

Subject: Science

Grade: 9 Physical Science

Hallsville R-IV High School

9th Grade Physical Science

[Rationale](#) | [Course Description](#)

Curriculum Strands

- [Matter and Energy](#)
- [Force and Motion](#)
- Living Organisms
- Ecology/Environments
- Earth Systems
- Universe
- [Scientific Inquiry](#)
- [Impact of Science, Technology and Human Activity](#)

Physical Science Rationale:

Physical science offers students the opportunity to investigate through appropriate scientific methods much of the physical universe and its relevance to their lives.

Physical Science Course Description:

Grade 9, 1 unit

This required course involves the study of matter, motion, forces and energy that we encounter in our everyday world. Students learn to deal with science concepts and principles in an orderly and systematic manner with scientific inquiry emphasized. It not only stresses scientific concepts and principles needed by all students, but also lays a solid foundation for students who will be taking physics and chemistry in later grades.

Concept: Matter and Energy

[top](#)**Topic Objective:**

Strand 1: Matter and Energy - All students will demonstrate proficiency in the knowledge that changes in properties and states of matter provide evidence of the atomic theory of matter and that energy has a source, can be transferred, and can be transformed into various forms but is conserved between and within systems.

Measurable Learner Objectives	Process	Content	GLE's	Integrated Skills	Suggested Activities	Suggested Assessments/Tools
<p>1A. Compare the densities of regular and irregular objects using their respective measures of volume and density.</p> <p>1B. Identify pure substances by their physical and chemical properties (i.e., color, luster/reflectivity, hardness, conductivity, density, pH, melting point, boiling point, specific heat, solubility, phase at room temperature, chemical reactivity)</p> <p>1C. Classify a substance as being made up of one kind of atom (element) or a compound when given the molecular formula or structural formula (or electron dot diagram) for the substance.</p> <p>1D. Compare and contrast the common properties of metals, nonmetals, metalloids, and noble gases.</p>	<p>1.1</p> <p>1.2</p> <p>4.1</p> <p>4.6</p>	SC 1			<p>1A, B Practice Examples: Calculate density, sheet of different types of density problems</p> <p>1A, B Lab - Density: test 4 liquids and 7 solids to determine their density (regular and irregular objects)</p> <p>1A, B Density Drill: Applying the formula Practice sheet before a lab or calculate density for points</p> <p>1A, B Reinforcement Sheet - A Matter of Density: Practice sheet with density problems</p> <p>1A, B Float Your Boat: Build a boat out of aluminum foil and float them to see the load (pennies) they will hold</p>	<p>1A, B (CR) Lab Sheets: Questions (Scoring Guide)</p> <p>1A, B (CR) Math Skills: Density (Scoring Guide)</p> <p>1A, B (PE) Float Your Boat: Investigate the load the boat will carry (Scoring Guide)</p> <p>1B, Q (SR, CR) Identify Physical/ Chemical Property (Scoring Guide)</p> <p>1 P, Q (SR, CR) Lab Questions: White Before Your Eyes (Scoring Guide)</p> <p>1 I, J (CR) Chart/Diagram: Show Atmospheric Ocean Pressure - design a chart/graph to show the atmospheric ocean pressure and answer questions (Scoring Guide)</p>

