Science
Grades 7 – 12

The following pages list each science class taught in grades 7 –12 in West Des Moines Schools. Each course is described in terms of:

Course Title
Course Description
Course Prerequisites
Essential Learnings
Topics/Skills/Concepts

Science – 7

Course Description:

Science 7 includes an investigation of the earth, life, physical, and environmental science. Skills include collecting and organizing data, controlling variables, and testing predictions. This is curse 1 of a three-year sequence. A unit on health is also included.

Essential Learnings:

1. Students will practice and apply the Scientific Method
   - Observing
   - Predicting
   - Inferring
   - Summarizing
   - Concluding

2. Students will learn to use measurement tools accurately.

3. Students will learn about human issues—healthy environmental, current, local, or global events—and technology in society.

Topics/Skills/Concepts (Science – 7):

1. Measurement
   - Metrics
   - Mass, volume, length
   - Density
   - Tools

2. Scientific Method
   - Formulating
   - Questions
   - 6-steps
     a) State problem
     b) Research—gather prior knowledge and information
     c) Hypothesis, prediction
     d) Experiment—procedures, control variables
     e) Analyze data
     f) Conclusion
   - Hypothesizing
   - Predicting
   - Inferring
   - Controlling variables
   - Interpreting data
   - Research

3. Living Things
   - Kingdoms
     a) Plant
     b) Animal
     c) Archaeabacteria
     d) Eubacteria
     e) Protist
     f) Fungi
   - Classification
   - Characteristics
   - Compare/contrast
   - Dichotomous key
   - Systems
   - Cells
   - Photosynthesis
   - Repiration

4. Chemistry
   - Physical/chemical changes & properties
   - Safety
   - Elements, compounds, mixtures (homogeneous and heterogeneous)
   - Atoms, molecules
   - States of matter

5. Motion
   - Newton's Laws of Motion (first 2 laws)
   - Friction
   - Egg drop
   - Gravity
   - Speed
   - Velocity
   - Acceleration
   - Kinetic and potential energy

6. Health
   - Smoking
   - Alcohol
   - Decision-making
   - Controlled substances
   - Over-the-Counter and Prescription Drugs

7. Ecology
   - Water cycle
   - Food webs, food chains, food pyramids
   - Biodiversity
   - Oxygen/carbon dioxide cycle
   - Habitats

Science – 8

Course Description:
Science 8 includes an investigation of the earth, environmental, physical, biological, and health sciences. Skills include collecting and organizing data, controlling variables, testing predictions, and applying science concepts to the world around us. This is the second course in a three year sequence.

Essential Learning's:
1. Students will practice and apply the Scientific Methods (Problem Solving, Basic Lab Techniques, Lab Safety).
2. Students will learn the properties of matter and energy.
3. Students will learn basic concepts about living organisms.

Topics/Skills Concepts
1. Plate Tectonics –
   Earthquakes
   Volcanoes
   Continental Drift
2. Geology –
   Rock Cycle
   Characteristics of rocks and minerals
3. Energy –
   Forms of Energy (light, heat, etc.)
   Kinds of Energy (potential, kinetic)
   Law of Conservation of Matter and Energy
4. Forces and Motion –
   Newton's Laws of Motion
5. Chemistry –
   Atoms and Molecules
   Chemical Reactions
   Chemical Classifications (elements, compounds, mixtures…)
   Periodic Table
6. Human Growth –
   Development
   Reproduction
   Health
7. Human Systems –
   Skeletal
   Muscular
   Nervous
   Endocrine
8. Measurement –
   Metrics
   Mass, Volume, Length, Temperature
   Density
   Instruments
9. Scientific Method –
   Safety
   Questioning
   Application of: Problem Solving, Hypothesizing, Predicting, Observing, Inferring, Controlling Variables, Interpreting Data, Research

General Science - 9

Course Description:

General Science is a two-semester course. All students are required to pass both semesters. It is an integrated program of earth, life, physical, and environmental science. The emphasis will be on critical thinking and applications to today's society and environment.

Essential Learnings:

1. Students will learn the scientific inquiry processes.

2. Students will learn to recognize inter-relationships with the human body.

3. Students will learn to critically analyze, sift, collect, and question to make rational and productive choices.

4. Students will learn that science is a never-ending story—always in flux.

5. Students will learn that life is more complex than the obvious.

Topics/Skills/Concepts (General Science – 9):

<u>First Quarter</u>:
Chapter 1: Identifying with the Scientific Process

Chapter 20: Understanding the water cycle and its impact on local and global weather

Chapter 9: Heat and energy transfer

Second Quarter:

Chapter 10: Electromagnetic and surface

- Light
- Problem-solving

Chapter 14: Knowing and relating the functions of circulation and respiration to the human body

Chapter 16: Identifying cause and effect of pathogens leading to disease

Chapter 17: Identifying male/female reproductive systems

- DNA, bases
- Menstrual period
- Pregnancy and birth

Third Quarter:

Chapter 11: Understanding electrical and magnetic properties

- Using voltmeters and ammeters to measure electrical circuits
- Virtual reality labs
- Ohm's Law
- Magnetic fields

Chapter 2: Chemical/physical changes, states of matter

Chapter 3: Energy Levels, Atomic Theory, Electron Configuration, Periodic Table

Chapter 4: Compounds and molecules, bonding, formulas

Fourth Quarter:

Chapter 4: Reaction types, equilibrium

Chapter 6: Rission/fusion

Chapter 18: Stars and galaxy

Chapter 19: Earth dynamics

Biology

Course Description:

This two-semester course exposes the student to the variety of living organisms found on the planet. Life functions are studied on the chemical, cellular, organism, and community levels. Genetics, diseases, nutrition, and biotechnology are studied with an emphasis directed toward human concerns. Laboratory participation is a vital component of this course and is expected of all students.

Essential Learnings:

1. Students will be able to understand that organisms change over time
   - DNA
   - Specialization/Adaptations

2. Students will understand that all organisms are inter-related and ultimately depend upon each other.
   - Ecosystems
   - Microbes
   - Personal choices
   - Populations/Biomes

3. Students will understand how the structure of cells, tissues, organisms, and systems determine function of organisms.
   - Plants
   - Vertebrate animals
   - Invertebrate animals
   - Personal choices

9-12 Standards and Benchmarks addressed in this course:

Standard #2: Students will understand major concepts in life science and how these apply to society.
- 12.2.d understand that populations of organisms change over time.
- 12.2.e identify factors affecting transmission of disease.
- 12.2.f understand that DNA is the common thread of living organisms.

Standard #4: Students will use scientific inquiry process (e.g. questioning, observing, predicting, experimenting, controlling variables, concluding) to understand the natural world.
- 12.4.k construct or develop a graph from experimental data.
- 12.4.l determine relationship between variables by interpreting graphs/charts/tables
- 12.4.m be able to make and interpret accurate and precise measurements.

Standard #5: Students will recognize the inter-relationships among the earth, life, and physical sciences and their effect on the environment.
- 12.5.n explain the effect of population growth on the earth's resources.
- 12.5.o understand the cyclical nature of the earth's resources.

Multicultural/Gender Fair Strategies:

The following strategies are incorporated into lessons of this course:

I. Affirm cultural diversity as a positive force in U.S. History
   - A. Heritage
   - B. Contributions

II. Understand the universal needs of all peoples and hold respect for the uniqueness of each
   - A. Cultural/ethnic comparison
   - B. Bias
   - C. Stereotyping
   - C. Stereotyping
   - D. Prejudice
   - Discrimination

III. Develop positive interpersonal and intergroup relations
   - A. Communication skills
   - B. Problem-solving
   - C. Cooperation
   - D. Problem-solving

Topics/Skills/Concepts (Biology – Cont'd.)

First Semester

Unit 1 Nature of Life

1. Science of Biology
   - What is science?
   - How scientists work
   - Studying life
   - Tools and procedures

2. Chemistry of Life
   - Nature of matter
   - Properties of water
   - Carbon compounds
   - Chemical reactions and enzymes

Unit 2 Cells

1. Cell Structure and Function
   - Life is cellular
   - Cell structures
   - Movement through the membrane
     - Diversity of cellular life

2. Photosynthesis
   - Energy and life
   - Overview of photosynthesis
   - Reactions of photosynthesis

3. Cellular Respiration
   - Chemical pathways
   - Krebs cycle and electron transport

4. Cell Growth and Division
   - Cell growth
   - Cell division
   - Regulating the cell cycle

Unit 3 Genetics

1. Introduction to Genetics
   - The work of Mendel
   - Probability and punnett squares
   - Mendelian genetics
   - Meiosis
   - Linkage and gene maps

2. DNA and RNA
   - DNA
   - Chromosomes and DNA replication
   - RNA and protein synthesis
   - Mutations
   - Gene regulation

3. Genetic Engineering
   - Changing the living world
   - Manipulating DNA
   - Cell transformation
   - Applications

4. The Human Genome
   - Human heredity
   - Human chromosomes
   - Human molecular genetics

Unit 4 Evolution

1. Darwin's Theory
   - Puzzle of life's diversity
   - Ideas that shaped Darwin's thinking
   - Darwin's case

2. Evolution of Populations
   - Gene and variation
   - Evolution as genetic change
   - The process of speciation

3. History of Life
   - Fossil record
   - Earth's early history
   - Evolution of multi-cellular life
   - Patterns of evolution

Unit 5 Human Biology

Nervous System
- Divisions of nervous system

Unit 7 Plants

1. Plant Diversity
   - Introduction to plants

- The senses
- Drugs and the nervous system

1. Digestive and Excretory System
   - Food and nutrition
   - Process of digestion
   - Excretory System

2. Endocrine and Reproductive System
   - Endrocrine system
   - Human endocrine glands
   - Reproductive system
   - Fertilization and development

2nd Semester

Unit 6 Microbes

1. Classification
   - Finding order in diversity
   - Modern evolutionary classification
   - Kingdoms and domains

2. Bacteria and Viruses
   - Prokaryotes
   - Bacteria in nature
   - Viruses

3. Protists
   - Kingdom protisa
   - Protozoans
   - Unicellular algae
   - Multicellular algae
   - Fungus-like protists

