Middle School Science

§112.24. Science, Grade 8.

(b) Knowledge and skills.

(8) Science concepts. The student knows that matter is composed of atoms. The student is expected to:

(A) describe the structure and parts of an atom; and

(B) identify the properties of an atom including mass and electrical charge.

SLIDE 3-7: Explain to students that matter is made of very small particles called atoms and atoms are made of neutrons, protons, and electrons. (http://education.jlab.org/atomtour/)

(9) Science concepts. The student knows that substances have chemical and physical properties. The student is expected to:

(A) demonstrate that substances may react chemically to form new substances;

(B) interpret information on the periodic table to understand that physical properties are used to group elements;

(C) recognize the importance of formulas and equations to express what happens in a chemical reaction; and

(D) identify that physical and chemical properties influence the development and application of everyday materials such as cooking surfaces, insulation, adhesives, and plastics.

SLIDE 3: Explain to students how atoms make up matter and that by differing the way atoms are arranged, they can form different substances such as coal, diamonds, computer chips, etc. (http://www.chemistry.mcmaster.ca/faculty/bader/aim/), (http://science.howstuffworks.com/atom1.htm), (http://www.chem4kids.com/files/atom_bonds.html), (http://www.allatoms.com/)

High School Science

§112.42. Integrated Physics and Chemistry.

(c) Knowledge and skills.

(7) Science concepts. The student knows relationships exist between properties of matter and its components. The student is expected to:

(A) investigate and identify properties of fluids including density, viscosity, and buoyancy;

(B) research and describe the historical development of the atomic theory;

(C) identify constituents of various materials or objects such as metal salts, light sources, fireworks displays, and stars using spectral-analysis techniques;

(D) relate the chemical behavior of an element including bonding, to its placement on the periodic table; and

(E) classify samples of matter from everyday life as being elements, compounds, or mixtures.

SLIDE 3: Explain to students how atoms make up matter and that by differing the way atoms are arranged, they can form different substances such as coal, diamonds, computer chips, etc. (http://www.chemistry.mcmaster.ca/faculty/bader/aim/), (http://science.howstuffworks.com/atom1.htm), (http://www.chem4kids.com/files/atom_bonds.html), (http://www.allatoms.com/), (http://education.jlab.org/atomtour/). Have students do research projects such as papers or posters about bonding, atomic theory, etc. (http://atoms.hypermart.net/), (http://zebu.uoregon.edu/~js/ast123/lectures/lec04.html), (http://www.gsu.edu/~mstjrh/atomictheory.html), (http://www.aip.org/history/curie/periodic.htm)

§112.45. Chemistry.

(c) Knowledge and skills.

(6) Science concepts. The student knows that atomic structure is determined by nuclear composition, allowable electron cloud, and subatomic particles. The student is expected to:

(A) describe the existence and properties of subatomic particles;

(B) analyze stable and unstable isotopes of an element to determine the relationship between the isotope's stability and its application; and

(C) summarize the historical development of the periodic table to understand the concept of periodicity.

SLIDE 3-7: Explain to students that matter is made of very small particles called atoms and atoms are made of neutrons, protons, and electrons. (http://education.jlab.org/atomtour/). Explain to students how atoms make up matter and that by differing the way atoms are arranged, they can form different substances

such as coal, diamonds, computer chips, etc. (http://www.chemistry.mcmaster.ca/faculty/bader/aim/), (http://science.howstuffworks.com/atom1.htm), (http://www.chem4kids.com/files/atom_bonds.html), (http://www.allatoms.com/), (http://education.jlab.org/atomtour/). Have students do research projects such as papers or posters about bonding, atomic theory, periodic table etc. (http://atoms.hypermart.net/), (http://zebu.uoregon.edu/~js/ast123/lectures/lec04.html), (http://www.gsu.edu/~mstjrh/atomictheory.html), (http://www.aip.org/history/curie/periodic.htm)

(8) Science concepts. The student knows how atoms form bonds to acquire a stable arrangement of electrons. The student is expected to:

(A) identify characteristics of atoms involved in chemical bonding;

(B) investigate and compare the physical and chemical properties of ionic and covalent compounds;

(C) compare the arrangement of atoms in molecules, ionic crystals, polymers, and metallic substances; and

(D) describe the influence of intermolecular forces on the physical and chemical properties of covalent compounds.