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<p>1E. Classify solutions as diluted, concentrated, or saturated.</p> <p>1F. Compare and contrast the properties of acidic, basic, and neutral solutions.</p> <p>1G. Predict the effect of the properties of the solvent or solute (e.g., polarity, temperature, surface area/particle size, concentration, agitation) on the solubility of a substance.</p> <p>1H. Using the Kinetic theory model, explain the changes that occur in the distance between atoms/molecules and temperature of a substance as energy is absorbed or released during a phase change.</p> <p>1I. Predict the effect of a temperature change on the properties (e.g., pressure, density) of a material (solids, liquids, gases).</p> <p>1J. Predict the effect of pressure changes on the properties (e.g., temperature, density) of a material (solids, liquids gases).</p>					<p>1P, Q Classroom Activity - Describe Something in the Room: Find something in the room, write a description of it and give the description to another student to identify</p> <p>1P, Q Lab - White Before Your Eyes: Given different white substances, test for different chemical properties</p> <p>1B, F Lab - Acid and Base: Test several substances with litmus and hydron paper to check for their PH</p> <p>1B, F Solutions - Solubility Curves/Graph Interpretation: given a graph, answer questions pertaining to their solubility</p> <p>1B, F Lab - Solubility: Using sugar cubes, try using all 3 ways to increase solubility (surface area, increase temperature and stirring)</p> <p>1B, F Enrichment Sheet - Using Solubility Data to Solve Problems: Complete a sheet containing already gathered data to answer questions</p>	<p>1K (SR) Atomic Structure: (Scoring Guide)</p> <p>1K, L (PE) Drawing: Atomic Model</p> <p>1N (SR, CR) Periodic Table Relationships: (Scoring Guide)</p> <p>1N, O (SR) Matching: Period 2(Scoring Guide)</p> <p>1Q (PE) Mystery: Develop a positive test to find a substance (Scoring Guide)</p> <p>1Q (PE) Drawing: Chemical Bonds (Scoring Guide)</p> <p>1U (PE) Research: Investigate waves on electromagnetic spectrum and present findings (Scoring Guide)</p> <p>1U (SR) Skills Sheet 14.2a: Wavelength, frequency and energy. (Scoring Guide)</p> <p>1U (CR) What Causes Colorful Swirl? (Scoring Guide)</p>

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<p>1K. Describe the atom as having a dense, positive nucleus surrounded by a cloud of negative electrons.</p> <p>1L. Calculate the number of protons, neutrons, and electrons of an element (or isotopes) given its atomic mass (or mass number) and atomic number.</p> <p>1M. Describe the information provided by the atomic number and the mass number (i.e., electrical charge, chemical stability).</p> <p>1N. Explain the structure of the periodic table in terms of the elements with common properties (groups/families) and repeating properties (periods).</p> <p>1O. Classify elements as metals, nonmetals, and noble gases according to their position on the Periodic Table.</p> <p>1P. Predict the chemical reactivity of elements, and the type of bonds that may result between them, using the Periodic Table.</p> <p>1Q. Distinguish between physical and chemical changes in matter.</p>					<p>1G, E Solutions Lab: Do a lab using the 3 methods for spreading up solubility, classify each as dilution, concentration or saturation</p> <p>1J Lab - Boyle's Law: Using Boyle's Law apparatus, add pressure and gather data from this - Questions given pertaining to Boyle's</p> <p>1I Lab - Charles' Law: Using a balloon and flask, measure the circumference of the balloon to determine heat relation with volume</p> <p>1J, I Lab Problem - Mathematical Gas: Boyle's and Charles' math problems</p> <p>1K, L Drawing Atoms: Draw atoms of various elements placing correct number of protons, electrons, neutrons in each</p> <p>1K The Structure of Atoms: Sheet of different elements, identify them with correct number of protons, neutrons, and electrons</p> <p>1R Making Models of Isotopes: Draw models of hydrogen isotope</p>	<p>1V, W (PE) Presentation: Alternative energy source (Scoring Guide)</p> <p>1Z, AA (CR) Calculate: GPE and KE (Scoring Guide)</p> <p>1Z, AA (SR) Quiz: Identification of types of energy (Scoring Guide)</p> <p>1A,E (PE) Research Paper: Advantages and disadvantages of nuclear energy (Scoring Guide)</p> <p>1AG(PE) Calculate Work and Power: (Scoring Guide)</p> <p>1AG (PE) Calculate Efficiency: (Scoring Guide)</p> <p>1AG (SR, CR) Quiz/Unit Test: Simple Machines, Work, Power (Scoring Guide)</p>

