

Physical Science

Course Description

Teacher: Robert J. Allen MD, Sr

Physical science begins with a discussion of what science actually is. Then we discuss some of the sub-branches of science such as biology, chemistry, physics and earth science. Following this we learn about the scientific method and how scientists solve problems. We then learn metric units of measurement along with metric prefixes and how to change metric units into English units and vice versa.

A discussion of what matter is, the phases of matter and the kinetic molecular theory are covered next. Also in this unit we discuss the physical properties of matter and the difference between weight and mass. Following this, a discussion of physical changes, chemical changes and energy changes takes place.

In the next unit we discuss what elements are and the use of certain elements. We learn about the elements that compose the Earth's crust, how elements may be grouped into phases, metals, nonmetals and metalloids. Then we discuss chemical symbols, the alchemist's symbols, modern chemical symbols and the rules or writing symbols. This unit ends with a discussion on the modern periodic table of the elements.

In the next unit we begin a discussion about what compounds are, the law of definite proportions and chemical formulas. Following this we get into a discussion about mixtures and separating the components of mixtures as well as the differences between mixtures and compounds.

In our next unit we discuss the structure of matter. We learn about the electrical nature of matter and subatomic particles such as electrons and protons. We discuss static electricity and then begin to study the atomic models of J.J. Thompson, Ernest Rutherford, and Niels Bohr. At this point we are introduced to the atomic particle known as the neutron and the role that it played in developing the modern periodic table of the elements. We learn about isotopes, the concept of atomic number, atomic mass and how electrons are positioned in atoms. Then we learn how to construct atomic diagrams. Following this we learn about the formation of compounds and chemical bonding.

In the next unit we study the chemistry of elements and how elements react with one another. We learn about valence electrons and how they function in the formation of compounds. We discuss atomic radius and chemical reactivity and factors determining chemical reactivity. We learn about polyatomic ions and the reactivity series of metals.

In the next unit we are introduced to the methodology of writing chemical formulas. Then we study the rules for nomenclature of chemical compounds. Also in this unit we study finding formula mass and computing percentage composition by mass.

Next we study chemical changes and the law of conservation of matter. Following this, we begin writing and balancing chemical equations. We study the different types of chemical reactions such as synthesis reactions, decomposition reactions, single replacement and double replacement chemical reactions.

From here we go into metallurgy, studying several types of ores and of course the separation of metals from their ores. We study iron and steel. In learning about the metallurgy of iron we learn about the blast furnace and the types of reactions that go on within the blast furnace. From here we go into corrosion and how metals are protected.

The next unit covers compounds, mixtures, and solutions. We discuss the various types of solutes and solvents. We learn about the factors affecting the rate of dissolving, such as temperature, particle size and the effect of stirring. Following this we learn about concentrated solutions as well as saturated and unsaturated solutions. We learn how to interpret solubility curves and have a discussion on supersaturated solutions. Other principles addressed in this unit include evaporation, distillation, fractional distillation and chromatography.

The next section is on suspensions and emulsions. We compare the properties of suspensions to those of solutions. We also study the techniques used in municipal water purification systems. This chapter also introduces us to emulsions and colloidal suspensions.

The next chapter introduces us to the discipline of organic chemistry. We learn about the properties of organic compounds and why the carbon atom is unique and capable of forming almost countless organic substances. We then go into the classification of organic compounds such as the hydrocarbons. We learn about the alkanes, alkenes, alkynes and ringed hydrocarbon such as benzene. We study some of the families of organic compounds such as alcohols, organic acids, amino acids and esters.

Usually by the time we get to this point the school year is over. In the event that a class absorbs material faster than anticipated, we have a host of other topics that can be investigated before we conclude the academic year.