

Course: Biology

Instructor: Mr. David A. Kren

Textbook: *Biology* Glencoe, 2007

Other materials needed: Bible, Binder with paper or notebook and folder, pencils and a variety of colored pens.

Course Purpose: God created all things in six days. A very important part of that creation was and is all living things; most important of all, Human kind. With those truths in mind as the foundation for this course, it is then the purpose of this course to increase the students' knowledge about who God is and what he has created by examining the irreducible complexity of life in all its forms. Students will gain a better appreciation for the power of their Lord as well as a better understanding of their role as caretakers of the earth in order to make God-pleasing decisions that will benefit the environment as well as the spiritual and physical welfare of themselves and all other people on Earth.

Course Outcomes: "In the beginning, God created the heavens and the earth." Using this as the foundation for all we do in this class, students will utilize Scripture to reinforce the fact that God did indeed create them and all living and non-living things. In addition, Biology also allows the student an opportunity to learn about how a living organism works and to become familiar with how a Biologist is able to research and discover things about life.

- 1. Hebrews 11 states "Now faith is being sure of what we hope for and certain of what we do not see. By faith we understand that the universe was formed at God's command, so that what is seen was not made out of what was visible." Understanding that it is through faith that we know the truth, students will "be prepared to give an answer to everyone who asks you to give a reason for the hope that you have." 1Pet 3:15.*
- 2. Explain the importance of understanding and studying Biology for their personal lives.*
- 3. Utilize the Scientific Method to solve a variety of scientific problems and transfer that method to solve problems and answer questions within their own lives.*
- 4. Utilize a variety of scientific tools and measurement systems to enhance learning of science now and in the future.*
- 5. Identify the major chemical components of life.*
- 6. Explain the importance of taking care of the earth as a God appointed caretaker over it. Use a variety of methods to demonstrate their understanding such as partaking recycling programs and designing methods of wise and efficient use of resources.*
- 7. Explain how genetic traits are inherited, identifying the major role players involved, as well as describing the problems that can arise as well as the God designed mechanisms safe-guarding against these potential problems. Try to understand that God has a plan for all things, even when things don't seem right to us.*
- 8. Use a taxonomic key to properly identify a variety of organisms.*

9. *Correctly identify the proper placement of living things in the taxonomic system by the characteristics of cell type, number of cells, mode of nutrition, and the presence of absence of a cell wall.*
10. *Explain the importance of plants to the overall survival of life.*
11. *Explain specifically how photosynthesis and cell reproduction are the most important chemical reactions on the planet.*
12. *Identify the 11 major systems of the human body and explain the major functions of their parts.*
13. *Demonstrate lab safety awareness by correctly following lab procedures.*
14. *Accurately explain the results of a laboratory experiment by reporting results on an official scientific lab report.*

Course Goals:

1. *By the grace of God each student will rely more confidently on God's forgiving grace in Christ and grow in Christ-like love in all human relationships.*
2. *In a world in which evolution and the absence of God are now proclaimed as the norm in science and in life, students will be able to, in their own God pleasing way, uphold the truths of scripture when faced with the opportunities to do so.*
3. *Students will appreciate more potently the power and wisdom of their Lord in creating the universe, world, themselves and all forms of life, seeing how wonderfully everything works within and with other parts of His creation.*

Course Outline: The following topics and concepts are standard for a high school level biology course. We will be learning these things with the truths of scripture as our authoritative text, and the scientific text being merely our topical guide.

Unit One: *In the beginning is a look at the truth of Creation and comparing it to alternative ideas as to how it all began.*

1. **Genesis 1-2:3.** *Describe what God did on each day 1-7, and explain the significance of the following not only for when he created them, but even their significance for us today.*
 - a. *List the statements or phrases God uses more than once in the account and describe why they are important.*
 - b. *Examine the order in which He created things and describe the importance of the order.*
 - c. *Explain the day of rest and its meaning in at least two ways.*
2. **The theory of Evolution.**
 - a. *Describe the basic tenets of the evolutionary theory along with identifying which specific parts of scripture the theory is trying to combat.*
 - b. *Describe the ethical and moral issues at stake because of how "successful" the devil has been in developing this theory.*