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<p>1R. Describe how the valence electron configuration determines how atoms interact and may bond.</p> <p>1S. Differentiate between thermal energy (the total internal energy of a substance which is dependent upon mass), heat (thermal energy that transfers from one object or system to another due to a difference in temperature), and temperature (the measure of average kinetic energy of molecules or atoms in a substance).</p> <p>1T. Recognize chemical energy as the energy stored in the bonds between atoms in a compound.</p> <p>1U. Describe the relationship among wavelength, energy, and frequency as illustrated by the electromagnetic spectrum.</p> <p>1V. Describe sources and common uses of different forms of energy (i.e., chemical, nuclear, thermal, mechanical, electromagnetic).</p>					<p>1M, K Lab - Constructing a Model: Construct a model of an atom of a given element with the correct number of electrons, protons, and neutrons</p> <p>1N Trends on the Periodic Table: Given a sheet with 13 groups of 4 words, determine which of the four words in each group is not related and explain why</p> <p>1P Element Activity - Compare the Pairs of Elements: Compare two given elements and decide which is the most chemically reactive and explain why</p> <p>1N Concept Mapping - "Periodic Web": Given a starting point, complete a periodic table concept map</p> <p>1O Element Maze: Follow a constructed maze which includes different properties and characteristics of elements in order to find the correct path</p> <p>1O Who Am I?: Given clues, identify element</p>	

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<p>1W. Identify and evaluate advantages/disadvantages of using various sources of energy (e.g., wind, solar, geothermal, hydroelectric, biomass, fossil fuel) for human activity.</p> <p>1X. Describe the effect of different frequencies of electromagnetic waves on the Earth and living organisms (e.g., radio, infrared, visible, ultraviolet, gamma, and cosmic rays).</p> <p>1Y. Interpret examples (e.g., land and sea breezes, home heating, plate tectonics) of heat transfer as convection, conduction or radiation.</p> <p>1Z. Relate kinetic energy to an object's mass and its velocity.</p> <p>1AA. Relate an object's gravitational potential energy to its weight and height relative to the surface of Earth.</p> <p>1AB. Distinguish between examples of kinetic and potential energy (i.e., gravitational, elastic) with in a system.</p>					<p>1B, Q Lab - Physical/Chemical Change: Travel through 15 stations to determine if a physical or chemical change occurred</p> <p>Electronic Arrangement: Determine if an elements electron arrangement is very reactive, reactive, well combined or stable.</p> <p>Drawing - Ionic and Covalent Bonds: Draw atoms of elements and properly show their correct bonds</p> <p>1Y R-value Calculations with Insulation requirements for U.S.: Given a set of specs for a wall, ceiling and floor, calculate what R-value they will have and is it acceptable for a specific region</p> <p>1H Lab - Change in Temperature of Different Masses: Test the temperature of different masses of water</p> <p>1U, X Observation: Electromagnetic spectrum and discuss its organization</p> <p>Energy Sources: Students will define different alternative energy sources</p>	

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<p>1AC. Describe evidence of energy transfer and transformation that occur during exothermic and endothermic chemical reactions.</p> <p>1AD. Describe how changes in the nucleus of an atom during a nuclear reaction (i.e., nuclear decay, fusion, fission) result in emission of radiation.</p> <p>1AE. Identify the role of nuclear energy as it serves as a source of energy for the earth, stars, and human activity (e.g., sources of electromagnetic radiation, thermal energy within mantle, nuclear power plants, fuel for stars).</p> <p>1AF. Describe the transformations that occur as energy changes from kinetic to potential within a system (e.g., car moving on rollercoaster track, child swinging, diver jumping off a board) (Do NOT assess calculations)</p> <p>1AG. Compare the efficiency of simple machines (recognizing that, as work is done, the amount of usable energy decreases with each transformation as it is transferred as heat due to friction)</p>					<p>1Z, AA Practice: Calculate GPE and KE from different physical positions</p> <p>1AE Essay Question: MAP like questions comparing the amount of PE vs. KE</p> <p>1AH Video: Three Mile Island</p> <p>1V, WW Research - Advantages/Disadvantages: Research the various alternative energy sources using different resources</p> <p>1AD Half Life Calculations: Complete a chart of the half-life of Uranium</p> <p>1AG Scavenger Hunt - Simple Machines: find as many simple machines as possible in our school</p> <p>1AG Lab - Work and Power: Within lab groups, calculate work and power while climbing stairs</p> <p>1AG Lab - Inclines: Using different heights, calculate MA</p> <p>1AG Lab - Pulleys: Using different number of pulleys, calculate MA</p>	

