 5
Learning Standard #1.2 Representing Vector Quantities	The student will be able to: • Graphically represent vector quantities. • Add and subtract vector quantities. • Adding vectors at right angles.	Unit Force and Motion • Lesson 6 • Working the number line	3 days	4, 5
Learning Standard #1.3 Problem Solving with Motion	The student will be able to: • Distinguish between velocity, speed and acceleration of a moving object. • Solve mathematical problems involving velocity, speed and constant acceleration.	Unit Force and Motion • Lesson 2…Speed • Activity: Determine the speed of a toy car. • Lesson 3…Velocity • Overhead notes • Lesson 4…Acceleration • Overhead notes • Concepts and Challenges in Physical Science,Lessons 4-1 and 4-2	10 days	1, 2, 4, 5

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Learning Standard #1.4 Graphing motion of objects	The student will be able to: • Interpret graphs of motion (position vs. time, speed vs. time, velocity vs. time and constant acceleration vs. time).	Unit Force and Motion • Lessons 2, 3 and 4. • Overhead notes and worksheets • The Physics Classroom Online…http://www.physicsclassroom.com/morehelp/graphpra/graphs.html	6 days	4, 5
Learning Standard #1.5 Mass and Inertia	The student will be able to: • Distinguish between mass and inertia.	Unit Force and Motion • Lesson 5 • Overhead notes • Activity: A Massive Problem	5 days	1, 4, 5
Learning Standard #1.6 Newton's First Law of Motion	The student will be able to: • Use this Law to explain how things move. • Apply Newton's First Law of Motion to everyday situations.	Unit Force and Motion • Lesson 9 • Overhead notes • Brick demo • Tablecloth trick • Shoebox listening skill • Inertia Apparatus demo. • Gyroscopic inertia activity • Which string will break Lab • Concepts and Challenges, Lesson 4-4	10 days	1, 2, 4, 5
Learning Standard #1.7 Newton's Second Law of Motion	The student will be able to: • Interpret Newton's Second Law to show how an object's motion will change only when a net force is applied. • Apply Newton's Second Law of Motion to everyday situations.	Unit Force and Motion • Lesson 10 • Overhead notes • Investigation: Calculating Force, mass and motion. • Concepts and Challenges, Lesson 4-5 pg. 68	5 days	1, 2, 4, 5

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Learning Standard #1.8 Free Body Diagrams	The student will be able to: • Draw free body diagrams to show all the co-linear forces acting on an object. • Determine the net force acting on an object.	Unit Force and Motion • Lesson 8 • Overhead Notes • The Physics Classroom Website: Recognizing Forces. • Video: Forces…Teacher's Video	5 days	3,4,5
Learning Standard #1.9 Static and Kinetic friction	The student will be able to: • Qualitatively distinguish between static and kinetic friction. • Determine what static and kinetic frictions depend on. • Explain their effects on the motion of objects.	Unit Force and Motion • Lesson 7 • Overhead notes • Activity: Measuring friction • Concepts and Challenges, Lesson 2-5 and 2-6	3 days	1, 5
Learning Standard #1.10 Newton's Third Law of Motion	The student will be able to: • Use Newton's Third Law of Motion to explain how things move • Apply Newton's Third Law to everyday occurrences.	Unit Force and Motion • Lesson 11 • Overhead notes • Video:Newton's Three Laws • Concept and Challenges, Lesson 4-6	6 days	1,2,3,4,5
Learning Standard #1.11 Newton's Law of Universal Gravitation	The student will be able to: • Conceptualize the law. • Understand that gravitational force varies with the mass of the objects and their distance from one another.	Unit Force and Motion • Lesson 7 • Video: Gravity…Discovery • Video: Thrill Ride • Concepts and Challenges, Lesson 2-2	6 days	1,2,3,4,5

