DREYFOUS & ASSOCIATES

Course Overview

Physical Science

TABLE OF CONTENTS

Unit 0. Scientific Problem Solving

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Scientific Problem Solving

Code: C411G0SU00L00

Unit Documents: Nature of Science and Study Guide and Review.

Lesson 1. Scientific Inquiry

Code: C411G0SU00L01

Essential Questions

- What are some steps used during scientific inquiry?
- What are the results of scientific inquiry?
- What is critical thinking?

Concepts

- critical thinking
- hypothesis
- inference
- observation
- prediction
- science
- scientific law
- scientific theory
- technology

Lesson 2. Measurement and Scientific Tools

Code: C411G0SU00L02

Essential Questions

- Why did scientists create the International System of Units (SI)?
- Why is scientific notation a useful tool for scientists?
- How can tools, such as graduated cylinders and triple-beam balances, assist physical scientists?

Concepts

- description
- explanation
- international system of units (si)
- percent error
- scientific notation

Lesson 3. Case Study: The Minneapolis Bridge Failure

Code: C411G0SU00L03

Essential Questions

- What are evaluation and testing important in the design process?
- How is scientific inquiry used in a real-life scientific investigation?

Concepts

- constant
- control group
- dependent variable
- experimental group
- independent variable
- qualitative data
- quantitative data
- variable

Unit 1. Describing Motion

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Describing Motion

Code: C411G0SU01L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Position and Motion

Code: C411G0SU01L01

Essential Questions

- How does the description of an object's position depend on a reference point?
- How can you describe the position of an object in two dimensions?
- What is the difference between distance and displacement?

Concepts

- displacement
- motion
- position
- reference point

Lesson 2. Speed and Velocity

Code: C411G0SU01L02

Essential Questions

- What is speed?
- How can you use a distance-time graph to calculate average speed?
- What are ways velocity can change?

Concepts

- average speed
- constant speed
- instantaneous speed
- speed
- velocity

Lesson 3. Acceleration

Code: C411G0SU01L03

Essential Questions

- What are three ways an object can accelerate?
- What does a speed-time graph indicate about an object's motion?

Concept

- acceleration

Unit 2. Laws of Motion

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Laws of Motion

Code: C411G0SU02L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Gravity and Friction

Code: C411G0SU02L01

Essential Questions

- What are some contact forces and some noncontact forces?
- What is the law of universal gravitation?
- How does friction affect the motion of two objects sliding past each other?

Concepts

- contact force
- force
- friction
- gravity
- mass
- noncontact force
- weight

Lesson 2. Newton's First Law

Code: C411G0SU02L02

Essential Questions

- What Is Newton's first law of motion?
- How is motion related to balanced and unbalanced forces?
- What effect does inertia have on the motion of an object?

Concepts

- balanced forces
- inertia
- net force
- newton's first law of motion
- unbalanced forces

Lesson 3. Newton's Second Law

Code: C411G0SU02L03

Essential Questions

- What is Newton's second law of motion?
- How does centripetal force affect circular motion?

Concepts

- centripetal force
- circular motion
- newton's second law of motion

Lesson 4. Newton's Third Law

Code: C411G0SU02L04

Essential Questions

- What is Newton's third law of motion?
- Why don't the forces in a force pair cancel each other?
- What is the law of conservation of momentum?

Concepts

- force pair
- law of conservation of momentum
- momentum
- newton's third law of motion

Unit 3. Work and Simple Machines

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Work and Simple Machines

Code: C411G0SU03L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Work and Power

Code: C411G0SU03L01

Essential Questions

- What must happen for work to be done?
- How does doing work on an object change its energy?
- How are work and power related?

Concepts

- Power
- Work

Lesson 2. Using Machines

Code: C411G0SU03L02

Essential Questions

- What are three ways a machine can make doing work easier?
- What is mechanical advantage?
- Why can't the work done by a machine be greater than the work done on the machine?

Concepts

- Efficiency
- Mechanical advantage

Lesson 3. Simple Machines

Code: C411G0SU03L03

Essential Questions

- What is a simple machine?
- How is the ideal mechanical advantage of simple machines calculated?
- How are simple machines and compound machines different?

