PHYSICAL SCIENCE CURRICULUM GRADE 8

Enduring Understandings	Standards Addressed	Essential Questions	Activities/Lessons
Properties of Matter			
Measurement systems have evolved to better meet our needs. Qualitative and quantitative measurements are an important part of science, math and technology.	Properties of Matter - Standard 2,3 Guiding Principles 2, 3	What do we measure? How have measurement systems changed? What are the features of the metric system that make it the most suitable system for science?	• Measurement of length, width and area lab • Cent-O-Gram balance activities • Penny Activity • Metric Review
The volume of an object can be determined in a variety of ways.	Properties of Matter - Standard 2,3	What are three techniques that can be used to measure the volume of an object? Is there a relationship between cubic centimeters and milliliters?	• Volume of Solids Lab
Density is dependent on both mass and volume. The volume of water in cubic centimeters and its mass in grams were designed to have a 1-1 relationship. The density (specific gravity) of water is 1. Water is the reference point in comparing density.	Properties of Matter - Standard 2	How is the relationship between mass and volume used to calculate density?	• Mass and Volume f Water Lab • Mass and Volume of Liquids Other Than Water Lab • Density Ball demonstration • Density Blocks Lab • Explore Learning Density Gizmo (computer activity) • Density Lab
Mass and weight are different measures.	Properties of Matter - Standard 1	How are mass and weight alike and different?	• Scale and balance demonstrations and activities
Matter has identifiable properties.	Properties of Matter - Standard 3, 4	What are the properties of matter?	• Brownian Motion Activity and video clip • Conservation of Mass Activity • Magnet Activity • Estimating Size lab • Chromatography lab

PHYSICAL SCIENCE CURRICULUM GRADE 8

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Elements, Compounds, and Mixtures			
An atom is the smallest unit of an element that still has all of the properties of that element. In science, theories and models change as new evidence is discovered.	Elements, Compounds, and Mixtures - Standard 5, 6	How have we learned about atoms if they are too small to see? Why has the model of an atom changed as technology has progressed?	• Research atomic structure • Identify electrons, protons, and neutrons as the basic structures of atoms • Study the history of atomic structure and the multi-national effort to learn about atoms • Drops lab • Drawing atoms activity
The Periodic Table is a listing of all the known elements and their properties.	Elements, Compounds, and Mixtures - Standard 5, 6, 7, 8	How are elements organized? How do elements become compounds?	• Arranging Elements activity • Grouping Elements lab
Matter can have electrical properties. Electricity is the flow of electrons. Static electricity is the result of stationary electrical charges.	Elements, Compounds, and Mixtures	How is battery electricity different than household electricity? How is static electricity and lightning the same?	• Van de Graaff generator activities (static electrical charges) • Research and discuss differences in DC and AC electricity • Static Charges lab • Museum of Science, Theater of Electricity presentation • Bill Nye videos on static and current electricity
Compounds are form by ionic and covalent bonding. Energy can be released or absorbed in a chemical reaction.	Elements, Compounds, and Mixtures - Standard 5, 8	How are compounds formed?	• Behavior of ions in solution lab • Electrolysis demonstration • Exothermic Reaction Activity • Endothermic Reaction Activity • Chemical reactions and Energy lab • Making a Polymer (slime activity)
The two biggest groups of elements, metals and nonmetals, have different properties.	Elements, Compounds, and Mixtures - Standard 9, 10	What are the properties of metals? What are the properties of nonmetals?	• Metal properties demonstrations • Conductivity of metals demonstration • Ball and ring demonstration
Matter can change with and without altering chemical makeup. Matter is grouped as elements, compounds, and mixtures.	Elements, Compounds, and Mixtures - Standard 8, 10	How are mixtures different than pure substances? Are all mixtures the same?	• Demonstrate the differences between chemical and physical changes (burning and melting) • Identify and demonstrate examples of heterogeneous and homogeneous mixtures

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Forms of Energy Heat is a form of energy	Forms of Energy - Standard 14	What is heat energy? How is heat energy measured?	• Calibrating a Thermometer lab • Heat and Temperature video (Discovery School)
Temperature is the measure of the average kinetic energy. A material's state of matter is related to its kinetic energy.	Forms of Energy - Standard 15	How are heat energy and phases of matter related? What are the four phases of matter? Can the behavior of gases be explained by the relationships between volume, pressure, and temperature?	• Ice to steam activity • Imploding cans activity • Vacuum pump demonstrations (Balloons, shaving cream, carbonated drinks, boiling point of water, Magdeburg cups)
The two states of energy are kinetic and potential. The five forms of energy are mechanical, heat, chemical, electromagnetic, and nuclear.	Forms of Energy - Standard 13, 14, 15	What are the forms and states of energy?	• Kinetic and potential energy slides • Radiometer demonstration • Research, discuss, and demonstrate the five forms of energy.
Heat transfers by conduction, convection, and radiation. Heat transfer, at a global level, impacts climate and weather.	Forms of Energy - Standard 16	How does heat move? What are the processes of heat transfer?	• Radiation lab • Convection tube demonstration (square tube) • Air convection demonstration • Tuning fork demonstration • Ocean currents and climate change research and activities • (Climate Change movie – The Day After tomorrow)
Motion of Objects Speed is a measure of distance over time. The combination of kinetic and potential energy and momentum explain how roller coasters work.	Motion of Objects - Standard 11, 12	How is speed calculated? How do roller coasters transfer energy to complete a whole roller coaster ride?	• Speed lab • Force and Speed lab • Roller Coaster Physics computer activities • Roller Coaster Physics (Discovery Channel DVD)

PHYSICAL SCIENCE CURRICULUM GRADE 8

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Motion of Objects (cont.) Acceleration is the rate of change in velocity. Newton's second law of motion states that an object accelerates because a force acts on it.	Motion of Objects - Standard 11	How is force related to acceleration? How has the understanding of the physics of motion translated into making cars safer?	• Acceleration lab (trolley) • Computer Activity, Discover Channel site (Funderstanding) • Car Crash video
The natural condition of an object is at rest (Newton's Law of Inertia) For every action, there is an equal and opposite reaction (Newton's third law)	Motion of Objects - Standard 11	What is the conservation of momentum? How do Newton's three laws explain the physics of motion?	• Collision balls demonstration • Powerful Forces video (Bill Nye on momentum) • Speed, Momentum, and Acceleration activity (4 tracks device) • Computer activity, Smash-Lab (Discovery Channel site)
Engineering The design and construction process is challenging and requires testing, trials, and refinement to produce the desired results.	Engineering Design Standard 2.1, 2.2, 2.3, 2.4 Materials, Tools, and Machines - Standard 1.1, 1.2	What is involved in the design and construction process? Why is trial and error part of the engineering process?	• Grade 8 Engineering projects (Terms 2 and 4) • Engineering journal
Knowledge of tools and materials are part of the engineering process. Experience with tools and construction materials aid the design and construction process.	Materials, Tools, and Machines - Standard 1.1, 1.2	How do engineers determine appropriate materials and tools to meet an engineering challenge? How are construction techniques evaluated?	• Grade 8 Engineering projects (Terms 2 and 4) • Engineering journal