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Learning Standard #1.12 System of International Units for Motion.	The student will be able to: • Identify the appropriate unit of measure for force, mass, distance, speed, acceleration and time. • Explain how they are measured.	Unit Force and Motion • Lesson 1 • Overheads • Concepts and Challenges, Lessons 1-4, 1-5, 1-6, 1-7	4 days	1,2,3,4,5,
Learning Standard #2 Conservation of Energy and Momentum				
Learning Standard #2.1 Law of Conservation of Energy	The student will be able to: • Interpret the Law of Conservation of Energy. • Provide examples of the Law.	Unit on Energy • Lessons 1 and 2 • Overhead notes • Concepts and Challenges, Lesson 3-4 pg. 48	5 days	1,2,3,4,5,6
Learning Standard #2.2 Energy Transformation	The student will be able to: • Give examples of how energy is transformed from kinetic to potential and vice versa.	Unit on Energy • Lessons 1 and 2 • Overhead notes • Concepts and Challenges, Lesson 3-3 pg. 46	4 days	1,4,5
Learning Standard #2.3 Mechanical Energy Calculations	The student will be able to: • Calculate the kinetic energy of a mechanical system. • Calculate the potential energy of a mechanical system.	Unit on Energy • Lessons 1 and 2 • Concepts and Challenges, Lesson 3-1 and 3-2 pg. 42-44	10 days	1,4,5
Learning Standard #2.4 Relationships among energy work and power.	The student will be able to: • Conceptualize the relationship among work, energy and power. • Describe quantitatively the relationship among energy, work and power.	Unit on Work • Overhead notes • Video: Energy and Work…Cambridge Educational. • Concepts and Challenges, Lessons 3-5, 3-6, and 3-7	5 days	1,4,5

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Learning Standard #2.5 Law of Conservation of Momentum	The student will be able to: • Interpret the Law of Conservation of Momentum. • Provide examples of the Law. • Calculate the momentum of an object.	Unit on Force and Motion • Lesson 5 • Lab on Momentum • Video: Thrill ride	5 days	1,4,5
Learning Standard #2.6 SI units for energy, work, power and momentum	The student will be able to: • Identify appropriate standard units of measure.	• Overheads • Concepts and Challenges, Lessons 3-5, 3-6, and 3-7	5 days	1,2,3,4,5,6
Learning Standard #3 Heat and heat transfer				
Learning Standard #3.1 Movement of Heat	The student will be able to: • Relate thermal energy to the movement of molecules. • Identify thermal expansion in substances.	Unit on Energy • Lesson 3 • Concepts and Challenges, Lesson 6-9 pg. 108	5 days	1,2,3,5
Learning Standard #3.2 Specific Heat and Heat Capacity	The student will be able to: • Distinguish between specific heat and heat capacity.	Unit on Energy • Lesson 3 • Concepts and Challenges, Lessons 6-1 and 6-2 pg. 92-94	2 day	1,2,4
Learning Standard #3.3 Temperature change in a substance	The student will be able to: • Explain the relationship between temperature and heat transferred. • Explain the relationship between temperature and the mass of the substance. • Explain the relationship between temperature and specific heat of a substance.	Unit on Energy • Lesson 3 • Overhead transparencies • Overhead notes • Concepts and Challenges, Lesson 6-3.	3 days	1,2,4

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Learning Standard #3.4 Phases of Matter	The student will be able to: • Classify matter • Distinguish between elements and compounds. • Identify a characteristic property of matter. • Distinguish between melting point, freezing point, and boiling point.	• Investigation: Measuring melting and freezing point. • Overhead transparencies • Overhead notes • Concepts and Challenges, Lessons 12-2 and 12-3	4 days	1,2,4,5
Learning Standard #4 Waves				
Learning Standard #4.1 Wave motion	The student will be able to: • Differentiate between wave motion and motion of objects.	• Demo with tuning forks • Overhead transparencies • Concepts and Challenges, Lesson 7-1	1 day	1,4,5
Learning Standard #4.2 Properties of Waves	The student will be able to: • Calculate velocity, frequency and wavelength. • Explain the relationship between velocity, frequency and wavelength.	• Concepts and Challenges, Lesson 7-3, pg. 118 • Overhead transparencies	3 days	1,2,4,5,
Learning Standards #4.3 Transverse and Longitudinal waves	The student will be able to: • Distinguish between transverse and longitudinal waves.	• Demos of the types of waves • Stadium wave demo • Longitudinal Wave Model • Transverse Wave Model • Concepts and Challenges, Lesson 7-2	3 days	1,2,4,5
Learning Standards #4.4 Mechanical and electromagnetic waves	The student will be able to: • Distinguish between mechanical and electromagnetic waves	• Demo of Mechanical Waves with Slinkies. • Concepts and Challenges, Lesson 7-1, pg. 114	2 days	1,2,4,5