4. Fungi
   - Kingdom fungi
   - Classifications of fungi
   - Ecology of fungi

Unit 9 Vertebrates

1. Non-vertebrate Chordates, Fishes, and Amphibians
   - Chordates
   - Fish
   - Bryophytes
   - Seedless vascular plants
   - Gymnosperms
   - Angiosperms

2. Roots, Stems, and Leaves
   - Specialized tissues in plants
   - Roots
   - Stems
   - Leaves
   - Transport in plants

3. Reproduction of seed plants
   - Cones and flowers
   - Seed development and germination
   - Agriculture

Unit 8 Invertebrates

1. Sponges and Cnidarians
   - Introduction to animal kingdom
   - Sponges
   - Cnidarians

2. Worms and Mollusks
   - Flatworms
   - Roundworms
   - Annelids
   - Mollusks

3. Arthropods and Echinoderms
   - Introduction to arthropods
   - Groups of arthropods
   - Insects
   - Echinoderms

4. Comparing Invertebrates
   - Invertebrate evolution
   - Form and function of invertebrates

5. Populations
   - How populations grow
   - Limits to growth
   - Human population growth

• Amphibians 2. Reptiles and Birds • Reptiles • Birds 3. Mammals • Introduction to mammals • Diversity of mammals • Primates 4. Comparing Chordates • Chordate evolution • Controlling body temperature • Form and function of chordates **Unit 10 Ecology** 1. The Biosphere • What is ecology? • Energy flow • Cycles of matter 2. Ecosystems and Communities • Role of climate • What shapes an ecosystems • Land biomes • Water biomes	

AP Biology

(Elective 11-12)

Prerequisite: Biology and chemistry or permission of AP instructor

Course Description:

Prior to selecting this course you should discuss your qualifications with both your Biology and Chemistry teachers or the course instructor. It is recommended you have earned an A or A- in both Biology and Chemistry.

This course is equivalent to a college course for Biology majors. Students who enroll should be academically prepared to do college work and should understand that a college lab course requires additional time. A college text is used and laboratory activities are typical of those done in college. The student will be expected to read in current magazines and journals as well as to extensive essay writing and independent work.

Topics to be studied include biochemistry, cell biology, genetics, animals and plants, ecology, evolution, embryology, biotechnology, human systems, and a vertebrate dissection. Students who successfully complete AP Biology will be well prepared to take the National Advanced Placement Biology Examination in May. Successful achievement on this exam may earn a student from 4 to 8 hours of college credit.

Essential Learnings:

1. Students will learn about the concept of structure and function.
   a) Students will understand how the structure of cells is related to the function they perform; i.e. the body form of fish is streamlined for swimming in water.
   b) Students will understand how the structure of plants is related to their function; i.e., leaf arrangement is for collecting the most light for photosynthesis.

2. Students will learn about the concept of homeostasis and interdependency.
   a) Students will learn how complex organisms perform a myriad of complex chemical reactions to maintain the living condition; i.e., enzymes cause chemical reactions to occur.
   b) Students will learn how plants produce their own food and transform solar energy into cellular energy by way of photosynthesis.
   a) Students will learn how metabolism in animals transform food obtained from plants to obtain vital nutrients and energy.

AP Biology – Essential Learnings – Cont'd.

3. Students will learn about genetic control and continuity and understand that:
   a) DNA is the master molecule that is the basis for all life activities.
   b) DNA is an unusual genetic code found in all living organisms.

Topics, Skills, and Concepts:

Unit I – Biochemistry:

Chapter 1 – Themes in Biology
- The ten themes in the study of life
- The Scientific Method

Chapter 2 – Basic Chemistry
- Elements and compounds
- Bonding and molecular interactions

Chapter 3 – Water
- Special properties of water
- The pH scale and its relationship to life

Lab: Acid rain

Chapter 4 – Carbon Chemistry
- Special bonding properties of carbon
- Functional groups

Chapter 5 – Macromolecules
- Types of carbohydrates and their function
- Types of lipids and their function
- Types of proteins and their function
- Tubes of nucleic acids and their function

Labs: Sugar chromatography
Identification of organic molecules

Unit II – Cells:

Chapter 7 – Cell Structure
- Techniques for cell study
- Major organelles of plant and animal cells
- A comparison of prokaryotic and eukaryotic cells
- Cell size relationships

Topics/Skills/Concepts (AP Biology) – Cont'd.

Unit II – Cells – cont'd.:
Labs: Cell studies with the microscope
Cell size

Chapter 8 – Membrane Function
- Membrane function
- Composition of the membrane
- Transport mechanisms across cell membranes

- Special mechanisms for bulk transport

Labs: Cell membrane activity
Movement of molecules through cell membranes

Unit III – Metabolism:

Chapter 6 – Introduction to Metabolism
- Laws of thermodynamics
- Energy relationships in chemical reactions
- Action of enzymes

Lab: Characteristics of enzymes

Chapter 9 – Cell Respiration
- Energy carrier molecules in cells
- The workings of anaerobic respiration
- The workings of aerobic cellular respiration

Lab: Cell respiration-using peas

Chapter 10 – Photosynthesis
- The light reactions and chlorophyll reaction centers
- The Calvin cycle and carbon fixation
- Alternate pathways for carbon fixation

Lab: Chromatography of plant pigments
Light reactions of photosynthesis

Unit IV – Cell reproduction and Genetics:

Chapter 12 – Cell Cycle/Mitosis
- Components of the cell cycle
- Phases of mitosis
- Comparing normal cell division to cancer

Topics/Skills/Concepts (AP Biology) – Cont'd.

Unit IV – Cell reproduction and Genetics – cont'd.:
Lab: Mitosis in plant and animal cells

Chapter 13 – Meiosis
- Events in meiosis
- Comparing meiosis in males and females
- Importance of meiosis to sexual reproduction

Chapter 14 – Mendelian Genetics
- Terminology important to understanding genetics
- The Law of Segregation
- The Law of Independent Assortment
- Family pedigrees

- Human genetic disorders
- Tools for genetic testing

Labs: Genetic Crosses
Chi square analysis of genetic crosses
Genetic differences in peas

Chapter 15 – Chromosomal Inheritance
- Gene linkage
- Sex chromosomes and inherited traits
- Genetic defects related to abnormal chromosomes

Unit V – Microbiology:

Chapter 18 – Viruses and Bacteria
- Viruses and diseases
- The biology of bacteria

Labs: Microbiology techniques: collecting, transferring, and identifying bacteria-making yogurt

Unit VI – Molecular biology:

Chapter 16 - DNA
- Classic experiments leading to the discovery of DNA as the hereditary material
- The Watson-Crick DNA model
- DNA replication
- Telomeres

Topics/Skills/Concepts (AP Biology) – Cont'd.

Unit VI – Molecular biology – Chapter 16 DNA – cont'd. :
Lab: Isolating DNA

Chapter 17 – Protein Synthesis
- Transpiration and transtation

Chapter 20 – DNA Technology
- Restriction enzymes
- Cell transformation
- Electrophoresis
- Cloning
- Human Genome project

Labs: Transforming bacteria
Gel electrophoresis

Unit VII – Simple Euraryotic Organisms:

Chapter 31 – Fungi

- Characteristics of fungi
- Diversity of fungi
- Importance of fungi

Labs: Isolating and growing fungi
Yeast growth

Chapter 28 – Protists
- Characteristics of protists
- Diversity of protists
- Importance of protists

Labs: Observing protists

Unit VIII – Evolution:

Chapter 22 – Theories
- Historical development of theories of evolution
- Lamarck's theory
- Darwin's theory
- Impact of Darwin's theory

Topics/Skills/Concepts (AP Biology) – Cont'd.

Unit VIII – Evolution – cont'd.:
Chapter 23 – Population Genetics
- Population gene pools
- Hardy-Weinberg equilibrium
- Changes in the genetics of populations

Lab: Hardy-Weinberg simulation

Chapter 24 – Speciation
- What is a species?
- Modes of speciation

Chapter 25 – Taxonomy
- Classification systems
- The fossil record
- Phylogenetic trees

Unit IX – Animals:

Chapters 32-34, 41-49
- Phyla of animals
- Phylum characteristics
- Development of organ systems

Labs: Dissection of a variety inverts

Dissection of a vertebrate animal

Unit X – Plants:

Chapters 29-30, 35-39

- Phyla of plants
- Plant structure
- Transport in plants
- Plant reproduction
- Plant hormones and response

Labs: Plant survey
Plant growth study
Transpiration lab
Plant hormone lab

Topics/Skills/Concepts (AP Biology) – Cont'd.

Unit XI – Ecology:

Chapters 50-55

- Distribution of living organisms; Biomes
- Interactions and structure of ecosystems
- Human impact on ecosystems and the biosphere
- Conservation biology

Labs: Population growth study
Computer simulation of population growth
Mark and recapture lab

Human Anatomy and Physiology

(Elective 11-12)

Prerequisite: Biology

Course Description:

This is a two-semester course designed for the student interested in an in-depth study of the human body. The structure and function of all body systems are covered through text reading, class discussion, computer simulations, teacher explanations, guest speakers, and laboratory experiences that will include dissection of a mammal and mammalian organs. It is expected that all students participate fully in all activities including dissection. Introduction to the course will include the chemical basis of life, the cell and its metabolism, as well as a tissue unit. The body systems taught will be: integumentary, skeletal, muscular, nervous, urinary, reproductive, digestive, circulatory, lymphatic, endocrine, and respiratory.

Essential Learnings:

1. Students will learn and understand the concept of homeostasis–how the interdependence of human organ systems maintains the balance in the human body.

2. Students will learn about the concept of structure and function.
   a) The student will understand how the structure of cells, tissues, organs, and organ systems determine function, cells, tissues, organs, and organ systems determine function.
   b) The student will understand the relationship between organic compounds and the biochemistry of the human body.