Textbook: Chapters 14-16, pages 388-475

Number of days: 8

School Outcomes: 1, 2,3,4,6

Department Outcomes: 1-4

State Standards: A12.1-7; B12.1-5; C12.1, 7; E12.3, 5

Unit Two: What is Biology? *As students begin to explore the basic foundational concepts of biology, they will gain an understanding of scientific thought and utilize various scientific tools and ideals used by scientists throughout history.*

- 1. The Characteristics of life.**
 - a. Describe the characteristics of living things*
 - b. Explain how life can be studied at different levels*
- 2. Scientific Method, experimentation and measurement**
 - a. Explain what the goal of science is*
 - b. Describe hypotheses and how scientists use them*
 - c. Explain how a scientific theory develops*
- 3. History of scientific thinking**
 - a. Identify the major scientists who have shaped modern science and Biology into what we know today, and what they have done.*
 - b. Explain how science is always in a process of change, where the truths of scripture are never changing.*
- 4. Branches of Biology**
 - a. Identify some of the major branches of Biology and what scientists in these fields do.*
- 5. Measurement tools and safety in the lab.**
 - a. Describe the measurement system scientists' use.*
 - b. Explain how light microscopes and electron microscopes are similar and different.*
 - c. Describe two common laboratory techniques.*
 - d. Explain why it is important to work safely in biology.*

Textbook: Chapter 1, pages 2-23

Number of days: 8

School Outcomes: 1, 2, 3, 4, 6

Dept. Outcomes: 1-4

State Standards: A.12.5, 6; B.12.1, 2, 4; C.12.1-7; F.12.11, 12; G.12.1, 3, 4

Unit Three: Chemistry in Biology. *Living things are made up of elements. Elements are utilized by living things to build and repair structures as well as for maintaining an internal balance through chemical reaction and metabolism.*

- 1. Basic chemistry.**
 - a. Identify the three subatomic particles found in atoms.*
 - b. Explain how all the isotopes of an element are similar and how they are different.*
 - a. Explain what chemical compounds are.*
 - b. Describe the two main types of chemical bonds.*
- 2. Properties of water**
 - a. Explain why water molecules are polar.*
 - b. Differentiate between solutions and suspensions.*
 - c. Contrast acidic and basic solutions.*
- 3. Organic chemistry, the building blocks of life.**
 - a. Describe the properties of an organic compound*
 - b. Identify the four main groups of organic compounds, what elements they are made up of and what their main function are.*

4. Chemical Reactions and Enzymes

- a. *Explain how reactions affect chemical bonds in compounds.*
- b. *Describe how energy changes affect the rate at which reactions occur.*
- c. *Explain the importance of enzymes to living things.*

5. Photosynthesis

- a. *Explain where plants get the energy they need to produce food*
- b. *Describe the role of ATP in cell activities.*
- c. *State the overall equation for photosynthesis*
- d. *Describe the role of light and chlorophyll in photosynthesis.*
- e. *Describe the structure of a chloroplast*
- f. *Describe what happens in the light –dependent reactions and the Calvin cycle.*

6. Respiration

- a. *Explain what cellular respiration is.*
- b. *Describe what happens in the process of glycolysis.*
- c. *Name the two main types of fermentation.*
- d. *Describe what happens during the Krebs cycle.*
- e. *Explain how high energy electrons are used by the electron transport chain.*
- f. *Compare photosynthesis and respiration.*

Textbook: Chapters 6 and 8, pages 146-173; 216-235

Number of days: 14

School Outcomes: 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.2-5, 7; B.12.1-4; C.12.1-7; D.12. 1-4, 6; F.12.1, 2, 10, 11; G.12.1, 3

Unit Four: Ecology is a look at all the levels of interaction between the living things to each other and their environment. Here God’s wisdom in designing not only life itself, but how life interacts with other life forms and the environment. We as caretakers of the earth will also be explored.

