Christ the Teacher CATHOLIC SCHOOL

K-8th Grade Continuum of Learning

GRADE: Middle School	Content Area: Physical Science
Standard: Matter and Its Interactions	
Key Idea: Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	
Required Skills: a.) I can develop models to describe the atomic composition of simple molecules and extended structures.	
Key Idea: Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.	
Required Skills: a.) I can analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	
Key Idea: Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.	
Required Skills: a.) I can gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	
Key Idea: Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.	
Required Skills: a.) I can develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	
Key Idea: Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. The total number of each type of atom is conserved, and thus the mass does not change.	

Required Skills: a.) I can develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
Key Idea: Some chemical reactions release energy, others store energy. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
Required Skills: a.) I can undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
Standard: MS-PS2 Motion and Stability: Forces and Interactions
Key Idea: For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).
Required Skills: a.) I can apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
Key Idea: The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.
Required Skills: a.) I can plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
Key Idea: Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.
Required Skills: a.) I can ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
Key Idea: Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.
Required Skills: a.) I can construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
Key Idea: Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).
Required Skills: a.) I can conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Standard: Energy
Key Idea: Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.
Required Skills: a.) I can construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
Key Idea: A system of objects may also contain stored (potential) energy, depending on their relative positions. When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object
Required Skills: a.) I can develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
Key Idea: Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. Energy is spontaneously transferred out of hotter regions or objects and into colder ones.
Required Skills: a.) I can apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
Key Idea: The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.
Required Skills: a.) I can plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
Key Idea: When the motion energy of an object changes, there is inevitably some other change in energy at the same time.
Required Skills: a.) I can construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
Standard: Waves and Their Applications in Technologies for Information Transfer
Key Idea: A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.
Required Skills: a.) I can use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

Key Idea: A sound wave needs a medium through which it is transmitted. When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. However, because light can travel through space, it cannot be a matter wave, like sound or water waves.
Required Skills: a.) I can develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
Key Idea: Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.
Required Skills: a.) I can integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.