Concepts

- fulcrum
- inclined plane
- lever

- pulley
- screw
- simple machine
- wedge
- wheel and axle

Unit 4. Forces and Fluids

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Forces and Fluids

Code: C411G0SU04L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Pressure and Density of Fluids

Code: C411G0SU04L01

Essential Questions

- How do force and area affect pressure?
- How does pressure change with depth in the atmosphere and under water?
- What factors affect the density of a fluid?

Concepts

- atmospheric pressure
- fluid
- pressure

Lesson 2. The Buoyant Force

Code: C411G0SU04L02

Essential Questions

- How are pressure and the buoyant force related?
- How does Archimedes' principle describe the buoyant force?
- What makes an object sink or float in a fluid?

Concepts

- Archimedes' principle
- buoyant force

Lesson 3. Other Effects of Fluids Forces

Code: C411G0SU04L03

Essential Questions

- How are forces transferred through a fluid?
- How does Bernoulli's principle describe the relationship between pressure and speed?
- What affects drag forces?

Concepts

- Bernoulli's principle
- Pascal's principle

Unit 5. Energy and Energy Resources

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Energy and Energy Resources

Code: C411G0SU05L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Forms of Energy

Code: C411G0SU05L01

Essential Questions

- What is energy?
- What are potential and kinetic energy?
- How is energy related to work?
- What are different forms of energy?

Concepts

- electric energy
- energy
- kinetic energy
- mechanical energy
- nuclear energy
- potential energy
- radiant energy
- sound energy
- thermal energy
- work

Lesson 2. Energy Transformations

Code: C411G0SU05L02

Essential Questions

- What is the law of conservation of energy?
- How does friction affect energy transformations?
- How are different types of energy used?

Concepts

- friction
- Law of conservation of energy

Lesson 3. Energy Resources

Code: C411G0SU05L03

Essential Questions

- What are nonrenewable energy resources?
- What are renewable energy resources?
- Why is it important to conserve energy?

Concepts

- fossil fuel
- inexhaustible energy resource
- nonrenewable energy resource
- renewable energy resource

Unit 6. Thermal Energy

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Thermal Energy

Code: C411G0SU06L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Thermal Energy, Temperature, and Heat

Code: C411G0SU06L01

Essential Questions

- How are temperature and kinetic energy related?
- How do heat and thermal energy differ?

Concepts

- heat
- temperature
- thermal energy

Lesson 2. Thermal Energy Transfers

Code: C411G0SU06L02

Essential Questions

- What is the effect of having a small specific heat?
- What happens to a material when it is heated?
- In what ways can thermal energy be transferred?

Concepts

- conduction
- convection
- convection current
- radiation
- specific heat
- thermal conductor
- thermal contraction
- thermal expansion
- thermal insulator

Lesson 3. Using Thermal Energy

Code: C411G0SU06L03

Essential Questions

- How does a thermostat work?

- How does a refrigerator keep food cold?
- What are the energy transformations in a car engine?

Concepts

- Heat engine
- Heating appliance
- Refrigerator
- Thermostat

Unit 7. Foundations of Chemistry

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Foundations of Chemistry

Code: C411G0SU07L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Classifying Matter

Code: C411G0SU07L01

Essential Questions

- What is a substance?
- How do atoms of different elements differ?
- How can you classify matter?

Concepts

- atom
- compound
- dissolve
- element
- heterogeneous mixture
- homogeneous mixture
- matter
- mixture
- substance

Lesson 2. Physical Properties

Code: C411G0SU07L02

Essential Questions

- What are some physical properties of matter?
- How are physical properties used to separate mixtures?

Concepts

- density
- mass
- physical property
- solubility

Lesson 3. Physical Changes

Code: C411G0SU07L03

Essential Questions

- How can a change in energy affect the state of matter?
- What happens when something dissolves?
- What is meant by conservation of mass?

Concept

- physical change

Lesson 4. Chemical Properties and Changes

Code: C411G0SU07L04

Essential Questions

- What is a chemical property?
- What are some signs of chemical change?
- Why are chemical equations useful?
- What are some factors that affect the rate of chemical reactions?

Concepts

- chemical change
- chemical property
- concentration

Unit 8. States of Matter

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. States of Matter

Code: C411G0SU08L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Solids, Liquids, and Gases

Code: C411G0SU08L01

Essential Questions

- How do particles move in solids, liquids, and gases?
- How are the forces between particles different in solids, liquids, and gases?