1. What is ecology?

- a. *Identify the levels of organization that ecologists study.*
- b. *Describe methods used to study ecology.*
- c. *Describe how matter cycles among the living and non-living parts of an ecosystem.*
- d. *Describe how God provides for all living things.*

2. Ecosystems and communities

- a. *Identify Earth’s three main climate zones.*
- b. *Explain how biotic/abiotic factors influence an ecosystem.*
- c. *Identify interactions that occur within communities.*
- d. *Describe how ecosystems recover following a disturbance.*
- e. *Identify the main characteristics of major land biomes.*
- f. *Identify the factors that govern aquatic ecosystems.*

3. Populations

- a. *List the characteristics used to describe a population.*
- b. *Identify factors that affect population size.*
- c. *Differentiate between exponential and logistic growth.*
- d. *Identify factors that limit population growth.*

- e. *Compare and contrast density–dependent and density-independent limiting factors.*
- f. *Describe how the size of human populations has changed over time.*

4. Human’s role

- a. *Explain God’s appointment of humankind as caretaker over the earth.*
- b. *Explain how environmental resources are classified.*
- c. *Describe how human activities both positively and negatively affect land, air, and water resources.*
- d. *Identify the characteristics of sustainable use.*
- e. *Define biodiversity; explain its value, and the current threats to it*

Textbook: Chapters 2-5, pages 28-137

Number of days: 20

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A12.1-7; B12.3, 4; C12.1, 2, 3, 7; E12.1, 2, 4; G12.5; H12.1-3

Unit five: Cells. The basic unit of life is not really basic at all. Even though all living things have one or more cells, the complexity of this creation is astounding. Our look will examine the basic parts, different kinds, and functions of these wonderful creations.

1. Cell Theory

- a. *Explain what cell theory is and who the main scientists were who helped shape it.*

2. Basic structure and function.

- a. *Name the basic cell structures.*
- b. *Compare and contrast prokaryotic cells and eukaryotic cells.*
- c. *Identify the functions of the major cell organelles.*
- d. *Describe the main roles of the cytoskeleton.*
- e. *Define the role of the nucleus.*
- f. *Identify the structure and main functions of the cell membrane.*
- g. *Describe the processes of diffusion, osmosis, facilitated diffusion and active transport.*
- h. *Identify the organizational levels in multicellular organisms.*

3. Plant and animal cell specifics

- a. *Identify the three main differences between plant and animal cells.*

4. Cell growth and division.

- a. *Explain the problems that growth causes for cells.*
- b. *Describe how cell division solves the growth problems.*
- c. *Name the main events of the cell cycle.*
- d. *Describe what happens during the four phases of mitosis.*
- e. *Identify a factor that can stop cells from growing.*
- f. *Describe how the cell cycle is regulated.*
- g. *Explain how cancer cells are different from other cells.*

Textbook: Chapters 7 and 9, pages 180-209;242-259

Number of days: 15

School Outcomes: 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.2-5, 7; B.12.1, 4; C.12.1-7; D.12.1-4, 6; F.12.1, 2, 10, 11; G.12.1, 3

Unit six: Genetics. God designed within every cell the instructions on how these cells will carry out its various functions for survival. The aforementioned instructions are so small, that the amount of information stored in one cell alone would occupy the pages of volumes and volumes of textbooks. We will study a variety of things including:

1. Gregor Mendel and the beginning of understanding genetics.

- a. Describe how Mendel studied inheritance in peas.
- b. Summarize Mendel's conclusion about inheritance.
- c. Explain the principle of dominance
- d. Describe what happens during segregation.
- e. Explain the principle of Independent assortment.
- f. Describe the other inheritance patterns that exist aside from simple dominance.

2. Genetic tools and probabilities.

- a. Explain how geneticists use the principles of probability.
- b. Describe how geneticists use Punnett squares and be able to use them.
- c. Identify the structures that actually assort independently.
- d. Explain how gene maps are produced and used.

3. Meiosis and inheritance.

- a. Contrast the chromosome number cells and gametes.
- b. Summarize the events of meiosis.
- c. Contrast meiosis and mitosis.

4. DNA and RNA

- a. Summarize the relationship between genes and DNA
- b. Describe the overall structure of the DNA molecule.
- c. Summarize the events of DNA replication.
- d. Relate the DNA molecule to chromosome structure.
- e. Explain how RNA and DNA differ.
- f. Name the three main types of RNA and explain their role in protein synthesis.
- g. Describe transcription and translation.
- h. Explain the relationship between genes and proteins
- i. Contrast gene mutations and chromosomal mutations.
- j. Describe a typical gene.