3. Students will learn and understand the effects of personal choice on health, disease, and aging.

Topics/Skills/Concepts:

CHAPTER 1 SAFETY AND BODY ORGANIZATION

- Define anatomy and physiology and explain how they are related.
- Describe each level of organization of the body with reference to an example.
- Use the terms that describe the relative positions of body parts and the plane, sections, and regions of the body.

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- List the cavities of the body and state their location.
- Name the organs located in each of the body cavities.
- List the organ systems of the body and state the major organs associated with each.
- Describe in general the functions of each organ system.
- Describe homeostasis and explain in general how homeostasis is maintained.
- Define disease and explain the difference between a local and systemic disease.

LABORATORIES:
Lab 2—Metric Measurement and Microscopy

CHAPTER 2 CHEMISTRY OF LIFE

- Explain why chemistry is pertinent to a study of the body.
- Name and describe the subatomic particles of an atom and indicate which one accounts for the occurrence of isotopes.
- Distinguish between ionic and covalent reactions and between ionic and covalent bonds.
- List and discuss the functions of ions in the body.
- Describe the structure of water and give examples of how it functions in the body.
- Relate the term electrolyte to the presence of ions in body fluids and tissues.
- Define the terms acid and base. Describe the pH scale, and explain the significance of buffers.
- Compare and contrast the structures and functions of carbohydrates, lipids, proteins, and nucleic acid.
- Explain what enzymes are and describe their role in the body.
- Describe how the structure and function of DNA and RNA differ.
- Describe the structure of ATP and explain how ATP functions in the body.

LABORATORIES:
Lab 3—Chemical Composition of Cells

CHAPTER 3 CELL STRUCTURE AND FUNCTION

- Describe the structure and function of the plasma membrane.
- Describe the structure and function of the nucleus.
- Describe the role of DNA in protein synthesis.

- Describe the roles of ribosomes and the three types of RNA in protein synthesis.
-

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- Describe the structures and roles of the endoplasmic reticulum and the Golgi apparatus in packaging and secretion.
- Describe the structures of lysosomes and the role of these organelles in the breakdown of molecules.
- Describe the structure of mitochondria and their role in producing ATP.
- Describe the structure of centrioles, cilia, and flagella and their roles in cellular movement.
- Describe how substances move across the plasma membrane and distinguish between passive and active transport.
- Give an overview of mitotic cell division and explain the mechanism by which the chromosome number stays constant.
- Contrast mitosis with meiosis in general terms.

LABORATORIES:
Lab 4—Cell Structure and Function

CHAPTER 4 BODY TISSUES AND MEMBRANES

- Describe the general characteristics and functions of epithelial tissues.
- Name the major types of epithelial tissues and relate each one to a particular organ.
- Describe the general characteristics and functions of connective tissues.
- Name the major types of connective tissues and relate each one to a particular organ.
- Describe the general characteristics and functions of muscular tissues.
- Name the major types of muscular tissues and relate each one to a particular organ.
- Describe the general characteristics and functions of nervous tissue.
- Name the different types of membranes and relate each one to a particular location in the body.
- State the names and locations of the serous membranes found in the ventral cavity.

LABORATORIES:
Lab 6—Human Body Tissues

CHAPTER 5 THE INTEGUMENTARY SYSTEM

- Describe the regions of the skin and the subcutaneous layer.
- Name two main epidermal layers and describe their structure and function.
- Describe the structure and growth of hair and nails.

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- Name three glands of the skin and describe their structure and function.

- List and discuss four functions of the skin.
- Name the three types of skin cancer and state their cause.
- Name and describe four types of burns with regard to depth.
- Describe how the “rule of nine’ may be used to estimate the extent of a burn.
- Describe the steps by which a skin wound heals.

LABORATORIES:
Adam—The Integumentary System
How Your Body Works—Skin, Hair, and Nails

CHAPTER 6 THE SKELETON SYSTEM

- Name at least five functions of the skeleton.
- Explain a classification of bones based on their shape.
- Describe the anatomy of a long bone.
- Describe the growth and development of bones.
- Name and describe eight types of fractures and state the four steps in fracture repair.
- Give examples of the surface features of bones.
- Distinguish between the axial and appendicular skeletons.
- Name the bones of the skull and be able to label a diagram of the skull. State the important features of each bone.
- Describe the structure and function of the hyoid bone.
- Name the bones of the vertebral column and be able to label a diagram of the vertebral column.
- Describe a typical vertebra, the atlas and axis, and the scrum and coccyx.
- Name the bones of the thoracic cage and be able to label a diagram of the thoracic cage.
- Name the three types of ribs and the three parts of the sternum.
- Name the bones of the pectoral girdle and be able to label diagrams that include surface features.
- Name the bones of the upper limb (arm) and be able to label diagrams that include surface features.
- Name the bones of the pelvic girdle and be able to label diagrams of them.
- Distinguish between the false and true pelvises.
- Cite at least five differences between the female and male pelvises.
- Name the bones of the lower limb (leg) and be able to label diagrams that include surface features.
- Explain how joints are classified and give examples of each type of joint.
- List the types of movements that occur at synovial joints.

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont’d.

LABORATORIES:
Lab—Musculoskeletal System
Adam—The Skeletal System
How Your Body Works—Locomotion

CHAPTER 7 THE MUSCULAR SYSTEM

- Describe the three types of muscles and indicate whether each type is voluntary/involuntary, striated/nonstriated.
- Name and discuss four functions of muscles.
- Describe the anatomy of a whole muscle and a muscle fiber.
- Describe the manner in which a muscle fiber contracts.
- Describe a muscle twitch, summation, and tetanus.
- Describe how ATP is made available for muscle contraction.
- Discuss how muscles work together to achieve movement.
- Explain muscle tone and the effects of contraction on the size of a muscle.
- Name the superficial muscles of the head, neck, and trunk; shoulder and upper limb (arm); and thigh and lower limb (leg). Indicate their origins and insertions.

LABORATORIES:
Lab 13—Musculoskeletal System
Adam—The Muscular System
How Your Body Works—Locomotion

CHAPTER 8 THE NERVOUS SYSTEM

- State and explain the divisions of the nervous system.
- Describe the three functions of the nervous system.
- Describe the structure and function of the three types of neurons.
- Describe the structure and function of four types of neuralgia cells.
- Explain how a nerve impulse is conducted along a nerve and across a synapse.
- Describe the structure of a nerve and the difference between the three different types of nerves.
- Describe the structure of a reflex arc and the function or a reflex.
- Associate the location of the ventricles with the parts of the brain.
- Describe the major parts of the brain and state functions for each part.
- Describe the structure of the cerebral cortex and the major functions of its lobes.
- Describe in detail the structure of the spinal cord and state its functions.
- Describe the three layers of meninges and state the function of each.
- Describe how cerebrospinal fluid is formed and circulates.

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- Name the twelve pairs of cranial nerves and give a function for each.
- Describe the structure and function of spinal nerves.
- Define and describe the autonomic nervous system.
- Distinguish between the sympathetic and parasympathetic divisions in four ways and give examples of their respective effects on specific organs.

LABORATORIES:
Lab 14—Nervous System
How Your Body Works—Thought and Action

CHAPTER 9 THE SENSORY SYSTEM

- Categorize receptors according to the system used in the text.
- Name the four senses of the skin and state the location of their receptors.
- Discuss the functions of visceral receptors.
- Discuss the function of proprioceptors.
- Name the chemoreceptors and state their location, anatomy, and mechanism of action.
- Describe the anatomy of the eye and the function of each part.
- Describe the anatomy and function of the accessory organs of the eye.
- Describe the receptors for sight, their mechanism of action, and the mechanism for stereoscopic vision.
- Describe common disorders of sight discussed in the text.
- Describe the anatomy of the ear and the function of each part.
- Describe the receptors for balance and hearing and their mechanism of action.

LABORATORIES:
Lab 14—Senses
Adam—The Nervous System and Senses
How Your Body Works—Seeing, Smelling and Tasting, Hearing and Balance

CHAPTER 10 THE ENDOCRINE SYSTEM

- Define a hormone and explain the mechanism of hormone action.
- Name the major endocrine glands and identify their locations.
- Discuss control of glandular secretion by negative feedback.
- Explain the anatomical and functional relationships between the hypothalamus and the pituitary gland, including both the anterior and posterior pituitary.
- Name the two hormones produced by the hypothalamus that is secreted by the posterior pituitary and give a function for each hormone.

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- Discuss the physiological action of growth hormones and tell how this affect stature.
- Name six hormones produced by the anterior pituitary and indicate which of these control other endocrine glands.
- Draw and explain the negative feedback mechanism.
- Discuss the anatomy of the thyroid gland and the chemistry and physiological function of thyroxin, hypothyroidism, and hyperthyroidism.
- State the location of the parathyroid glands and discuss the function of parathyroid hormone and calcitonin.
- State the location of the adrenal glands and describe the relationship between the adrenal medulla and its relationship to the nervous system.
- Name three categories of hormones produced by the adrenal cortex, give an example of each category, and discuss their physiological action.
- State the location of the adrenal glands and describe the relationship between the adrenal medulla and the adrenal cortex.

- Discuss the function of the adrenal medulla and its relationship to the nervous system.
- State the location of the pancreas and describe its microscopic anatomy.
- Name two hormones produced by the pancreas and discuss their function.
- Discuss two types of diabetes mellitus and contrast hypoglycemia with hyperglycemia.
- State the location of the testes; name the most important male sex hormone and discuss its functions.
- State the location of the ovaries; name the female sex hormones and discuss their functions.
- State the location and function of the pineal gland.
- State the location and function of the thymus gland.
- Discuss atrial natriuretic hormone, growth factors, and prostaglandin as hormones not produced by glands.