SLIDE 3-7: Explain to students that matter is made of very small particles called atoms and atoms are made of neutrons, protons, and electrons. (http://education.jlab.org/atomtour/). Explain to students how atoms make up matter and that by differing the way atoms are arranged through different types of bonds (ionic, covalent, metallic, hydrogen), they can form different substances such as coal, diamonds, computer chips, etc. (http://www.chemistry.mcmaster.ca/faculty/bader/aim/), (http://science.howstuffworks.com/atom1.htm), (http://www.chem4kids.com/files/atom_bonds.html), (http://www.allatoms.com/), (http://education.jlab.org/atomtour/). Have students do research projects such as papers or posters about bonding, atomic theory, periodic table etc. (http://atoms.hypermart.net/), (http://zebu.uoregon.edu/~js/ast123/lectures/lec04.html), (http://www.gsu.edu/~mstjrh/atomictheory.html), (http://www.aip.org/history/curie/periodic.htm), (http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/bond.html),

(11) Science concepts. The student knows that balanced chemical equations are used to interpret and describe the interactions of matter. The student is expected to:

(A) identify common elements and compounds using scientific nomenclature;

(B) demonstrate the use of symbols, formulas, and equations in describing interactions of matter such as chemical and nuclear reactions; and

(C) explain and balance chemical and nuclear equations using number of atoms, masses, and charge.

SLIDE 3: Explain to students how atoms make up matter and that by differing the way atoms are arranged through different types of bonds (ionic, covalent, metallic, hydrogen), they can form different substances

such as coal, diamonds, computer chips, etc. (pg 5 of http://www.chemistry.ohio-state.edu/~chan/chem121_autumn02/printouts/chan_Lecture_16_doc.pdf), (http://www.chem.wisc.edu/~newtrad/CurrRef/BDGTopic/BDGtext/BDGDmnd.html), (http://chemistry.beloit.edu/Chip/)

§112.47. Physics.

(c) Knowledge and skills.

(8) Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:

(A) examine and describe a variety of waves propagated in various types of media and describe wave characteristics such as velocity, frequency, amplitude, and behaviors such as reflection, refraction, and interference;

(B) identify the characteristics and behaviors of sound and electromagnetic waves; and

(C) interpret the role of wave characteristics and behaviors found in medicinal and industrial applications.

SLIDE 8: Students should understand the relationship between wavelength and color in the visible light spectrum. (http://hyperphysics.phy-astr.gsu.edu/hbase/vision/specol.html) (http://eosweb.larc.nasa.gov/EDDOCS/Wavelengths_for_Colors.html) (http://home.att.net/~B-P.TRUSCIO/SPECTRUM.htm)

(9) Science concepts. The student knows simple examples of quantum physics. The student is expected to:

(A) describe the photoelectric effect; and

(B) explain the line spectra from different gas-discharge tubes.

SLIDE 10: Explain the photoelectric effect to students and its importance to today's society (http://fcis1.wie.warwick.ac.uk/~richard_beare/wss_pages/PHYS2STU/phot.htm)

§112.43. Biology.

(c) Knowledge and skills.

(4) Science concepts. The student knows that cells are the basic structures of all living things and have specialized parts that perform specific functions, and that

viruses are different from cells and have different properties and functions. The student is expected to:

(A) identify the parts of prokaryotic and eukaryotic cells;

(B) investigate and identify cellular processes including homeostasis, permeability, energy production, transportation of molecules, disposal of wastes, function of cellular parts, and synthesis of new molecules;

(C) compare the structures and functions of viruses to cells and describe the role of viruses in causing diseases and conditions such as acquired immune deficiency syndrome, common colds, smallpox, influenza, and warts; and

(D) identify and describe the role of bacteria in maintaining health such as in digestion and in causing diseases such as in streptococcus infections and diphtheria.

SLIDE 28: Students should recognize the differences between prokaryotic and eukaryotic cells (http://www.biology.arizona.edu/cell_bio/tutorials/pev/main.html), (http://dekalb.dc.peachnet.edu/~pgore/students/w96/joshbond/toc.htm) , learn the structure of viruses and how they cause diseases such as HIV (http://micro.magnet.fsu.edu/cells/virus.html), (http://www.avert.org/virus.htm)

(6) Science concepts. The student knows the structures and functions of nucleic acids in the mechanisms of genetics. The student is expected to:

(A) describe components of deoxyribonucleic acid (DNA), and illustrate how information for specifying the traits of an organism is carried in the DNA;

(B) explain replication, transcription, and translation using models of DNA and ribonucleic acid (RNA);

(C) identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes;

(D) compare genetic variations observed in plants and animals;

(E) compare the processes of mitosis and meiosis and their significance to sexual and asexual reproduction; and

(F) identify and analyze karyotypes.