5. Genetic engineering

- a. Explain the purpose of selective breeding,
- b. Explain how scientists manipulate DNA.
- c. Summarize what happens during transformation.
- d. Summarize the main steps in cloning.
- e. What are the moral and ethical issues at stake regarding stem cell research?

6. Human genetics.

- a. Identify the types of human chromosomes in a karyotype.
- b. Explain how sex is determined.
- c. Explain how pedigrees are used to study human traits.
- d. Explain how small changes in DNA cause genetic disorders.
- e. Identify characteristics of human chromosomes.

- f. Summarize non-disjunction and the problems it causes.
- g. Describe how researchers are attempting to cure genetic disorders.

Textbook: Chapters 10-14, pages 266-381

Number of days: 25

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.2-7; B.12.1, 4; C.12.1-7; F.12.3, 4; G.12.1, 3

Unit seven: Classification of living things. *Scientists have organized and labeled all “discovered” living things for the sake of order and ease of study. God however was the first to classify his creations by creating like kinds on certain days. He also provided them with the ability to make more of these kinds through the process of reproduction. Students will examine the organization of life and then using scripture; critique the means by which things are organized.*

1. Order in Diversity

- a. Explain how living things are organized for study.
- b. Describe binomial nomenclature.
- c. Explain Linnaeus’s system of classification.

2. Kingdoms and Domains

- a. Name the six kingdoms of life as they are now identified.
- b. Describe the three domain system of classification.

Textbook: Chapter 17, pages 482-505

Number of days: 5

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes:

State Standards: A12.5, 6, 7; B112.1, 2; C12.2

Unit Eight: Microorganisms and fungi. *Some of the most interesting creations are the smallest. We will examine the kinds of and major roles these living things play in the world today.*

1. Bacteria and Viruses

- a. Explain how the two groups of prokaryotes differ.
- b. Describe the factors that are used in identifying prokaryotes
- c. Describe the ecological roles bacteria play in the environment.
- d. Explain how bacteria cause disease.
- e. Identify ways humans use bacteria in beneficial ways.
- f. Describe the structure of a virus and explain how viruses cause infection.

2. Protists

- a. Explain what a protist is by highlighting the major characteristics that place these created living organisms in this kingdom
- b. Describe the major phyla of the animal like protists, the unicellular algae, the plantlike protists, and the fungus like protists.
- c. Summarize the ecological roles of and human uses of the major protist phyla.
- d. Compare and contrast fungus like protists and fungi.
- e. Describe slime molds and water molds.

3. Fungi

- a. *Identify the defining characteristics of fungi.*
- b. *Describe the main structures of a fungus.*
- c. *Classify the fungi kingdom into four major groups.*
- d. *Explain how fungi reproduce.*
- e. *Explain the ecological role of fungi.*
- f. *Describe the kinds of mutualistic and parasitic relationships that fungi form with other organisms.*

Textbook: Chapters 18-20, pages 512-593

Number of days: 8

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.5,6; B.12.1,2,4; C.12.1-7; F.12.1,2,7,8,9,11,12; G.12,1,3,4

Unit nine: Plants. *Without these green guys, life on the earth wouldn't exist as it does. Their role in the whole plan for life is more than a source of food. Our look will include an examination of various kinds along with their parts and functions.*

1. Plant Diversity

- a. *Describe what a plant needs to survive.*
- b. *Identify the three groups of Bryophytes.*
- c. *Define what vascular tissue is and explain how it is an important creation in ferns and related plants.*
- d. *Identify four groups of gymnosperms*
- e. *Identify the characteristics of angiosperms.*
- f. *Explain what monocots and dicots are by highlighting major differences in their structure.*
- g. *Describe the three different life spans of angiosperms.*

2. Roots Stems and Leaves.

- a. *Describe the organs and tissues of vascular plants.*
- b. *Contrast meristematic tissue with other plant tissue.*
- c. *Identify the specialized cells of vascular tissue.*
- d. *Describe two main types of roots and identify the tissues and structures in a mature root.*
- e. *Describe the different functions of roots.*
- f. *Describe the two main functions of stems.*
- g. *Explain how primary growth and secondary growth occurs in stems.*
- h. *Contrast monocot and dicot stems.*
- i. *Describe how the structure of a leaf allows it to carry out photosynthesis.*
- j. *Explain why leaves change color and why they fall.*
- k. *Explain how water and the products of photosynthesis are transported throughout a plant.*