LABORATORIES:
Adam—The Endocrine System
How Your Body Works—Hormones

CHAPTER 11 BLOOD

- Describe the composition of blood.
- Describe the structure and function of red blood cells, white blood cells, and platelets.
- Explain the hematopoietic role of stem cells in the red bone marrow.
- Describe, in general, the composition of the plasma.
- Describe the functions of blood.

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- Discuss the transport function of blood and describe the capillary exchange within the tissues.
- Describe the blood clotting process and how it is associated with thromboembolism.
- Explain the ABO and Rh systems of blood typing.
- Describe how each person's blood type is determined for transfusion purposes.

LABORATORIES:
Lab 9—Cardiovascular System
Adam—The Circulatory System

CHAPTER 12 THE CIRCULATORY SYSTEM

- Describe the anatomy of the heart and trace the path of blood through it.
- Name the heart valves and describe their function.
- Describe the cardiac cycle and the cardiac system.
- Label and explain a normal electrocardiogram.
- Describe how the heartbeat is regulated.
- Describe the conditions that may cause a heart attack.

- Name the three types of blood vessels and describe their structure and function.
- Name the two circuits of the circulatory system and trace the path of blood in general and specifically to any organ in the body.
- Describe the functions of the fetal circulatory structures.
- Define pulse and name the pulse point of the body.
- Describe the factors that control blood pressure and blood flow in the arteries, capillaries, and veins.
- Define hypertension and distinguish between systolic pressure and diastolic pressure.

LABORATORIES:
Lab 9—Cardiovascular System
Lab 10—Features of the Cardiovascular System
Probeware—EKG
Probeware—Heart Rate
How Your Body Works—Circulation

CHAPTER 13 THE LYMPHATIC SYSTEM AND IMMUNITY

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- Describe the structure and functions of the lymphatic system.
- Describe the structure and function of the lymph system.
- Describe the structure and functions of the thymus, spleen, and red bone marrow.

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- Describe the body's nonspecific defense mechanisms.
- Contrast antibody-mediated immunity with cell-mediated immunity.
- Describe how to provide an individual with active and passive immunity.
- Give examples of immunotherapeutic drugs.
- Give examples of how the immunity system overdefends and underdefends the body.

LABORATORIES:
Adam—Lymphatic system
Adam—Immune system
How Your Body Works—Infection Fighters

CHAPTER 14 THE RESPIRATORY SYSTEM

- Describe the organization of the respiratory system and the process of respiration.
- Describe the structures and functions of the respiratory system organs.
- Describe the structure and function of the respiratory membrane.
- Describe the mechanisms by which breathing occurs including explanations of inspiration and expiration.
- Tell where the respiratory center is located and explain how it controls normal breathing rate.
- Describe vital capacity and its relationship to other measurements of breathing capacities.
- Describe the process of gas exchange in the lungs and the tissues.

- Explain how oxygen and carbon dioxide are transported in the blood.
- Name and describe the various infections of the respiratory tract.
- Describe the effects of smoking on the respiratory tract and on overall health.

LABORATORIES:
Lab 10—Features of the Cardiovascular System
Probeware—Breathing Rate
Probeware—Effects on Breathing and Heart Rate
Adam—Respiratory System
How Your Body Works—Respiration

CHAPTER 15 THE DIGESTIVE SYSTEM

- Trace the path of food in the digestive tract and describe the general structure and function of each organ mentioned.
- Describe peristalsis and state its function.
-

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

- Describe the wall of the small intestine and relate its anatomy to nutrient absorption.
- Name the hormones produced by the digestive tract that help control digestive secretions.
- Name the accessory organs of digestion and describe their contributions to the digestive tract.
- Name and state the functions of digestion enzymes for carbohydrates, proteins, and fats.
- State the function of glucose, fats, and amino acids in the body.
- Define the terms "essential fatty acids, essential amino acids, and vitamin".
- Describe the functions of major vitamins and minerals in the body.

LABORATORIES:
Lab 7—Chemical Aspects of Digestion
Lab 8—Energy Requirements and Ideal Weight

Adam—Digestive System
How Your Body Works—Digestion

CHAPTER 16 THE URINARY SYSTEM

- List and discuss the functions of the urinary system.
- Describe the macroscopic and microscopic anatomy of the kidney.
- State the parts of a kidney nephron and relate them to the gross anatomy of the kidney.
- Name and describe the structure and function of each organ in the urinary system.
- Trace the path of urine and describe how urination is controlled.
- State the characteristics of normal urine.
- Describe the three steps in urine formation and relate them to parts of a nephron.

- Describe how the kidneys help maintain the fluid, electrolyte, and acid-base balance of blood.
- Name and explain how three hormones work together to maintain blood volume and pressure.

LABORATORIES:
Lab 12—Homeostasis
Adam—Urinary System

Topics/Skills/Concepts (Human Anatomy and Physiology) – Cont'd.

CHAPTER 17 THE REPRODUCTIVE SYSTEM

- Name and state the functions of the male reproductive structures.
- Describe the macroscopic and microscopic anatomy of the testes.
- State the path of sperm from their site of production to the site of fertilization.
- Name the glands and describe the secretions that contribute to the composition of semen.
- Describe the anatomy of the penis and the events preceding and during ejaculation.
- Discuss hormonal regulation in the male.
- Name at least six actions of testosterone, including mention of both primary and secondary sexual characteristics.
- Name and state the functions of the female reproductive structures.
- Describe the macroscopic and microscopic anatomy of the ovaries.
- Label a diagram of the external female genitals.
- Contrast male orgasm with female orgasm.
- Describe the ovarian and uterine cycle.
- Discuss hormonal regulation in the female, including feedback control.
- Name at least six actions of estrogen and progesterone, including mention of both primary and secondary sexual characteristics.
- List several means of birth control and describe their effectiveness.
- Describe the symptoms of AIDS, genital herpes, genital warts, gonorrhea, chlamydia, and syphilis.

LABORATORIES:
Adam—Reproductive System
The Nine Month Miracle
How Your Body Works—Reproduction

Introduction to Plant Science

Elective 10-11-12

Course Description:
Plant Science is a one-semester course in which students will have the opportunity to grow and care for plants in the laboratory. Much class time will involve observation and investigation of the various life activities of plants. This course is intended for students who do not yet feel ready to take biology or choose not to take college preparatory science courses.

Essential Learnings

1. Students will learn about the history and nature of science.
2. Students will learn about the diversity and properties of plants.
3. Students will learn about plant propagation and care.

Topics/Skills/Concepts

First Quarter:

1. History and Nature of Science
    - Famous Botanists
    - Minorities in Science
    - Female Botanists

2. Landscaping
    - Common garden flowers, grasses, trees
    - Garden layout/design

3. Classification and Identification
    - Angiosperms
    - Dichotomous keys
    - Iowa trees

Second Quarter:

1. Plant Properties
    - Pigments
    - Essences

2. Roots, Stems, Leaves, and Seeds
    - Propagation

3. Reproduction
    - Seed development and germination
    - Greenhouse operation

Mankind in the Environment

Course Description:

This is a one-semester course offered to create within the students an awareness of their influence upon the environment. Fundamental principles of ecology are taught so that impact of resource, population, and pollution problems can be viewed and appreciated in the proper perspective. Classroom activity approach is primarily the problems of the environment. This class is responsible for paper recycling in the school.

Essential Learnings:

1. Students will have an understanding of how humans pollute the land, water, and air.

2. Students will have an understanding of the energy uses humans have to run various machines.

3. Students will have an understanding of the positive and negative impact humans can have on the earth.

Topics/Skills/Concepts (Mankind in the Environment):

Unit 1 –
Environmental Science Introduction
- Problem solving
- Scientific Method
- Decision making

Unit 2 – Water
- Resources
- Pollution
- Uses

Unit 3 – Air and Atmosphere
- Pollution
- Make-up
- Acid Rain
- Ozone Hole
- Greenhouse Effect

Unit 4 – Land and Fuel
- Uses of land
- Erosion
- Feeding of the world
- Agriculture
- Pest control

Unit 5 – Energy
- Fossil fuels
- Alternative energies
- Nuclear energy
- Pollution

Unit 6 – Wastes
- Solid/liquid/gas
- Hazardous
- Storage/disposal
- Recycling

Unit 7 – Population Growth
- Changes in population
- Human population
- Problems related to

Unit 8 – Sustainable Future
- International cooperation
- Policies

Introductory Chemistry

Elective 10-11-12

Course Description:

This is a one-semester course intended for those students who want to learn how chemistry affects their everyday life. Students taking this course will have the opportunity to explore consumer chemistry topics and discuss chemical issues and their impact on our world. Much of class time will involve observation and investigation in the laboratory. This class will not meet science requirements for entrance into college.

Essential Learnings:

1. Students will learn basic chemical concepts, such as atomic structure, properties of matter, chemical reactions, and solutions.

2. Students will relate chemistry concepts to real life and learn practical applications for those concepts.

3. Students will learn good laboratory techniques, including safety practices, equipment setup and usage, solution preparation, etc.

Topics/Skills/Concepts:

First Quarter:

Safety:

A. Safety Scavenger Hunt
   - Safety features in room are labeled with letters. Students search for features and record letters.

B. Safety Lecture
   - Eye wash
   - Safety shower
   - Fume hood
   - Fire exit
   - Contacts
   - Goggles

C. Safety Film – "Accident at Jefferson High"

Topics/Skills/Concepts (Introductory Chemistry) – Cont'd.