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<p>1AH. Classify the different forms of energy (i.e., chemical, nuclear, thermal, mechanical, electromagnetic) that can be observed as energy is transferred and transformed within a system when given a scenario (e.g., dynamite explosion, solar radiation interacting with the Earth, electromagnetic motor doing work, energy generated by nuclear reactor).</p> <p>1AI. Explain how energy can be transferred (absorbed or released) or transformed between and within systems as the total amount of energy remains constant (i.e., Law of Conservation of Energy)</p>					1AG Lab - Levers: Using different force arms and resistance arms, calculate MA	
<p>Resources:</p> <p>Text: Addison - Wesley "Physic for Everyday"</p>				<p>Instructional Methods:</p>		
<p>Enrichment/ Special Needs:</p>						

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+Key to Integrated Skills

DS = Disability Equity

C = Character Education

E = Gender Equity

D = Cultural Diversity

R = Research Skills

W = Workplace Skills

T = Technology Skills

Concept: Force and Motion

[top](#)**Topic Objective:**

Strand 2: Properties and Principles of Force and Motion - All students will demonstrate proficiency in the knowledge that the motion of objects is described by its change in position relative to another object or point and that forces affect motion.

Measurable Learner Objectives	Process	Content	GLE's	Integrated Skills	Suggested Activities	Suggested Assessments/Tools
<p>2A. Represent and analyze the motion of an object graphically.</p> <p>2B. Analyze the speed of two objects in terms of distance and time.</p> <p>2C. Calculate the speed of objects (speed = distance/time)</p> <p>2D. Measure and analyze an object's motion in terms of speed, velocity and acceleration.</p> <p>2E. Calculate the acceleration of an object (final velocity-starting velocity/time)</p> <p>2F. Compare the momentum of two objects in terms of mass and velocity (Do NOT assess calculations)</p> <p>2G. Explain that the total momentum remains constant within a system.</p>		SC 2			<p>Lab: 100m Sprint</p> <p>2X Lab: Change variables to see the affect on the motion.</p> <p>Practice Math Problems: On speed, constant speed, velocity and acceleration</p> <p>2F Momentum: Given a list of objects found in everyday life, rank in order of the least momentum to greatest when given a velocity</p> <p>2S Move that Barge: Draw force diagram - given amount of force, draw vectors to show the result when the force is acting in different places and directions</p> <p>How Much Do You Weigh?: Calculate weight on different planets</p> <p>Question: "What could possibly change the interior of this object?"</p>	<p>(PE) Graph: Construct a graph from a set of data (Scoring Guide)</p> <p>(CR) Math Problem: Speed, velocity, and acceleration (Scoring Guide)</p> <p>(SR) Penny Puns: Vocabulary review (Scoring Guide)</p> <p>(PE) Build Electromagnet: (Scoring Guide)</p> <p>(PE) Bell: Construct a method to ring a bell (Scoring Guide)</p> <p>(CR) To The Finish Line: Involves a diagram with different forces and masses. (Scoring Guide)</p> <p>(CR) Calculate Newton's Second Law of Motion" (Scoring Guide)</p> <p>(SR) Identify examples of Newton's 1st, 2nd, 3rd Laws of Motion (Scoring Guide)</p>

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<p>2H. Identify and describe the forces acting on an object (i.e., type of force, direction, and magnitude in Newtons)</p> <p>2I. Describe gravity as an attractive force among all objects.</p> <p>2J. Compare and describe the gravitational forces between two objects in terms of their masses and the distances between them.</p> <p>2K. Describe weight in terms of the force of a planet's or moon's gravity acting on a given mass.</p> <p>2L. Recognize that free-falling bodies accelerate at a constant rate (neglecting friction) due to gravity.</p> <p>2M. Recognize that changing magnetic fields can produce electrical current and electric currents can produce magnetic forces.</p> <p>2N. Predict the effects of an electromagnetic force on the motion of objects (attract or repel).</p>					<p>Lab: Newton's First Law - (tennis ball) (Index card/coin)</p> <p>Practice: Identify Examples of Newton's First Law of Motion</p> <p>Teacher Demonstration: Liquid Accelerometer - Form hypothesis and then test, describe the direction and the speed</p> <p>Lab: Baseball</p> <p>Lab: Work and Power - Staircase</p>	<p>(CR) Work and Power Calculation: (Scoring Guide)</p> <p>(CR) Work/Power Lab Sheet: Questions (Scoring Guide)</p>