SLIDE 28: Explain where DNA and RNA are kept in eukaryotic cells, how they replicate, how mutations can cause some disorders like Down's Syndrome.
(http://www.rothamsted.bbsrc.ac.uk/notebook/courses/guide/trans.htm)

(9) Science concepts. The student knows metabolic processes and energy transfers that occur in living organisms. The student is expected to:

(A) compare the structures and functions of different types of biomolecules such as carbohydrates, lipids, proteins, and nucleic acids;

(B) compare the energy flow in photosynthesis to the energy flow in cellular respiration;

(C) investigate and identify the effects of enzymes on food molecules; and

(D) analyze the flow of matter and energy through different trophic levels and between organisms and the physical environment.

SLIDE 28: Explain the role of biomolecules in our lives
(http://www.umass.edu/microbio/rasmol/rasclass.htm), (http://www.chemistry-info.net/)

Middle School Technology Education

§123.2. Technology Education.

(c) Knowledge and skills.

(4) The student describes emerging and innovative manufacturing, construction, communication, energy, power, transportation, and bio-related technologies. The student is expected to:

(A) prepare reports on emerging and innovative technologies; and

(B) create a display that presents information on emerging and innovative technologies.

Have students do research on the evolution of technology and where they think technology will lead us over the next 50-100 years.

(10) The student describes the importance of codes, laws, standards, or regulations related to manufacturing, construction, communication, energy, power, transportation, and bio-related technology, such as Occupational Safety and Health Administration (OSHA), National Electrical Code (NEC), American Society for Testing Materials (ASTM), standard symbols, and line weights. The student is expected to:

(A) describe the importance of codes, laws, standards, or regulations;

(B) identify areas where codes, laws, standards, or regulations may be required; and

(C) follow the appropriate codes, laws, standards, or regulations.

Have students do research on the evolution of technology and where they think technology will lead us over the next 50-100 years. Have them include what new codes if any will be required and how today's laws/standards will apply in the future.

(11) The student describes the intended and unintended effects of technological solutions. The student is expected to:

(A) use an assessment strategy to determine the risks and benefits of technological activities;

(B) describe how technology has affected individuals, societies, cultures, economies, and environments;

(C) describe change and the factors that affect the adoption or rejection of technology; and

(D) describe how and why technology evolves.

Have students do research on the evolution of technology and how society has changed due to it.

(12) The student identifies the factors that influence the evolution of manufacturing, construction, communication, energy, power, transportation, and bio-related technology. The student is expected to:

(A) describe how changes in technology affect business and industry;

(B) describe how the development and use of technology is influenced by past events; and

(C) discuss the international effects of technology.

Have students do research on the evolution of technology and how society has changed due to it.

(17) The student selects and reports on career opportunities and requirements in manufacturing, construction, communication, energy, power, transportation, or bio-related technology. The student is expected to:

(A) identify an area of interest and investigate its entry level and advancement requirements; and

(B) describe the careers available in technology.

Have students do research on various careers available in technology such as computer engineering, nanotechnology, biotechnology, etc. Perhaps have students fill out an application for a teacher's TechSys company and hold interviews for new positions.

High School Technology

§123.32. Technology Systems (One Credit).

(c) Knowledge and skills.

(4) The student describes emerging and innovative manufacturing, construction, communication, energy, power, transportation, and bio-related technologies. The student is expected to:

(A) report on emerging and innovative technologies in at least two of the following content areas: manufacturing, construction, communication, energy, power, transportation, or bio-related technologies; and

(B) conduct research and experimentation in manufacturing, construction, communication, energy, power, transportation, and bio-related technology.

Have students do research on the evolution of technology and where they think technology will lead us over the next 50-100 years.

(10) The student applies the appropriate codes, laws, standards, or regulations related to manufacturing, construction, communication, energy, power, transportation, and bio-related technology, such as Occupational Safety and Health Administration (OSHA), National Electrical Code (NEC), American Society for Testing Materials (ASTM), standard symbols, and line weights. The student is expected to:

(A) describe the importance of codes, laws, standards, or regulations;

(B) identify areas where codes, laws, standards, or regulations may be required; and

(C) follow the appropriate codes, laws, standards, or regulations.

Have students do research on the evolution of technology and where they think technology will lead us over the next 50-100 years. Have them include what new codes if any will be required and how today's laws/standards will apply in the future.