D. Safety Demos
   - Goggles demo (foam plate face, goggles, acetone)

- Contacts demo (transparency with eye drawn on and phenolphthalein iris, cover slip style contact dropper with NaOH)

E. Safety Quiz

Matter: (Note: No textbook or packet)

A. Periodic Table
   - Memorize 33 elements, symbols, and names.
B. Metals/Nonmetals/Metalbids
C. Solids/Liquids/Gases
   - Students begin by making their own definitions
   - Then go over "real" definitions
D. Properties of a Chemical Reaction
   - Lab – Patriotic Law of Conservation of Mass
   - Law of Conservation of Mass
   - Five evidences of chemical change
E. Balancing Equations

Water Packet (from Flinn Scientific) (Introduce Video – "The Sacred Balance: the Matrix of Life"

Packet – Part 1: Unique Properties of Water

A. Expands When Freezes/Density
   - Lab - Students devise a way to test how much water expands
B. Heat Capacity
C. Boiling/Freezing Point
   - Lab – boiling/freezing point determination
   - Lab – making ice cream (f.p. depression)
D. Hydrogen Bonds
   - Watch section of Antz with water drops
   - Show pictures of surface tension
   - Molecular attraction lab (water on pennies)
E. Universal Solvent

Water Cycle:

A. On-line Water Cycle Activity (NASA's Observation)
   - Evaporation/transpiration
   - Condensation

Topics/Skills/Concepts (Introductory Chemistry - Water Cycle) – Cont'd.

- Precipitation
- Infiltration
- Run-off

Packet Part 2 – Sea Water:

A. Chemicals in the Ocean (Na, Cl, S, Mg, etc.)
B. Why We Can't Drink Sea Water

C. Desalination
- Distillation - (Lab – solar distiller)
- Electrodialysis

Packet Part 3 – Pollution:
A. Video – “Explore More Water Quality” (IPTV)
B. Natural Purification
- Crystallization
- Sedimentation
- Dilution
- Distillation
- Aeration

[Lab – Purifying water 2 ways (including distillation)]

C. Man-made pollution

Groundwater:
A. Aquifers/aquicludes
B. Wells/groundwater
C. Pollution in ground water

Water Testing – Tap Water Tour
A. Testing for pH, Cu, Fe, Cl, and Hardness
- Tap water
- Pool water
- Well water

<u>Second Quarter:</u>
Soil Packet:
Part l – Nitrogen/Phosphorus/Potassium
A. Nutrients Essential for Plant Growth
- Lab – Topsoil Tour
- Test various soils for nitrogen, phosphorus, potassium, and pH
- Learn what each element is used for by plants

B. Fertilizer grades

Topics/Skills/Concepts (Introductory Chemistry, Second Quarter, Soil Packet) – Cont’d.

C. Composting
- Read about compost micro-organisms
- Oxidation

Part 2 – Checking pH
A. What is pH
B. Why pH matters
- Lab – red cabbage indicator pH scale

Part 3 – Information on purchasing fertilizers

Food Packet:

- Lab – invisible inks – pH using lemon juice, baking soda, etc.

Part 1 – Nutrition Labels

- Reading and interpreting nutrition labels

Part 2 – Carbohydrates

A. Sugars
   - Photosynthesis
   - Mono, di, polysaccharides
B. Baking Soda
   - Lab – comparing baking sodas

Part 3 – Fats

A. What They Are Made From
B. Saturated vs. Unsaturated Fats
   - Lab – comparing fats of cheese puffs
   - Activity – counting fats in foods you eat

Part 4 – Proteins

A. Polymers
B. Amino Acids

To finish the semester/year:

Either – Metal Packet

A. Aluminum
   - Lab – NaOH and Al
B. Iron and Steel
   - Lab – Corrosion of a nail in H_2O_2
C. Copper
   - Lab – affect of heating copper

Topics/Skills/Concepts (Introductory Chemistry, Second Quarter, Soil Packet) – Cont'd.

Or – Polymers and GLUEP – (no packet)

A. Make GLUEP
B. Talk about polymers in the real world

Or – Soap Packet

A. Making soap
B. Cosmetics
C. Shaving Cream
D. Shampoos

Chemistry

Prerequisite: Algebra

Course Description:

This is a two-semester college preparatory course. The students will be prepared to pursue fields where chemical knowledge is used. A student should have an understanding of math so he/she can use equations to solve problems. The topics covered will be classification of matter, reaction principles and descriptive chemistry. The course will consist of laboratory work, textbook problems, classroom activities, and teacher explanations.

Essential Learnings:

1. Students will learn the properties of matter through chemical and physical change.
   a) Students will understand the properties of matter at the molecular level.
   b) Students will understand the changes molecules go through during change.

2. Students will learn various measurement skills, correct use of lab equipment, and correct interpretation and organization of data.

3. Students will learn conceptual thinking and problem solving, using appropriate techniques and skills.

Topics/Skills/Concepts (Chemistry):

<u>First Quarter</u>: **Introduction (3 days)** • Safety	• Naming covalent molecules (mono, di, tri, tetra, etc.) • Polarity

- Chemical vs. physical
- Conservation matter

Chapter 1 & 3 Atomic Structure (6 days)

- History
- Element symbols
- Isotopes
- Protons, neutrons, electrons
- Gram formula mass
- # of atoms present in a molecule

Chapter 3 (12) Electronic Structure (5 days)

- s, p, d, f
- Electron configuration (Shorthand method)
- Electron dot method
- Orbital filling diagrams

Chapter 4 Periodic Table (7 days)

- History
- Electron configuration with table
- Trends
- Atomic radius
- Ionic radius
- Affinity

Chapter 5 & 6 Ionic, Covalent, and Naming Compounds (12 days)

- Dot diagram and ionic bonding
- Naming ionic compounds
- Naming polyatomic compounds
- Steps to covalent bonding
- Electronegativity
- Properties of compounds
- Hydrates
- Intermolecular forces

<u>Second Quarter</u>:

Chapter 2 London Forces, H-Bond, Metric System, and Dimensional Analysis (4 days)

- Basic metric units
- Scientific notation
- Dimensional analysis (conversions)
- 51 units

Chapter 8 Mole (7 days)

- Concept
- Avogadro's #
- Percent composition
- Moles and particles problems
- Moles and mass problems
- Moles and volume problems
- Molecular and empirical formulas

Chapter 9 Balancing Equations (8 days)

- Proficient at balancing
- Identify 5 reaction types
- Predict products

Chapter 10 Stoichiometry (9 days)

- Mass-mass problems
- Volume-volume problems
- Mixed stoichiometry problems
- Limiting reagents
- Percent yield
- Authentic Project

End of First Semester

Topics/Skills/Concepts (Chemistry – Cont'd.)

<u>Third Quarter</u>:

Measurement and Density (6 days)

- Sig Figs
- Solid volume
- Archimedes Principle
- Mass of liquids
- Density
- Lab practical

Solutions (10 days)

- Tyndall effect
- Factors that influence solubility
- Miscibility (polar vs. non-polar)
- Molarity and Molality
- Concentration $M_1V_1 = M_2V_2$
- Colligative properties
- Homogeneous vs.

States of Matter (8 days)

- Kinetic Theory of solids, liquids, gases
- Temperature, Kelvin temperature, and absolute zero
- Define—phase changes (evaporation, condensation, boil, melt, freeze)
- Triple point
- Liquid nitro demos
- Intermolecular forces and how they influence phase changes
- Vapor pressure and boiling point
- Phase diagrams

Thermochemistry (9 days)

- $Q = mc\Delta T$
- ΔH of fusion and vaporization
- Q = -Q and specific heat

Gas Laws (7 days)

- Boyle's Law
- Charles' Law
- Combined Gas Law
- Ideal Gas Law
- Graham's Law of effusion and Dalton's Law of partial pressure
- Gay Lussac's Law

heterogeneous

Equilibrium (5 days)

- Le Chatelier's Principle
- K_{eq}

Acid/Base (8 days)

- Properties of acids and bases
- pH and pOH ($-\log[H^+]$)
- Indicators
- Conjugate pairs
- K_a and K_b
- Titration

Rate of Reaction (5 days)

- 6 factors affecting rate (E_a, catalyst, surface area, temp, pressure, concentration
- Activation Energy
- Rate Law

End of Year – Authentic Project (9 days)

AP Chemistry

(Elective 11-12)

Prerequisite: Chemistry, Algebra II, and Trigonometry or permission of AP Instructor

Course Description:

AP Chemistry is designed to be the equivalent of a first-year college chemistry course. A college text is used and a variety of college-level experiments will be done in the laboratory. Topics such as the structure of matter, kinetic theory of gases, chemical equilibria, chemical kinetics, and thermodynamics will be presented in considerable depth. The course should contribute to the

development of the students' abilities to think clearly and to express their ideas, orally or in writing, with clarity and logic when dealing with chemical problems. This will prepare the students to take the AP Chemistry exam given in the spring, the results of which may qualify the students to earn college credit.

Essential Learnings:

1. Students will understand the properties/changes of matter

2. Students will learn how to make and interpret accurate and precise measurements, collect experimental data from a variety of procedures, analyze unknowns, compare experimental results, and derive conclusions from experimental data

3. Students will develop a variety of problem-solving skills

Topics/Skills/Concepts:

<u>First Semester</u>:

1. Develop a variety of problem-solving skills
   - Review operations with scientific notation
   - Use significant figures properly
   - Review English-metric conversions
   - Solve problems by dimensional analysis

2. Investigate various classifications and properties of matter
   - Distinguish between the various states of matter
   - Differentiate physical and chemical changes

Topics/Skills/Concepts (AP Chemistry- First Semester) – Cont'd.

   - Compare elements, compounds, and mixtures
   - Solve problems involving density
   - Interconvert various temperature scales
   - Solve problems involving heat transfer

3. Examine various aspects of composition stoichiometry
   - Differentiate between atoms, molecules, and ions
   - Explain the meaning of a chemical formula
   - Calculate masses of various formula units
   - Relate the mole unit to other units of matter measurement
   - Solve problems involving percent composition of matter
   - Derive formulas from composition data

4. Derive stoichiometric relationships from balanced equations
   - Identify the information contained in a chemical equation
   - Balance chemical equations
   - Use the mole ratios from balanced equations to solve problems
   - Identify limiting reactants

- Solve problems involving percent yield
- Relate sequential reactions to one another
- Use percent by mass to describe solution concentration
- Use molarity to describe solution concentration
- Use solution concentration in stoichiometry problems

5. Explain basic atomic structure
   - Determine the composition of an atom
   - Distinguish isotopes from one another
   - Relate mass numbers to atomic weights
   - Review basic relationships involving electromagnetic radiation
   - Use electromagnetic radiation to investigate the Bohr model of the atom
   - Use quantum numbers to identify electrons
   - Use the periodic table to determine electron configurations for elements
   - Distinguish between paramagnetism and diamagnetism

6. Relate the position of an element on the periodic table to various properties of that element
   - Explain variations in atomic radii
   - Explain variations in ionic radii
   - Relate ionization energy to ease of losing electrons
   - Relate electron affinity to ease of gaining electrons
   - Use electronegativity to describe the relative electron-attracting ability of the elements

Topics/Skills/Concepts (AP Chemistry – First Semester) – Cont'd.