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Measurable Learner Objectives	Process	Content	GLE's	Integrated Skills	Suggested Activities	Suggested Assessments/Tools
<p>2O. Recognize that inertia is a property of matter that can be described as an object's tendency to resist a change in motion and is dependent upon the object's mass (Newton's First Law of Motion)</p> <p>2P. Describe the effect of a change in mass of an object on the inertia of that object (Newton's First Law of Motion).</p> <p>2Q. Using information about the mass and acceleration of two objects, compare the forces required to move them (force = mass x acceleration) (Newton's Second Law of Motion)</p> <p>2R. Identify forces acting on a falling object and the factors that affect the rate of fall (i.e., mass, volume, shape, or type of material from which the object is made)</p> <p>2S. Determine the overall effect (i.e., direction and magnitude) of forces acting on an object at the same time (i.e., net force).</p> <p>2T. Predict and explain the effect of a change in force and/or mass on the motion of an object (Newton's</p>						

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<p>Second Law of Motion).</p> <p>2U. Analyze action/reaction forces acting between two objects (e.g., handball hits concrete wall, shotgun firing) and describe their magnitude and direction (Newton's Third Law of Motion)</p> <p>2V. Predict the change in motion of one object when it is acted upon by the equal and opposite force of another object (i.e., action/reaction forces) (Newton's Third Law of Motion).</p> <p>2W. Describe the force(s) that keep an object traveling in a circular path.</p> <p>2X. Describe the force(s) acting on a projectile on the Earth.</p> <p>2Y. Predict the path of an object when the forces directing it in a given direction change.</p> <p>2Z. Describe the relationships between work, applied net force and the distance an object moves.</p> <p>2AA. Describe the effect of work on an object's kinetic and potential energy.</p>						

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<p>2AB. Explain how the efficiency of machines can be expressed as a ratio of work output to work input.</p> <p>2AC. Describe power in terms of work and time.</p> <p>2AD. Analyze and describe the relationship among work, power, and efficiency.</p>						

Resources:

Edunetics (Plato)
 Prentice Hall -Physical Science
 Physics for Everyone
 Holt Science Spectrum
 Addison-Wesley - science Insight
 Instructional Fair Inc. - Physical Science

Instructional Methods:

Enrichment/ Special Needs:

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Concept: Science Inquiry

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Topic Objective:
Strand 7: Science Inquiry - All students will demonstrate proficiency in the knowledge that science understanding is developed through the use of science process skills and scientific knowledge in combination with scientific investigation, reasoning, and critical thinking.

Measurable Learner Objectives	Process	Content	GLE's	Integrated Skills	Suggested Activities	Suggested Assessments/Tools
<p>7A. Formulate testable questions and hypotheses.</p> <p>7B. Analyze an experiment, identify the components (i.e., independent variable, dependent variable, control of constant, multiple trials) and explain their importance to the design of a valid experiment.</p> <p>7C. Design and conduct a valid experiment.</p> <p>7D. Recognize that it is not always possible, for practical or ethical reasons, to control some conditions (e.g., when sampling or testing humans, when observing animal behaviors in nature).</p>		SC 7			<p>7A Each student within a group formulates a testable question</p> <p>7A, B given experimental data, write a question, materials needed and procedure (Antifreeze Experiment)</p> <p>7C Design/construct/perform an independent experiment</p> <p>7E Lab group members discuss possible flaws in their experiment (sampling, uncontrolled constant, etc.)</p> <p>7H Given a set of problems, determine whether each will require quantitative or qualitative data</p> <p>7I, J Practice lab using tools of science</p>	<p>7B, C, D Final group lab sheet from independent experiment (Scoring Guide)</p> <p>7B Picking out the dependent and independent variables (Scoring Guide)</p> <p>7H - L (PE) Lab test using balance scale, spring scale, metric ruler, thermometer, graduated cylinder, etc. (Scoring Guide)</p> <p>7H - 7L (SC, CR) Unit Test (Scoring Guide)</p> <p>7O Analyze data from an already performed experiment</p>