Concepts

- gas
- liquid
- solid
- surface tension
- vapor
- viscosity

Lesson 2. Changes ins State

Code: C411G0SU08L02

Essential Questions

- How is temperature related to particle motion?
- How are temperature and thermal energy different?
- What happens to thermal energy when matter changes from one state to another?

Concepts

- condensation
- deposition
- evaporation
- kinetic energy
- sublimation
- temperature
- thermal energy
- vaporization

Lesson 3. The Behavior of Gases

Code: C411G0SU08L03

Essential Questions

- How does the kinetic molecular theory describe the behavior of a gas?
- How are temperature, pressure, and volume related in Boyle's law?
- How is Boyle's law different from Charles's law?

Concepts

- Boyle's law
- Charles's law
- Kinetic molecular theory
- pressure

Unit 9. Understanding the Atom

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Understanding the Atom

Code: C411G0SU09L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Discovering Parts of an Atom

Code: C411G0SU09L01

Essential Questions

- What is an atom?
- How would you describe the size of an atom?
- How has the atomic model changed over time?

Concepts

- atom
- electron
- electron cloud
- neutron
- nucleus
- proton

Lesson 2. Protons, Neutrons, and Electrons – How Atoms Differ

Code: C411G0SU09L02

Essential Questions

- What happens during nuclear decay?
- How does a neutral atom change when its number of protons, electrons, or neutrons changes?

Concepts

- atomic number
- average atomic mass
- ion
- isotope
- mass number
- nuclear decay
- radioactive

Unit 10. The Periodic Table

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. The Periodic Table

Code: C411G0SU10L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Using the Periodic Table

Code: C411G0SU10L01

Essential Questions

- How are elements arranged on the periodic table?
- What can you learn about elements from the periodic table?

Concepts

- group
- period
- periodic table

Lesson 2. Metals

Code: C411G0SU10L02

Essential Questions

- What elements are metals?
- What are the properties of metals?

Concepts

- alkali metal
- alkaline earth metal
- ductility
- luster
- malleability
- metal
- transition element

Lesson 3. Nonmetals and Metalloids

Code: C411G0SU10L03

Essential Questions

- Where are nonmetals and metalloids on the periodic table?
- What are the properties of nonmetals and metalloids?

Concepts

- halogen

- metalloid
- noble gas
- nonmetal
- semiconductor

Unit 11. Elements and Chemical Bonds

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Elements and Chemical Bonds

Code: C411G0SU11L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Electrons and Energy Levels

Code: C411G0SU11L01

Essential Questions

- How is an electron's energy related to its distance from the nucleus?
- Why do atoms gain, lose, or share electrons?

Concepts

- chemical bond
- electron dot diagram
- valence electron

Lesson 2. Compounds, Chemical Formulas, and Covalent Bonds

Code: C411G0SU11L02

Essential Questions

- How do elements differ from the compounds they form?
- What are some common properties of a covalent compound?
- Why is water a polar compound?

Concepts

- chemical formula
- covalent bond
- molecule
- polar molecule

Lesson 3. Ionic and Metallic Bonds

Code: C411G0SU11L03

Essential Questions

- What is an ionic compound?

- How do metallic bonds differ from covalent and ionic bonds?

Concepts

- ion
- ionic bond
- metallic bond

Unit 12. Chemical Reactions and Equations

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Chemical Reactions and Equations

Code: C411G0SU12L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Understanding Chemical Reactions

Code: C411G0SU12L01

Essential Questions

- What are some signs that a chemical reaction might have occurred?
- What happens to atoms during a chemical reaction?
- What happens to the total mass in a chemical reaction?

Concepts

- chemical equation
- chemical reaction
- coefficient
- Law of conservation of mass
- product
- reactant

Lesson 2. Types of Chemical Reactions

Code: C411G0SU12L02

Essential Questions

- How can you recognize the type of chemical reaction by the number or type of reactants and products?
- What are the different types of chemical reactions?

Concepts

- combustion
- decomposition
- double replacement
- single replacement
- synthesis

Lesson 3. Energy Changes and Chemical Reactions

Code: C411G0SU12L03

Essential Questions

- Why do chemical reactions always involve a change in energy?

- What is the difference between an endothermic reaction and an exothermic reaction?