(11) The student describes the intended and unintended effects of technological solutions. The student is expected to:

(A) use an assessment strategy to determine the risks and benefits of technological solutions;

(B) describe how technology has affected individuals, societies, cultures, economies, and environments; and

(C) discuss the international effects of technology.

Have students do research on the evolution of technology and how society has changed due to it.

(12) The student identifies the factors that influence the evolution of manufacturing, construction, communication, energy, power, transportation, and bio-related technology. The student is expected to:

(A) describe how changes in technology affect business and industry;

(B) describe how the development and use of technology is influenced by past events;

(C) describe change and the factors that affect the adoption or rejection of technology; and

(D) describe how and why technology evolves.

Have students do research on the evolution of technology and how society has changed due to it.

(17) The student selects and reports on career opportunities, requirements, and expectations in manufacturing, construction, communication, energy, power, transportation, and bio-related technology. The student is expected to:

(A) identify an area of interest in manufacturing, construction, communication, energy, power, transportation, and bio-related technology, and investigate its entry-level and advancement requirements and its growth potential; and

(B) describe the careers available in technology and engineering.

Have students do research on various careers available in technology such as computer engineering, nanotechnology, biotechnology, etc. Perhaps have students fill out an application for a teacher's TechSys company and hold interviews for new positions.

§123.46. Bio-related Technology Systems (One-Half to One Credit).

(c) Knowledge and skills.

(4) The student investigates emerging and innovative bio-related technologies. The student is expected to:

(A) report on emerging and innovative bio-related technologies; and

(B) conduct research and experimentation in bio-related technology.

Have students do research on the evolution of biotechnology and where they think the technology will lead us over the next 50-100 years. http://www.nature.com/biotech/ , http://www.ncbi.nlm.nih.gov/

(11) The student describes the intended and unintended effects of technological solutions. The student is expected to:

(A) use an assessment strategy to determine the risks and benefits of developments in bio-related technology;

(B) describe how technology has affected individuals, societies, cultures, economies, and environments; and

(C) discuss the international effects of bio-related technology.

Have students do research on the evolution of technology and how society has changed due to it. http://www.nature.com/biotech/ , http://www.ncbi.nlm.nih.gov/

(12) The student identifies the factors that influence the evolution of bio-related technology. The student is expected to:

(A) describe how changes in bio-related technology affect business and industry;

(B) describe how the development and use of bio-related technology are influenced by past events;

(C) describe change and the factors that affect the adoption or rejection of bio-related technology; and

(D) describe how and why technology evolves.

Have students do research on the evolution of technology and how society has changed due to it. http://www.nature.com/biotech/ , http://www.ncbi.nlm.nih.gov/

(17) The student investigates career opportunities, requirements, and expectations in bio-related technology. The student is expected to:

(A) identify an area of interest in bio-related technology and investigate its entry-level and advancement requirements and its growth potential; and

(B) describe the careers available in bio-related technology.

Have students do research on various careers available in biotechnology. Perhaps have students fill out an application for a teacher's Biotech company and hold interviews for new positions. http://www.nature.com/biotech/ , http://www.ncbi.nlm.nih.gov/

§123.47. Computer Applications (One Credit).

(c) Knowledge and skills.

(4) The student investigates emerging and innovative computer technologies. The student is expected to:

(A) report on emerging and innovative computer technologies; and

(B) conduct research and experimentation in computer technology.

Have students do research on the evolution of computer technology and where they think the technology will lead us over the next 50-100 years.

(11) The student describes the intended and unintended effects of technological solutions. The student is expected to:

(A) use an assessment strategy to determine the risks and benefits of technological developments in computer technology;

(B) describe how technology has affected individuals, societies, cultures, economies, and environments;

(C) discuss the international effects of the use of computer technology; and

(D) describe how and why technology evolves.

Have students do research on the evolution of technology and how society has changed due to it.

(12) The student describes how and why computer technology evolves. The student is expected to:

(A) describe how changes in computer technology affect business and industry;

(B) describe how the development and use of computer technology are influenced by past events;

(C) describe change and the factors that affect the adoption or rejection of computer technology; and

(D) describe the factors that encourage the evolution of technology.

Have students do research on the evolution of technology and how society has changed due to it.

(17) The student investigates career opportunities, requirements, and expectations in computer technology. The student is expected to:

(A) identify an area of interest in computer technology and investigate its entry-level and advancement requirements and its growth potential; and

(B) describe a variety of careers available in computer technology.

Have students do research on various careers available in computer technology. Perhaps have students fill out an application for a teacher's Comtech company and hold interviews for new positions.