3. Reproduction of seed plants

- a. *Identify the reproductive structures of gymnosperms and angiosperms.*
- b. *Describe the development of seeds and fruits.*
- c. *List the factors that influence the dormancy and germination of seeds.*

4. Plant hormones and responses.

- a. *Describe patterns of plant growth.*
- b. *Explain what plant hormones are.*
- c. *Describe how auxins, cytokinins, gibberellins, and ethylene affect plant growth.*
- d. *Explain tropism and photoperiodism.*
- e. *Describe how temperate plants prepare for the winter.*
- f. *Explain how plants defend themselves.*

Textbook: Chapters 21-23, pages 600-681

Number of days: 15

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.5, 6; B.12.1, 4; C.12.1-7; F.12.6, 7, 9, 11, 12; G.12.1, 4

Unit Ten: Invertebrates. *There are many living animals that are so unlike us. A major group is that of the invertebrates, those without backbones. Kinds of spineless critters and their God given roles will be examined.*

1. Sponges and Cnidarians.

- a. *Explain what a sponge is, describe how sponges carry out functions, and describe sponge ecology.*
- b. *Explain what a cnidarian is, describe the two body plans of a cnidarian, describe cnidarian ecology, describe how cnidarians carry out essential functions, describe cnidarian ecology, and identify three groups of cnidarians.*

2. Worms and mollusks.

- a. *Describe the defining features of flatworms and roundworms.*
- b. *Describe the form and function of flatworms and roundworms.*
- c. *Identify roundworms that are important in human disease.*
- d. *Describe the defining features of the annelids.*
- e. *Identify the characteristics and roles of the three annelid classes.*
- f. *Describe the ecology of annelids.*
- g. *Describe the defining features of the mollusks.*
- h. *Describe form and function of the mollusks.*
- i. *Identify the characteristics of three main classes of mollusks.*
- j. *Describe the ecology of mollusks.*

3. Arthropods and Echinoderms.

- a. *Identify the defining features of arthropods.*
- b. *Explain growth and development in arthropods.*
- c. *Explain how arthropods are classified.*
- d. *Identify the distinguishing features of insects.*
- e. *Describe two types of development in insects.*
- f. *Identify the distinguishing features of echinoderms.*
- g. *Describe the functions carried out by the water vascular system.*

Textbook: Chapters 24-27, pages 688-809

Number of days: 15

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.5, 6; B.12.4; C.12.1-7; F.12.7, 9, 12; G.12.1

Unit Eleven: Vertebrates. *The animals God gave a spine to are usually bigger and more familiar to us. However there is a lot about them we may not yet know. Our examination time will include a look at the major kinds as well as their purpose for life here on earth.*

1. Fishes and amphibians

- a. *Identify the basic characteristics of a fish.*
- b. *Describe the three main groups of fishes.*
- c. *Describe what an amphibian is.*
- d. *Name the main groups of living amphibians.*

2. Birds and Reptiles

- a. *Describe the characteristics that all birds share.*
- b. *Explain how birds have been created/designed for flight.*
- c. *Describe the diversity of birds.*
- d. *Describe the characteristics of reptiles.*
- e. *Identify the four living orders of reptiles.*
- f. *Research and report on the extinct groups of reptiles, namely the dinosaurs, and give examples, both from research and from scripture that they co-existed with humankind and not millions of years before humankind.*

3. Mammals

- a. *List the characteristics of mammals.*
- b. *Describe how animals perform their God given abilities to carry out life functions.*
- c. *Name the major orders of placental mammals*
- d. *Explain how the three groups of living mammals differ from one another.*

4. Animal Behavior

- a. *Identify what produces behavior in animals.*
- b. *Explain what an innate behavior is.*
- c. *Describe the major types of learning.*
- d. *Explain how environmental changes affect animal behavior.*
- e. *Identify behavioral patterns used to claim and defend territories.*
- f. *Summarize how animals communicate.*

Textbook: Chapters 28-31, pages 816-925

Number of days: 15

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.5, 6; B.12.4; C.12.1-7; F.12.6, 7, 9, 12; G.12.1

