MIDDLE SCHOOL (6th – 8th) PHYSICAL SCIENCE

Cardinal Newman Standards: Catholic Identity Integration

- **CS.S.712.GS2:** Explain and promote the unity of faith and reason with confidence that there exists no contradiction between the God of nature and the God of the faith.
  (NGSS.MS.PS1.1; PS1.4; PS1.5; PS2.1; PS2.2; PS2.4; PS2.5; PS3.2; PS3.4; PS3.5; PS4.1)
- **CS.S.712.IS2:** Demonstrate confidence in human reason and in one's ability to know the truth about God's creation and the fundamental intelligibility of the world.
  (NGSS.MS.PS1.1; PS1.2; PS1.3; PS1.6; PS2.1; PS2.3; PS2.4; PS3.1; PS3.3; PS3.5; PS4.1; PS4.3)
- **CS.S.712.IS5:** Explain the processes of conservation, preservation, overconsumption, and stewardship as it relates to creation and to caring for that which God has given to sustain and delight us.
  (NGSS.MS.PS1.4; PS1.5; PS1.6; PS2.2; PS3.3; PS3.4; PS3.5; PS4.1; PS4.2)
- **CS.S.712.IS10:** Articulate the limitations of science (the scientific method and constraints of the physical world) to know and understand God and transcendent reality.
  (NGSS.MS.PS1.1; PS1.2; PS1.5; PS1.6; PS2.1; PS2.2; PS2.3; PS2.4; PS2.5; PS3.1; PS3.2; PS3.4; PS3.5; PS4.3)
- **CS.S.712.DS1:** Display a deep sense of wonder and delight about the natural universe.
  (NGSS.MS.PS1.4; PS1.5; PS2.4; PS2.5; PS3.2; PS3.5; PS4.1; PS4.3)
- **CS.S.712.DS5:** Adhere to the idea of the simultaneous complexity and simplicity of physical reality.
  (NGSS.MS.PS1.1; PS1.3; PS1.5; PS2.2; PS2.3; PS2.5; PS3.1; PS3.2; PS3.4; PS4.1; PS4.2)

Priority Skills	Supporting Skills
• 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. • 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. • Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. • Apply Newton's Laws to predict outcomes and conduct experiments.	• Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. • Understand that macroscopic patterns are related to the nature of microscopic and atomic-level structure. • Recognize that "heat" refers to the energy transferred due to the temperature difference between two objects. • Test solutions and then modify them on the basis of the test results, in order to improve it. • Articulate that substances are made from different types of atoms, which combine with one another in various ways.

Priority Skills	Supporting Skills
• 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. • 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. • 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.	• Utilize graphs and charts to read and present data findings. • Recognize and articulate the properties of waves of all types. • Compare and contrast the characteristics of natural forces (gravitational, electric, magnetic). • Use cause and effect relationships to predict phenomena in natural or designed systems. • Understand energy systems, specifically related to potential and kinetic energy.

Essential Questions

- How do scientific laws give evidence to the existence of God?
- How do atomic and molecular interactions explain the properties of matter that we see and feel?
- How can one describe physical interactions between objects and within systems of objects?
- How can energy be transferred from one object or system to another?
- What are the characteristic properties of waves and how can they be used?
- In what ways can scientific principles, such as the laws of conservation of energy and matter, help us understand and predict real-world processes and systems?
- How do the interactions of energy and matter influence the behavior and motion of objects in our world?

Vital Vocabulary

- Acceleration, Amplitude, Atomic, Buoyancy, Chemical Reaction, Circuit, Conduction, Convection, Density, Electric Force, Energy, Energy Transfer, Force, Frequency, Friction, Gravitational Force, Heat, Inertia, Kinetic Energy, Law of Conservation of Energy, Law of Conservation of Matter, Magnetic Force, Mass, Matter, Mechanical Wave, Molecule, Motion, Phenomena, Potential Energy, Principle, Property, Reflection, Refraction, Resistance, Sound, Temperature, Velocity, Voltage, Weight, Work, Wavelength.

Additional Resources: Cardinal Newman Science Resources, Appendix E