Oxford Middle School Science Curricula at a Glance
Grade 8
Text: *Savvas Realize: Pearson Elevate Science (Physical)*

Topic	Learning Outcomes Students will:
Unit 1: **Forces, Motion, Energy**	**Know:** ● A force is a push or pull on an object that causes an interaction between two objects. ● An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force. ● Inertia is the resistance to a change in motion. ● Speed = distance/time ● Acceleration results from a change in speed. ● Friction opposes the motion of an object. ● Unbalanced forces cause acceleration. ● An applied force is by a person to an object. ● Gravitational, electrical, and magnetic forces are action “at a distance” forces. ● A Newton, N, is the unit of force. ● The acceleration of an object is dependent upon the net force and mass of an object. ● F = ma where mass is in kilograms and acceleration is in m/s^2. ● The weight of an object is its mass multiplied by the acceleration due to gravity, g, 9.8 N. ● Mass is not weight. ● The net force is the sum of all forces on an object; forces in the opposite direction will have a negative value. ● For every action there is an equal and opposite reaction. ● Electricity can create a magnetic field. ● Gravitational forces are interactive. ● Kinetic energy is related to the motion of an object. **Understand:** ● If an object is not moving, the balanced forces keep it at rest. ● If an object is moving at a constant speed, the forces acting upon it are balanced. ● The first law of motion is only applicable if the forces on an object are balanced. ● How graphs and diagrams can be used to depict speed, acceleration, and forces. ● In the absence of friction an object would continue its motion. ● A more massive object has more inertia, a greater tendency to resist changes in its motion.

	● Gravity pulls an object downward. ● The normal force opposes gravity and pushes an object upward. ● Contact forces result from two objects physically contacting each other; at a distance forces occur between objects that are not touching. ● In every interaction there is a pair of forces acting on interacting objects. The forces are opposite in direction and equal in force. ● The more massive an object the more force it needs to get it moving. ● The strength of an electromagnetism increases as the number of coils increases. ● The strength of an electromagnetic is stronger when the objects are closer together. ● Gravitational forces depend on the masses of the objects; larger objects exert larger gravitational forces. ● Mass and velocity impact the kinetic energy of an object proportionally. ● The higher the object from the surface of the Earth the more gravitational potential energy it possesses. ● The distance between objects impacts the potential energy. ● There are transformations between kinetic and potential energy. **Do:** ● Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* ● 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. ● Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. ● Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. ● 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. ● 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. ● 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. ● Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Unit 4: **Waves and their applications**	**Know** ● A wave is a series of pulses created from a disturbance. ● The amplitude, frequency, wavelength of a wave. ● Matter waves. ● Light wave. ● Light is part of the electromagnetic spectrum. ● Reflection is the bouncing back of waves from a surface. ● Absorption occurs when a substance absorbs the wave. ● Refraction occurs when a wave crosses the boundary into a less dense material and bends. ● Transmittance occurs when the wave goes through a medium. ● Analog and Digital signals. **Understand** ● The wavelength of a wave is inversely proportional to its frequency. ● The amplitude of a sound wave correlates to the volume, the amplitude of a matter wave correlates to the height of the wave, the amplitude of a light wave correlates to the brightness of the light. ● The frequency of sound waves correlates to the pitch of the sound. ● The frequency of a wave is directly proportional to the energy of the wave. ● The energy of a wave is proportional to the square of the amplitude. ● A change in a wave variable produces a change in the energy of the wave. ● Matter waves need a material for movement, light waves do not require a medium for travel. ● The pro's and con's of analog and digital signals. **Do** ● 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. ● Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. ● 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.

Unit 3: **Matter and its interactions**	**Know** ● The three main states of matter are solid, liquid, and gas. ● The phase changes between the states of matter: boiling, condensing, melting, freezing. ● Atoms are composed of protons, neutrons, and electrons. ● Matter can be classified as a pure substance (atom or molecule) or mixture (solution or heterogeneous mixture). ● Physical and chemical properties describe matter. ● Density, mass, volume, odor, solubility, and phase change points are physical properties. ● Flammability is a chemical property. ● Filtration, magnetism, and evaporation are separation techniques. ● Atoms are arranged systematically in the periodic table. ● The periodic table is separated by the staircase into metals and nonmetals with metalloids bordering the staircase. ● Pure substances can form extended structures. ● The law of conservation of mass. ● Synthetic material. ● Natural Resources. ● Atoms can bond ionically or covalently. ● Ionic Bonds. ● Covalent Bonds. ● Valence electrons. **Understand** ● The particle/molecular arrangement of solids vs. liquids vs. gasses. ● The relationship between temperature changes, kinetic energy, and particle arrangement of matter. ● The relationship between potential energy and phases changes. ● How temperature and pressure are related to and impact gasses. ● How the arrangement of protons, neutrons, and electrons are arranged in atoms. ● How to classify matter as an atom, molecule, solution, or mixture. ● How to describe matter by utilizing its physical and chemical properties. ● How to determine if a chemical change occured, and that the physical properties of the products are different than the physical properties of the reactants. ● How to separate mixtures based upon the physical and chemical properties of the individual components of the mixture. ● How to identify matter based upon its physical and chemical properties, and its ability to undergo physical and/or chemical change. ● How to calculate the density of a solid and liquid. ● How to determine, experimentally, the density of a regular shaped solid, irregularly shaped solid, and liquid. ● How and why the atoms of the periodic table are placed into their respective periods and families. ● The differences between the structures of atoms, molecules, and extended structures. ● How to build models for atoms, molecules, and extended structures such as diamond and sodium chloride. ● Why some atoms and molecules stick together and others do not. ● How the law of conservation of mass relates to chemical reactions.

	● How synthetic materials are made from natural resources. ● How the creation of synthetic materials impacts society. ● How to evaluate the credibility of a website. **Do** ● Develop models to describe the atomic composition of simple molecules and extended structures. ● Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. ● Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. ● 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. ● 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.
Unit 2: **Heat energy**	**Know** ● Conduction transfers heat by contact. ● Convection transfers heat by the movement of matter. ● Radiation is the transfer of energy by waves. ● Kinetic energy is the energy of motion of molecules. ● Endothermic reactions absorb heat. ● Exothermic reactions produce heat. **Understand** ● Temperature is a measure of the average kinetic energy of a substance. ● Heat is transferred from hot to cold. ● Heat depends upon the amount of material, type of material and temperature change that the material undergoes. ● Any device has criteria to meet and constraints that can impact their design. ● Energy can be calculated by: mass x specific heat x temperature change. ● Power can be calculated by dividing the energy produced or used by the time in seconds. **Do** ● Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

	● Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* ● 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. ● 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.