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Learning Standards #4.5 Reflection and Refraction of waves	The student will be able to: • Interpret the laws of reflection and refraction. • Apply the laws of reflection and refraction to all waves.	• Demonstrations • Concepts and Challenges, Lessons 7-4 and 7-5, pg. 120-122	3 days	1,2,4,5
Learning Standards # 4.6 Polarization, Wave Interaction and the Doppler Effect	The student will be able to: • Describe what happens when two waves arrive at a point at the same time. • State how the motion of the source of sound affects the pitch in the Doppler effect. • Evaluate and explain how reverberation influences acoustics. • Identify the ways in which certain filters polarize light.	• Demonstration of the Doppler Effect • Effect of Polarizing Filters • Demo with Different Filters • Concepts and Challenges, Lesson 7-6 pg. 124	4 days	1,2,3,5
Learning Standard #4.7 Constructive and Destructive Interference	The student will be able to: • Explain graphs of constructive and destructive interference.	• Slinky Demo • Physics Classroom Web Site	4 days	1,2,3,5
Learning Standards #4.8 Wave Mediums	The student will be able to: • Explain the relationship between the speed of a wave and the medium it travels through.	• Activity: How can you Measure the Speed of Sound? • Demonstrations • Video: Faster than Sound, NOVA • Video: Let's Form a Band, TMW Media group • Concepts and Challenges, Unit 8 Sound	4 days	1,2,3,4,5

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Learning Standard #4.9 Standing Wave	The student will be able to: • Recognize the characteristics of a standing wave. • Explain how a standing wave can be formed in a string or a pipe.	• Overhead transparencies • Concepts and Challenges, Unit 8 Sound	3 days	1,2,3,4,5
Learning Standard #5 Electromagnetism				
Learning Standard #5.1 Static Charge	The student will be able to: • Recognize the characteristics of static charge. • Explain how a static charge is generated.	• Concept and Challenges,Unit 10 Electricity • Overhead transparencies • Video: Lightning, NOVA	4 days	1,5,6
Learning Standard #5.2 Coulomb's Law	The student will be able to: • Interpret Coulomb's law. • Apply Coulomb's law.	• Physics classroom web site: • Video: Getting Charged, TMW Media Group	4 days	1,4,5
Learning Standard #5.3 Electric Forces and Fields	The student will be able to: • Identify an Electric Force. • Identify the Electric Field. • Explain the difference between them.	• Physics Classroom Web site: • Video: The Earth is a Giant Magnet: TMW Media Group • Concepts and Challenges, Unit 10 Electricity	4 days	1,4,5
Learning Standard # 5.4 Measuring Electricity	The student will be able to: • Define current, voltage, and resistance. • Quantify current, voltage and resistance • Use these quantities in the appropriate formulas. • Understand the connection between these quantities.	• Physics Classroom Web Site: • Concepts and Challenges, Lesson 10-7 and 10-8	3 days	1,4,5

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Learning Standard # 5.5 Units of Measure	The student will be able to: • Identify appropriate units of measure. • Explain how these units are measured.	• Physics Classroom Web site	1 day	1,4,5
Learning Standard # 5.6 Circuits	The student will be able to: • Analyze circuits • Use Kirchoff's and Ohm's Laws to find the current and potential difference between any two points in the circuit.	• Concepts and Challenges, Lessons 10-5 and 10-6 • Ohm's Law, Lesson 10-8, pg. 190 • The Physics Classroom Web Site.	4 days	1,2,3,4,5
Learning Standard # 6 Electromagnetic Radiation				
Learning Standard # 6.1 Electromagnetic Spectrum	The student will be able to: • Describe the spectrum in terms of wavelength and energy. • Identify specific regions of the spectrum and give examples.	• Overhead Transparencies • Concepts and Challenges, Lesson 9-9, pg. 168	5 days	1,2,5
Learning Standard # 6.2 Applications of Spectrum	The student will be able to: • Explain the application of wavelengths to technology	• Overhead transparencies • The Physics Classroom Web Site • Concepts and Challenges, Lesson 9-10, pg. 170	6 days	1,2,3,5
Learning Standard # 6.3 Properties of Electromagnetic Wave	The student will be able to: • Calculate the frequency of an electromagnetic wave. • Calculate the energy of an electromagnetic wave.	• The Physics Classroom Web Site • Concepts and Challenges, Lessons 9-1, 9-2, and 9-3	3 days	1,4,5

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Learning Standard # 6.4 Visible Light	The student will be able to: • Recognize the ways in which visible light can be changed • Explain the ways in which the direction of visible light can be changed.	• Overhead transparencies • Video: Lenses and Magnification, BARR Film • Video: Lenses and Mirrors, TMW, Media Group	5 days	1,2,3,4,5