7. Contrast various types of bonding in chemical compounds
   - Explain formation of ionic compounds
   - Predict formulas for ionic compounds
   - Explain the formation of covalent compounds
   - Predict formulas for covalent compounds
   - Distinguish between polar and non-polar covalent bonds
   - Differentiate polar bonds from polar molecules
   - Draw Lewis dot structures for chemical species
   - Assign oxidation numbers to elements
   - Interconvert names and formulas for compounds

8. Explain molecular structure in terms of covalent bonding theories
   - Generate 3-dimensional models of molecules using VSEPR theory
   - Describe the bonding around a central atom using Valence Bond (hybridization) Theory
   - Compare Lewis dot structures, VSEPR models and valence-bond diagrams
   - Predict polarity of chemical species

9. Analyze chemical reactions based on similar patterns
   - Recognize common acids
   - Recognize common bases
   - Distinguish between electrolytes and non-electrolytes

- Differentiate between oxidation and reduction
- Classify reactions as combination, decomposition, displacement, or metathesis
- Classify reactions as acid-base or redox
- Relate the behavior of reactants in chemical reactions to their positions on the periodic table
- Predict common oxidation numbers for the representative elements
- Predict logical reaction products for various types of chemical reactions

10. Explain behavior of gases
    - Identify several common pressure units
    - Use Boyle's Law
    - Use Charles' Law
    - Use the combined gas law
    - Use Avogadro's Law
    - Use the ideal gas law
    - Determine molecular weights of gases
    - Determine densities of gases
    - Use Dalton's Law of Partial Pressures

Topics/Skills/Concepts (AP Chemistry – First Semester) – Cont'd.

10. Behavior of gases – cont'd.

    - Calculate relative diffusion rates of gases
    - Compare real and ideal gases
    - Relate gas laws to stoichiometry problems

11. Investigate the condensed states of matter
    - Describe the 4 types of interparticle attractions
    - Discuss the relationship between vapor pressure, evaporation rate, attractive forces, and boiling point
    - Describe the melting point of a solid
    - Incorporate changes of state into heat transfer problems
    - Diagram various cubic unit cells
    - Relate unit cell dimensions to atomic or ionic radii
    - Use unit cell data to predict densities of solids
    - Determine various physical properties from a phase diagram

12. Examine the composition and properties of solutions
    - Explain the relationship between energy and entropy in the dissolving process
    - Describe what happens when various kinds of solutes dissolve in liquid solvents
    - Explain the effect of temperature on solubility
    - Explain the effect of temperature on solubility
    - Explain how pressure affects solubility of gases in liquids
    - Use molality to express solution concentration
    - Use mole fraction to express solution concentration
    - Predict vapor pressures of solutions using Raoult's Law

- Calculate the boiling point of a solution
- Calculate the freezing point of a solution
- Explain how electrolytes affect colligative properties
- Solve problems involving osmotic pressure

13. Perform various laboratory operations.
    - Develop accurate measurement techniques
    - Use laboratory equipment in a prescribed manner
    - Handle chemicals safely
    - Collect data from a variety of experiments
    - Use experimental data to study chemical theories
    - Relate experimental measurements to classroom work

Topics/Skills/Concepts (AP Chemistry) – Cont'd.

<u>Second Semester</u>:

1. Relate the principles of Semester 1 to applicable topics in Semester 2

2. Investigate various theories of acid-base behavior
    - Use Arhenius Theory to describe acid-base behavior
    - Use Bronsted-Lowry Theory to describe acid-base behavior
    - Identify conjugate acid-base pairs
    - Determine relative strengths of acids
    - Relate acid strength to the strengths of conjugate bases
    - Use Lewis Theory to explain acid-base behavior
    - Use molarity to solve acid-base stoichiometry problems
    - Use equivalents to describe acid-base reactions
    - Solve acid-base stoichiometric problems using normality

3. Relate thermodynamics to chemical processes
    - Explain what the First Law of Thermodynamics means
    - Calculate internal energy changes of a system
    - Use correct symbolism when describing the state functions under different conditions
    - Calculate enthalpy changes using Hess' Law
    - Determine bond energies from thermodynamic data
    - Describe the relationship between energy and entropy in predicting the spontaneity of a process
    - Calculate entropy changes from thermodynamic data
    - Calculate free energy changes from thermodynamic data
    - Estimate the temperature range over which a particular process would be spontaneous
    - Recognize the limitations of thermodynamics in predicting path-dependent information

4. Explain the factors that affect reaction rates
    - Calculate reaction rates from experimental data

- Describe how the nature of reactants can affect reaction rates
- Derive rate law expressions for reactions using experimental data
- Determine the order of a reaction
- Solve problems involving the half-life of a first order reaction
- Use collision theory to model chemical reactions
- Use transition state theory to model chemical reactions
- Explain the relationship of activation energy to reaction rates
- Relate rate data to simple reaction mechanisms
- Explain how temperature affects reaction rates
- Describe the effect of a catalyst on the rate of a reaction

Topics/Skills/Concepts (AP Chemistry – Second Semester) – Cont'd.

5. Apply the basic principles of chemical equilibrium
    - Describe the characteristics of a process at equilibrium
    - Determine the value of an equilibrium constant in terms of molarity
    - Use the reaction quotient to predict where a reaction is with respect to equilibrium
    - Solve problems involving equilibrium constants
    - Evaluate the equilibrium for a reaction involving gases in terms of partial pressures
    - Describe equilibrium shifts caused by various changes in experimental conditions
    - Determine the new position of equilibrium after a shift has occurred
    - Distinguish between homogeneous and heterogeneous equilibria
    - Solve problems involving heterogeneous equilibria
    - Calculate equilibrium constants at standard temperature from thermodynamic data
    - Estimate equilibrium constants at non-standard temperatures using thermodynamic data

6. Relate equilibrium principles to acid-base chemistry
    - Review differences between strong and weak electrolytes
    - Determine the pH of a solution
    - Calculate ionization constants for weak electrolytes
    - Determine the percent ionization of a weak electrolyte
    - Use ionization constants to solve problems
    - Explain how acid-base indicators work
    - Illustrate the effect of a common ion on the ionization of a weak electrolyte
    - Describe the action of a buffer solution
    - Select appropriate materials to make a buffer solution with a specific pH
    - Predict the change in pH caused by adding an acid or base to the buffer solution
    - Describe the ionization of polyprotic weak electrolytes using two or more ionization constants
    - Solve problems involving the ionization of polyprotic weak electrolytes

7. Apply equilibrium principles to hydrolysis and acid-base titrations
    - Recognize ions that will undergo hydolysis
    - Determine ionization constants for ions that hydrolyze

- Calculate the pH of solutions of various classes of salts
- Determine the percent hydrolysis of various ions
- Extend the concept of hydrolysis to ions derived from polyprotic weak electrolytes

Topics/Skills/Concepts (AP Chemistry – Second Semester) – Cont'd.

- Determine the pH at various points in the titration of a strong acid with a strong base
- Determine the pH at various points in the titration of a weak acid with a strong base
- Determine the pH at various points in the titration of a strong acid with a weak base
- Select appropriate indicators for use in a particular titration

8. Apply equilibrium principles to slightly soluble strong electrolytes
   - Calculate solubility product constants
   - Solve problems involving solubility product constants
   - Determine which of two species will precipitate first in a fractional precipitation
   - Use ionization constants in conjunction with solubility products to solve problems on simultaneous equilibria
   - Describe various methods for dissolving slightly soluble strong electrolytes
   - Use dissociation constants for complex ions to solve problems
   - Calculate the quantities of materials needed to dissolve slightly soluble strong electrolytes

9. Relate oxidation-reduction processes to electrochemistry
   - Review the principles of oxidation-reduction chemistry
   - Balance redox reactions via the half-reaction method
   - Apply the equivalent concept to oxidizing or reducing agents
   - Use normality to solve problems involving redox stoichiometry
   - Distinguish between electrolytic and galvanic cells
   - Determine which electrode serves as anode or cathode
   - Apply Faraday's Law to electrolytic cells
   - Explain the operation of a simple galvanic cell
   - Use standard electrode potentials to determine the potential of a galvanic cell
   - Diagram electrochemical cells
   - Use the Nernst equation to calculate the potential of cells under non-standard conditions
   - Relate the cell potential to the free energy change
   - Use standard potentials to determine equilibrium constants

10. Examine various aspects of nuclear chemistry
    - Review the composition of the nucleus
    - Relate neutron-proton ratio to nuclear stability
    - Calculate binding energies for atomic nuclei
    - Describe various modes of a radioactive decay

Topics/Skills/Concepts (AP Chemistry – Second Semester) – Cont'd.

10. Examine various aspects of nuclear chemistry – cont'd.
    - Predict the type or types of decay that are most likely for certain kinds of nuclei
    - Use half-life to solve problems involving radioactive decay processes
    - Write equations for various radioactive decays
    - Compare natural radioactivity to artificial transmutation
    - Distinguish between fission and fusion

11. Perform various laboratory exercises
    - Collect experimental data from a variety of procedures
    - Use laboratory equipment as instructed
    - Analyze unknowns using semi-micro qualitative analysis
    - Compare experimental results to those predicted in theory
    - Handle chemicals safely
    - Derive conclusions from experimental measurements

Introductory Physics

(Elective 10 -11 - 12)

Introductory Physics (Elective 10-11-12) **3=SCI403**

Practical Physics is a semester course which focuses on the conceptual aspects of physics, with minimum mathematics. This course has a heavy emphasis on laboratory investigations. Students taking this course will experience hands-on activities which address force and motion, electricity and magnetism, light and optics, sound and waves, and energy. Students will make connections between these investigations and the occurrences in the real world. This course will not meet science requirements for entrance into colleges.

