**Physical Science**

**MS-PS1 Matter and Its Interactions**

**MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.**

Further explanation: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, three-dimensional ball and stick structures, or computer representations showing different molecules with different types of atoms.

Developing and using models; Obtaining, evaluating, and communicating information; structure and properties of matter; scale, proportion, and quantity

**MS-PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.**

Further explanation: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride. Examine electrical conductivity differences between fresh water and sea water.

Obtaining, evaluating, and communicating information; Analyzing and interpreting data; structure and properties of matter; chemical reactions; patterns

**MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.**

Further explanation: Emphasis is on natural resources that undergo a chemical process to form synthetic material. Examples of new materials could include new medicines, foods, and alternative fuels (alternative plastics derived from potatoes and jet fuel made from trees). Other possible areas of study might include plastics from organics, advanced composites and wood products under development at UMO.

Obtaining, evaluating, and communicating information; chemical reactions; structure and properties of matter; structure and function

**MS-PS1-4 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.**

Further explanation: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.

Developing and using models; structure and properties of matter; definitions of energy; cause and effect

**MS-PS1-5 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.**

Further explanation: Emphasis is on the law of conservation of matter and on physical models or drawings, including digital forms that represent atoms.

Developing and using models; chemical reactions; energy and matter

**MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.**

Further explanation: Emphasis is on design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride for road treatments in Maine winters.

Constructing explanations and designing solutions; chemical reactions; developing possible solutions; optimizing the design solution; structure and function