Concepts

- activation energy
- catalyst
- endothermic
- enzyme
- exothermic
- inhibitor

Unit 13. Mixtures, Solubility, and Acid/Base Solutions

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Mixtures, Solubility, and Acid/Base Solutions

Code: C411G0SU13L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Substances and Mixtures

Code: C411G0SU13L01

Essential Questions

- How do substance and mixtures differ?
- How do solutions compare and contrast with heterogeneous mixtures?
- In what three ways do compounds differ from mixtures?

Concepts

- heterogeneous mixture
- homogeneous mixture
- mixture
- solution
- substance

Lesson 2. Properties of Solutions

Code: C411G0SU13L02

Essential Questions

- Why do some substances dissolve in water and others do not?
- How do concentration and solubility differ?
- How can the solubility of a solute be changed?

Concepts

- concentration
- polar molecule
- saturated solution
- solute
- solvent
- solubility
- unsaturated solution

Lesson 3. Acid and Base Solutions

Code: C411G0SU13L03

Essential Questions

- What happens when acids and bases dissolve in water?
- How does the concentration of hydronium ions affect pH?
- What methods can be used to measure pH?

Concepts

- acid
- base
- hydronium ion
- indicator
- pH

Unit 14. Carbon Chemistry

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Carbon Chemistry

Code: C411G0SU14L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Elemental Carbon and Simple Organic Compounds

Code: C411G0SU14L01

Essential Questions

- How is carbon unique compared to other elements?
- How does carbon bond with other carbon atoms?

Concepts

- hydrocarbon
- isomer
- organic compound
- saturated hydrocarbon
- unsaturated hydrocarbon

Lesson 2. Other Organic Compounds

Code: C411G0SU14L02

Essential Questions

- What are the four common functional groups of organic compounds?
- What are polymers?

Concepts

- amino group
- carboxyl group
- functional group
- halide group
- hydroxyl group
- monomer
- polymer
- polymerization
- substituted hydrocarbon

Lesson 3. Compounds of Life

Code: C411G0SU14L03

Essential Questions

- What are biological molecules?
- What are some groups of carbon compounds found in living organisms?

Concepts

- amino acid
- biological molecule
- carbohydrate
- lipid
- nucleic acid
- protein

Unit 15. Waves

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Waves

Code: C411G0SU15L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. What are Waves?

Code: C411G0SU15L01

Essential Questions

- What is a wave?
- How do different types of waves make particles of matter move?
- Can waves travel through empty space?

Concepts

- compression
- crest
- electromagnetic wave
- longitudinal wave
- mechanical wave
- medium
- rarefaction
- transverse wave
- trough
- wave

Lesson 2. Wave Properties

Code: C411G0SU15L02

Essential Questions

- What are properties of waves?
- How are the frequency and the wavelength of a wave related?
- What affects wave speed?

Concepts

- amplitude
- frequency
- wavelength

Lesson 3. Wave Interactions

Code: C411G0SU15L03

Essential Questions

- How do waves interact with matter?
- What are reflection, refraction, and diffraction?
- What is interference?

Concepts

- absorption
- diffraction
- interference
- law of reflection
- refraction
- reflection
- transmission

Unit 16. Sound

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Sound

Code: C411G0SU16L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Producing and Detecting Sound

Code: C411G0SU16L01

Essential Questions

- How is sound produced?
- How does sound move from one place to another?
- Why does sound travel at different speeds through various materials?
- What are the functions of the different parts of the human ear?

Concepts

- compression
- longitudinal wave
- medium
- rarefaction
- sound wave
- vibration

Lesson 2. Properties of Sound Waves

Code: C411G0SU16L02

Essential Questions

- How are amplitude and intensity related to energy?
- What is the relationship among frequency, pitch, and wavelength?
- How can you recognize sounds from different sources?
- In what ways are musical sounds produced?

Concepts

- amplitude
- doppler effect
- frequency
- intensity
- interference
- pitch
- resonance
- wavelength

Lesson 3. Using Sound Waves

Code: C411G0SU16L03

Essential Questions

- In what ways does sound interact with matter?
- How can people control sound?
- What are some ways to use ultrasound?

Concepts

- absorption
- acoustics
- echo
- echolocation
- reflection
- reverberation
- sonar

Unit 17. Electromagnetic Waves

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Electromagnetic Waves

Code: C411G0SU17L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Electromagnetic Radiation

Code: C411G0SU17L01

Essential Questions

- How do electromagnetic waves form?
- What are some properties of electromagnetic waves?