This course is under construction for the 07-08 school year.

Physics

(Elective 10-11-12)

Prerequisite: Geometry

Course Description:

This full year course will consist of the study of the following topics: optics and wave motion, motion and energy, electricity, and magnetism. The nature of the laws of physics will be covered through text reading, class activities, teacher explanation, and laboratory experiences. A working knowledge of basic geometry and trigonometry concepts is strongly suggested.

Essential Learnings:

1. Students will understand the function of energy as it interacts with objects in the physical world; e.g., heat, motion, friction, gravity, sound, and light.

2. Students will understand the form and function of waves as they are propagated through the universe and interact with each other; e.g., forms transverse vs. longitudinal; e.g., refraction, reflection, interference, and diffraction.

Topics/Skills/Topics:

<u>Quarter 1</u>:

Chapter 1 The Science of Physics
Chapter 2 Motion in One Dimension
Chapter 3 Two-Dimensional Motion and Vectors
Chapter 4 Forces and the Laws of Motion

<u>Quarter 2</u>:

Chapter 5 Work and Energy
Chapter 6 Momentum and Collisions
Chapter 7 Rotational Motion and the Law of Gravity
Chapter 8 Rotational Equilibrium and dynamics

Topics/Skills/Concepts (Physics) – Cont'd.

<u>Quarter 3</u>:

Chapter 9 Fluid Mechanics

Special Relativity

Chapter 12 Vibrations and Waves
Chapter 13 Sound

<u>Quarter 4</u>:

Chapter 14 Light and Reflection
Chapter 15 Refraction
Chapter 25 Subatomic Physics
Rollercoaster/Rube Goldberg Project

AP Physics

(Elective 11-12)

Prerequisite: Completion of or concurrently taking Functions

Course Description:

This full year course is designed to be taken by a student wanting a thorough knowledge of physics. The instructor assumes that the student possesses sufficient background knowledge and math skills to be able to handle a university level course. This course will cover mechanics, energy, optics, electricity, and magnetism. This course will emphasize the development of problem-solving abilities. The student may take the AP exam on completion of this course.

Essential Learnings:

1. Students will understand the function of energy as it interacts with objects in the physical world; e.g., heat, motion, friction, gravity, sound, and light.

2. Students will understand the form and function of waves as they are propagated through the universe and interact with each other; e.g., forms transverse vs. longitudinal; e.g., refraction, reflection, interference, and diffraction.

Topics/Skills/Concepts:

<u>Quarter 1</u>:

Chapter 1 Measurement and Problem Solving
Chapter 2 Kinematics: Description of Motion
Chapter 3 Motion in Two Dimensions
Chapter 4 Force and Motion
Chapter 5 Work and Energy

<u>Quarter 2</u>:

Chapter 6 Linear Momentum and Collisions
Chapter 7 Circular Motion and Gravitation
Chapter 8 Only: Torque and Mechanical Equilibrium
Chapter 29 The Nucleus

Topics/Skills/Concepts (AP Physics) – Cont'd.

Chapter 30 Nuclear Reactions and Elementary Particles
Chapter 9 Solids and Fluids
Chapter 10 Temp and Kinetic Theory

Quarter 3:

Chapter 11	Heat
Chapter 12	Thermodynamics
Chapter 15	Electric charge, Forces, and Fields
Chapter 16	Electric Potential, Energy, and Capacitance
Chapter 17	Electric Current and Resistance
Chapter 18	Basic Electric Circuits

Quarter 4:

Chapter 13	Vibrations and Waves
Chapter 14	Sound
Chapter 22	Reflection and Refraction of Light
Chapter 23	Mirrors and Lenses
Chapter 24	Physical Optics: The wave nature of lights
Chapter 27	Only: Quantization of Energy, Photoelectric Effect and Bohr Model of Atom
Chapter 19	Magnetism

Review, Review, Review for AP Exam.

Astronomy

(Elective 10-11-12)

Course Description:

This is a one-semester laboratory course devoted to the study of astronomy. Units of study that will be included are as follows: objects that can be observed in the sky with the unaided eye such as the sun, planets, and stars; equipment that is used to further our knowledge of the universe; the relationship between the earth and the other objects in the sky; the constellations and the zodiac; the motion of the objects in the sky.

Essential Learnings:

Students will learn about:

1. Our place in space with studies of the motion and distances of the sun, stars, planets, and moon.

2. The birth of modern science will be explored by studies of the early astronomers and their contributions to science.

3. The study of our solar system and its formation and each of the nine planets.

4. The study of stars and stellar evolution.

Topics/Skills/Concepts:

<u>Chapter 1 – Basic Astronomy</u>

Students will learn and see

- Celestial sphere, celestial poles N and S, celestial equator
- Celestial coordinates declination and right ascension
- Rotation evidence that earth rotates; star trails; pendulum motion of moon, stars, sun
- Coriolis effect motion of wind ocean current
- Revolution evidence that earth revolves Zodiac
- Seasonal changes - Equinox autumnal, vernal solstices summer, winter
- Moon phases
- New, waxing crescent; 1st quarter; waxing gibbons; full moon; wanning gibbous; 3r^{d} quarter; wanning crescent
- Precession

Topics/Skills/Concepts (Astronomy) – Cont'd.

<u>Chapter 1 – Basic Astronomy – cont'd.</u>

- Eclipses - lunar – partial, total
- Parallax distance to the stars

Chapter 2 – Astronomers and their Contributions

Students will learn about these people and their contributions to science

- Pythagoras earth shape
- Aristotle geocentric model of the universe
- St. Thomas of Aquinas
- Copernicus earth rotated on axis as revolved around sun (Heliocentric model)
- Galileo's 1st telescope, 4 moons of Jupiter, sunspots, phases of Venus, experimentation as part of the scientific method
- Brahe
- Kepler Laws of planetary orbits
- Newton's universal gravitation 3 laws of motion
- Christian Dopler
- Edwin Hubble Red Shift
- Albert Einstein's General Theory of Relativity

Chapter 6 and Chapter 15 – The Solar System and Its Formation

Students will learn about

- Nebular Theory, condensation
- Accretion, planetesimals, protoplanets, protosun
- Planetary probes, drawing the solar system to scale

Chapter 8, 9, 10, 11, 12, 13 – The Planets

Students will learn about and see and do

- Mercury investigation – "To the Moon and Beyond" video
- Apollo 11 Mission to the Moon
- Crater impact lab- "What If We Had No Moon" video
- Venus investigation, "Venus Unveiled" video
- Mars packet
- Mars – "Journey to Mars" video
- "Exploring the Red Planet" video
- "Pathfinder Destination Mars" video
- "Mars Terra Forming" video
- "Mars link – What's a day like on Mars?
- Mars link – Dust storms and global temperatures on Mars

Topics/Skills/Concepts (Astronomy) – Cont'd.

Chapter 8, 9, 10, 11, 12, 13 – The Planets – cont'd.

- Jovian planets investigation
- Videos, "Jupiter," Saturn," "Uranus," "Neptune," and "Pluto."

Chapter 14 – Solar System Debris

Students will se, learn about, and do

- Comet investigation, and video
- Meteoroid, meteor, and meteorite investigation

- Asteroids, “The Doomsday Asteroid” video; crater impact lab

Chapter 16 – The Sun

Students will do, and see, and learn about
- Sun investigation
- “The Savage Sun” video
- Fusion, parts of the sun, size, solar wind
- Solar cycle, solar eclipse

Chapter - Parts of 17, 18, 19, 20, 21, 22 – Stars

Students will learn about
- Star colors, star sizes, kinds of stars, star evolution, star formation, HR diagram, stellar explosions, constellations investigation, overheads, Starlab
- The 10 constellations

Chapter Parts of 23, 24 – Galaxies

- Our galaxy, The Milky Way
- Nearest galaxies, local group, star counts
- Kinds of galaxies classification

Chapter Parts of 26 – Cosmology

- Big bang, big crunch, steady state, expanding universe, red shift, no boundaries on universe, boundaries on universe

Geology

(Elective 10-11-12)

Prerequisite: General Science

Course Description:

Geology is a one-semester course that includes study in the following areas:

1. Sedimentary, metamorphic, and igneous rock and mineral properties with identification in the classroom and out of the classroom.

2. Geologic maps and mapping techniques with the identification of land forms and features.

3. Study of various physical land form features caused by erosive agents on the earth's surface.

Essential Learnings:

1. Students will understand the rock cycle.

2. Students will understand that earth as a giant multi-dimensional system with many separate parts but interacting together.

3. Students will have an understanding about how the earth works and how it is necessary to our survival and well being.

4. Students will have an understanding plates tetonics and its role in supporting life on earth.

Topics/Skills/Concepts:

<u>Chapter 1 – Minerals: Building Blocks of Rocks</u>

1. Properties of minerals
    - Crystal form, luster, color, streak
    - Harness, cleavage, fracture, specific gravity, other
3. Mineral groups
4. Mineral resources
5. Gemstones
6. How to identify minerals
7. Mineral key, properties, and rock kits, lab practical evaluation

Topics/Skills/Concepts (Geology) – Cont'd.