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<p>7E. Acknowledge that some scientific explanations (e.g., explanations of astronomical or meteorological phenomena) cannot be tested using the standard experimental "scientific method" due to the limits of the laboratory environment, resources, and/or technologies.</p> <p>7F. Acknowledge that there is no fixed procedure called "the scientific method", but that some investigations involve systematic observations, carefully collected, relevant evidence, logical reasoning, and some imagination in developing hypotheses and other explanations.</p> <p>7G. Evaluate the design of an experiment and make suggestions for reasonable improvements.</p> <p>7H. Make qualitative and quantitative observations using the appropriate senses, tools, and equipment to gather data (e.g., microscope, thermometer, analog and digital meters, computers, spring scales, balances, metric rulers, graduated cylinders)</p>						

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<p>7I. Measure length to the nearest millimeter, mass to the nearest gram, volume to the nearest milliliter, force (weight) to the nearest Newton, temperature to the nearest degree Celsius, time to the nearest second.</p> <p>7J. Determine the appropriate tools and techniques to collect, analyze and interpret data.</p> <p>7K. Judge whether measurements and computation of quantities are reasonable.</p> <p>7L. Calculate the range, average/mean, percent and ratios for sets of data.</p> <p>7M. Recognize that observation is biased by the experiences and knowledge of the observer (e.g., strong beliefs about what should happen in particular circumstances can prevent the detection of other results).</p> <p>7N. Use quantitative and qualitative data to construct reasonable explanations (conclusions).</p>						

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<p>7O. Analyze experimental data to determine patterns, relationships, perspectives and credibility (e.g., predict/extrapolate data, explain the relationship between the independent and dependent variables.</p> <p>7P. Identify the possible effects of errors in observations, measurements and calculations, on the validity and reliability of data and resultant explanations (conclusions)</p> <p>7Q. Analyze whether evidence (data) and scientific principles support proposed explanations (hypotheses, laws, theories)</p> <p>7R. Evaluate the reasonableness of an explanation (conclusions)</p> <p>7T. Communicate the procedures and results of investigations and explanations through:</p> <ul style="list-style-type: none">* oral presentations* drawings and maps* data tables (allowing for the recording and analysis of data relevant to the experiment such as independent and dependent variables, multiple trials, beginning and ending times or						

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<p>temperatures, derived quantities) * graphs (bar, single and multiple line) * equations and writings</p> <p>7U. Communicate and defend a scientific argument.</p> <p>7V. Explain the importance of the public presentation of scientific work and supporting evidence to the scientific community (e.g., work and evidence must be critiqued, reviewed, and validated by peers; needed for subsequent investigations by peers; results can influence the decisions regarding future scientific work)</p>						
Resources:				Instructional Methods:		
Enrichment/ Special Needs:						

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Concept: Impact of Science

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Topic Objective:
Strand 8: Impact of Science, Technology and Human Activity - All students will demonstrate proficiency in the knowledge that the nature of technology is advanced by and can advance science as it seeks to apply scientific knowledge in ways that meet human needs and that science is a human endeavor.

Measurable Learner Objectives	Process	Content	GLE's	Integrated Skills	Suggested Activities	Suggested Assessments/Tools
8A. Identify the ethical issues involved in experimentation (i.e., risks to organisms or environment) 8B. Identify and evaluate the role of models as an ethical alternative to direct experimentation (e.g., using a model for a stream rather than pouring oil in an existing stream when studying the effects of oil pollution) 8C. Evaluate a given source for its scientific credibility (e.g., articles in a new periodical quoting an "eye witness", a scientist speaking within or outside his/her area of expertise) 8D. Explain why accurate record-keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society.		SC 8			8A, B, C Research: Search for an article on an experiment that raises ethical issues. Summarize the article in one page or less, using your own words. Present your findings to the class	8A, B, C Issues: Take a stand on an experimental issue presented and defend your stance. (Scoring Guide)

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