Concepts

- electromagnetic wave
- radiant energy

Lesson 2. The Electromagnetic Spectrum

Code: C411G0SU17L02

Essential Questions

- What is the electromagnetic spectrum?
- How do electromagnetic waves differ?

Concepts

- electromagnetic spectrum
- Gamma ray
- infrared wave
- microwave
- radio wave
- ultraviolet wave
- X-ray

Lesson 3. Using Electromagnetic Waves

Code: C411G0SU17L03

Essential Questions

- How are different types of electromagnetic waves used for communication?
- What are some everyday applications of electromagnetic waves?
- What are some medical uses of electromagnetic waves?

Concepts

- amplitude modulation

- broadcasting
- carrier wave
- frequency modulation
- global positioning system

Unit 18. Light

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Light

Code: C411G0SU18L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Light, Matter, and Color

Code: C411G0SU18L01

Essential Questions

- What are some sources of light, and how does light travel?
- What can happen to light that strikes matter?
- Why do objects appear to have different colors?

Concepts

- absorption
- light
- opaque
- reflection
- translucent
- transmission
- transparent

Lesson 2. Reflection and Mirrors

Code: C411G0SU18L02

Essential Questions

- How does light reflect from smooth surfaces and rough surfaces?
- What happens to light when it strikes a concave mirror?
- Which types of mirrors can produce a virtual image?

Concepts

- concave mirror
- convex mirror
- diffuse reflection
- focal length
- focal point
- law of reflection
- regular reflection

Lesson 3. Refraction and Lenses

Code: C411G0SU18L03

Essential Questions

- What happens to light as it moves from one transparent substance to another?
- How do convex lenses and concave lenses affect light?
- How do eyes detect light and color?

Concepts

- concave lens
- cone
- convex lens
- lens
- refraction
- rod

Lesson 4. Optical Technology

Code: C411G0SU18L04

Essential Questions

- What do devices such as telescopes, microscopes, and cameras have in common?
- What is laser light, and how is it used?
- How do optical fibers work, and how are they used?

Concepts

- hologram
- laser
- microscope
- optical device
- reflecting telescope
- refracting telescope

Unit 19. Electricity

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Electricity

Code: C411G0SU19L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Electric Charge and Electric Forces

Code: C411G0SU19L01

Essential Questions

- How do electrically charged objects interact?
- How can objects become electrically charged?
- What is an electric discharge?

Concepts

- electric conductor
- electric discharge
- electric insulator
- grounding
- polarized
- static charge

Lesson 2. Electric Current

Code: C411G0SU19L02

Essential Questions

- What is the relationship between electric charge and electric current?
- What are voltage, current, and resistance?
- How do they affect each other?

Concepts

- electric circuit
- electric current
- electric resistance
- Ohm's law
- voltage

Lesson 3. Electric Circuits

Code: C411G0SU19L03

Essential Questions

- What are the basic parts of an electric circuits?

- How do the types of electric circuits differ?

Concepts

- parallel circuit
- series circuit

Unit 20. Magnetism

At the end of this unit the student will have answered the essential questions found in the following lessons.

Lesson 0. Magnetism

Code: C411G0SU20L00

Unit Documents: Lab, Nature of Science, Standardized Test Practice and Study Guide and Review

Lesson 1. Magnets and Magnetic Fields

Code: C411G0SU20L01

Essential Questions

- What types of forces do magnets apply to other magnets?
- Why are some materials magnetic?
- Why are some magnets temporary while others are permanent?

Concepts

- ferromagnetic element
- magnet
- magnetic domain
- magnetic force
- magnetic material
- magnetic pole
- permanent magnet
- temporary magnet

Lesson 2. Making Magnets Using Electric Current

Code: C411G0SU20L02

Essential Questions

- Why does a magnet apply a force on an electric current?
- How do electromagnets and permanent magnets differ?
- How do electric motors use magnets?

Concepts

- electric motor
- electromagnet

Lesson 3. Making Electric Current with Magnets

Code: C411G0SU20L03

Essential Questions

- How can a wire and a magnet produce an electric current?
- How do electric generators create an electric current?

- How are transformers used to bring an electric current into your home?

Concepts

- alternating current
- direct current
- electric generator
- transformer
- turbine