<u>Chapter 1 – Minerals: Building Blocks of Rocks – cont'd.</u>

8. Videos: "Earth Revealed, Minerals", "Crystals: Flowers of the Mineral Kingdom, "Earth Treasures: Gold," "Earth Treasures: Diamonds," "Gems"

Chapter 2 – Rocks: Materials of the Lithosphere

1. Earth System, Rock cycle
2. Igneous Rocks
   - How formed
   - Identification - rock kits
   - Naming and classification
   - "Earth Revealed: Intrusive Igneous Rocks" video
3. Sedimentary Rocks
   - Classifying sedimentary rocks
   - Lithification of sediment
   - Features of sedimentary rocks
   - Identification of sedimentary rock using rock kits
   - "Earth Revealed: Sedimentary Rocks" video
3. Metamorphic Rocks: Changed in Form
   - Three metamorphic agents
   - Metamorphic changes – texture
   - Classifying metamorphic rocks
   - Identifying metamorphic rocks using rock kits
   - "Earth Revealed: Metamorphic Rocks" video

Chapter 3 – Weathering, Soil, and Mass Wasting

1. Mechanical Weathering
   - Frost wedging, unloading, biological activity
2. Chemical Weathering
   - Water and carbonic acid
   - How granite weathers
   - Weathering of silicate minerals
   - Rates of weathering, mineral makeup, climate, differential weathering
3. Soil
   - What is soil?
   - Soil texture and structure
   - Controls of soil formation
     - Parent material, time, climate, plants and animals, slope
     - Soil profile
     - Soil types
     - Soil erosion

Topics/Skills/Concepts (Geology) – Cont'd.

Chapter 3 – Weathering, Soil, and Mass Wasting – cont'd.

4. Mass Wasting: The Work of Gravity
   - Controls and triggers of mass wasting
   - Role of water, oversteepened slope, vegetation, earthquakes
   - Kinds of mass wasting: Falls, slides, flows, slumps, rockslides, debriflow, earthflow, lahars, creep, solifluction
5. Topographic Mapping

- Introduction to aerial photographs and topographic maps, township, range, stereoscope, stereogram, catographer (Exercise 3 from lab book)
- How do topographic maps show elevation? Contour lines, general rules for contour lines, contour interval, slope
- Contour maps/scales
- Construction of contour maps benchmarks
- Methods of representing topography
- Drawing a profile from a topographic map, relief
- Exercise in map reading and interpretation
- Comparing topographic maps of West Des Moines from 1965 to present day

Chapter 4 – Running Water and Groundwater

1. Earth as a system: The Hydrologic Cycle
2. Running Water
   - Streamflow
   - Changes from upstream to downstream
3. Baslevel – work of streams
   - Erosion
   - Transportation
   - Deposition
4. Stream Valleys
   - Narrow valleys
   - Wide valleys
5. Floods and Flood Control
   - Cause of floods
   - Flood control
6. Drainage Basins and Patterns
7. Shaping the Earth's Surface: Running Water and Groundwater(Exercise 4)
8. Water Beneath the Surface
   - The importance of groundwater
   - Groundwater's geological roles

Topics/Skills/Concepts (Geology) – Cont'd.

Chapter 4 – Running Water and Groundwater – cont'd.

9. Distribution and Movement of Groundwater Springs
   - Hot springs
   - Geysers
10. Environmental Problems Associated with Groundwater
    - Treating groundwater as a nonrenewable resource
    - Land subsidence caused by groundwater withdrawal
    - Groundwater contamination
    - The geologic work of groundwater caverns, Karst topography

Chapter 5 – Glaciers, Deserts, and Wind

Shaping Earth's Surface: Arid and Glacial Landscapes (Exercise 5)

1. Glaciers: Part of Two Basic Cycles
    - How Glaciers Move
    - Glacial erosion
        - How glaciers erode
        - Landforms created by glacial erosion
    - Glacial Deposits
        - Types of glacial drift
        - Moraines, outwash plains, and kettles
        - Drumlins, Eskers, and Kames
    - Glaciers of the Age
    - Some indirect effects of Ice Age glaciers
    - Causes of glaciation
        - Plate tectonics
        - Variations in earth orbit
2. Deserts
    - Geological processes in arid climates
        - Weathering
        - The role of water
    - Basin and range: The evolution of a desert landscape
        - Wind erosion
        - Wind deposits
            - Loes, sand dunes, types of dunes

Topics/Skills/Concepts (Geology) – Cont'd.

<u>Chapter 6 – Earthquakes and Earth's Interior</u>

1. Geological Maps and Structures (Exercise 7)
2. Earthquakes and Earth's Interior (Exercise 8)
3. What is an earthquake?
    - Earthquakes and faults
    - Elastic rebound
    - Foreshocks and aftershocks
    - Tectonic forces and earthquakes
4. Earthquake Waves
5. Finding Earthquake Epicenters
6. Earthquake Intensity and Magnitude
7. Destruction from Earthquakes
    - Destruction from seismic vibrations
    - Tsunami (Tsunami video)
    - Landslides and ground subsidence
    - Fire

8. Can earthquakes be predicted?
    - Short range
    - Long range forecasts
9. Earthquakes and Earth's Interior
    - Discovering earth's major layers
    - Discovering earth's composition

Chapter 7 - Plate Tectonics

1. Continental Drift – An Idea Before Its Time
    - Evidence the continental jigsaw puzzle
    - Fossils match across the seas
    - Evidence rock types and structures match
    - Evidence ancient climates
2. Plate Tectonics: A Modern Version of an Old Idea
    - Plate Boundaries
        - Divergent boundaries
        - Convergent boundaries
        - Transform fault boundaries
3. Testing the Plate Tectonics Model
    - Evidence paleomagnetism
    - Evidence earthquake patterns
    - Evidence earthquake drilling
    - Evidence hot spots

Topics/Skills/Concepts (Geology) – Cont'd.

Chapter 7 - Plate Tectonics – cont'd.

4. Pangea: Before and after
    - Breakup of pangea
    - Before pangea
5. The Driving Mechanism
    - Convection current hypothesis
    - Slab push and slab pull hypothesis
    - Hot plumes hypothesis

Chapter 8 – Igneous Activity

1. The Nature of Volcanic Eruptions
    - Factors affecting viscosity
    - Importance of dissolved gases in magma
2. What is Extruded During Eruptions?
    - Lava flows
    - Gasses
    - Pyroclastic materials
3. Volcano Types
    - Shield volcano, cinder cones, composite cones
4. Other Volcanic Landforms

- Calderas and pyroclastic flows
- Fissure eruptions and lava plateaus
- Volcanic necks

5. Intrusive Igneous Activity
   - Dikes and sills
   - Laccoliths and batholiths
6. Igneous Activity and Plate Tectonics
   - Origin of magma
   - Distribution of igneous activity

Chapter 9 – Mountain Building

1. Crustal Uplift
   - Isostasy
   - Isostatic adjustment
2. Rock Deformation
   - Types of deformation (folds, faults, joints)
3. Mountain Types
   - Fault-block mountains
   - Folded mountains
   - Up-warped mountains

Topics/Skills/Concepts (Geology) – Cont'd.

Chapter 9 – Mountain Building – cont'd.

4. Mountain Building
   - Mountain building at convergent boundaries
   - Mountain building and continental accretion

Chapter 10 – Geologic Time

Geology Needs a Time Scale—

1. A Short History of Geology
   - Birth of modern geology
   - Geology today
2. Relative Dating Key Principles
   - Law of superposition
   - Principle of original horizontality
   - Principles of cross-cutting relationships
   - Inclusions
   - Unconformities
   - Using relative dating principles
3. Correlation of Rock Layers
4. Fossils Evidence of Past Life
   - Type of fossils
   - Conditions favoring preservation
   - Fossils and correlation
5. Dating with Radioactivity
   - Reviewing basic atomic structure
   - Radioactivity

- Half-life
- Radiometric dating
- Dating with carbon – 14
- Importance of radiometric dating

6. The Geologic Time Scale
7. Difficulties in Dating the Geologic Time Scale

Chapter 11 – Earth's History: A Brief Summary

1. Origin of the earth
2. Earth's Atmosphere Evolves
3. Earth's Precambrian Time: Vast and enigmatic
   - Precambrian rocks
   - Precambrian fossils

Topics/Skills/Concepts (Geology) – Cont'd.

Chapter 11 – Earth's History: A Brief Summary – cont'd.

4. Paleozoic Era: Life Explodes
   - Early Paleozoic history
   - Early Paleozoic life
   - Late Paleozoic history
   - Late Paleozoic life
4. Mesozoic Era
   - Mesozoic history
   - Mesozoic life
5. Cenozoic Era; Age of the Mammals
   - Cenozoic North America
   - Cenozoic life

Chapter 12 – The Ocean Environment

1. The Vast World Ocean
2. Composition of Seawater
   - Salinity and its variations
   - Sources of sea salt
3. Resources from Seawater
4. Oceans Layered Structure
5. Mapping the Ocean Floor
6. Continental Margins
   - Passive continental margins
   - Active continental margins
7. Submarine Canyons and Turbidity Currents
8. The Ocean Basin Floor
   - Deep – Ocean trenches
   - Abyssal plains
   - Seamounts
9. Mid-Ocean Ridges
10. Marine Life Zones

- Availability of light
- Distance from shore
- Depth

11. Other Marine Habitats
    - Estuaries
    - Coral refs and atolls
12. Seafloor Sediments
    - Types of seafloor sediments
    - Seafloor sediments and climate change

Topics/Skills/Concepts (Geology) – Cont'd.

Chapter 13 – The Restless Ocean

1. Surface Currents
    - Ocean circulation patterns
    - Ocean currents and upwellings
    - Importance of ocean currents
2. Deep-Ocean Circulation
3. Tides
    - Causes of tides
    - Spring and neap tides
    - Types of tides
    - Tidal currents
4. Waves Modify the Shoreline
5. Waves
    - Characteristics of waves
    - Types of waves
    - Wave erosion
    - Wave refraction
    - Moving sand along the beach
6. Shoreline features
    - Wave-cut cliffs and platforms
    - Arches, stacks, splits and bars
    - Barrier Islands
    - The evolving shore
7. Shoreline Erosion Problems
    - Groins
    - Breakwaters and seawalls
    - Beach nourishment
    - Abandonment and relocation
    - Contrasting the Pacific and Atlantic coasts