Unit Twelve: The Human Body. *We were created in God's image in his likeness, male and female. In this unit we will examine specifically the different systems God created within us and how these systems benefit us. You can't help but be drawn closer to him as you learn more about how you work. Before examining the specific systems listed below, students will describe how the body is organized and explain homeostasis.*

1. Nervous system

- a. *Identify the functions of the nervous system.*
- b. *Describe how a nerve impulse is transmitted.*

- c. *Identify the functions of the central nervous system.*
- d. *Describe the divisions of the peripheral nervous system.*
- e. *Name the five types of sensory receptors.*
- f. *Identify the five senses.*

2. Skeletal, Muscular and Integumentary systems

- a. *State the functions of the skeletal system.*
- b. *Describe the typical bone structure.*
- c. *Explain how bones develop.*
- d. *Identify the five kinds of joints.*
- e. *Identify divisions of the human skeleton along with naming 40 different human bones.*
- f. *Describe the three main types of muscle tissue.*
- g. *Explain the sliding filament theory.*
- h. *Explain how muscles and bones interact.*
- i. *State the functions of the Integumentary system.*
- j. *Describe the structure and function of hair and nails.*

3. Circulatory and Respiratory systems.

- a. *Identify the functions of the human circulatory system.*
- b. *Describe the structures of the circulatory system.*
- c. *Name the three types of blood vessels.*
- d. *Describe blood pressure.*
- e. *Identify and explain the functions of the four main blood components.*
- f. *Describe the role of the lymphatic system.*
- g. *Identify the structures of the respiratory system.*
- h. *Describe gas exchange and breathing.*
- i. *Explain how smoking affects the respiratory system.*

4. Digestive and Excretory systems.

- a. *Explain how food provides energy and describe the nutrients your body needs.*
- b. *State why water is such an important nutrient.*
- c. *Identify the organs of the digestive system and describe their functions.*
- d. *Name the organs of the excretory system.*
- e. *Explain how the kidneys maintain homeostasis.*

5. Endocrine and Reproductive systems.

- a. *State the function of the endocrine system.*
- b. *Describe hormones and glands.*
- c. *Contrast endocrine and exocrine glands.*
- d. *Identify major hormones and explain their functions in the body.*
- e. *Explain how the endocrine system is involved in homeostasis.*
- f. *Describe fertilization.*
- g. *State what happens during gastrulation and development.*

6. Immune system and Disease.

- a. *Identify the causes of disease.*
- b. *Explain how infectious diseases are transmitted.*
- c. *Describe how antibiotics fight infection.*
- d. *Identify the body's non-specific defenses against invading pathogens.*

- e. *Describe how immunity works.*
- f. *Describe how HIV affects the immune system.*
- g. *Identify the basic mechanism of cancer and describe how cancer is treated.*

Textbook: Chapters 32-37, pages 932-1097

Number of days: 40

School Outcomes: 1, 2, 3, 4, 5, 6

Dept. Outcomes: 1-4

State Standards: A.12.5, 6, 7; B.12.1, 4; C.12.1-7; D.12.4, 6, 7; F.12.2, 7, 9-12; G.12.1, 5

Instructional Strategies

- 1. Teacher presentations 40%**
- 2. Lab experimentation 20%**
- 3. Group work 20%**
- 4. Visual presentations 10%**
- 5. Student presentations 10%**

Grading and percentages

- 1. Tests and Quizzes 50%**
- 2. Lab work and reports 20%**
- 3. Presentations and projects 20%**
- 4. Review sheets and assignments 10%**

Wisconsin Lutheran High School Science Department Outcomes

Unit 1: In the beginning, God created the heavens and the earth.

1. Students will be God centered thinkers who

- 1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.
- 1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

- 2.1 Express an understanding of the major concepts and principles of science and related technology.
- 2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

- 3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.
- 3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

- 4.1 Research, evaluate, and use scientific information from a variety of sources.
- 4.2 Contribute both independently and cooperatively with their peers.
- 4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 2: What is Biology?

1. Students will be God centered thinkers who

- 1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.
- 1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

- 2.1 Express an understanding of the major concepts and principles of science and related technology.
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- 4.1 Research, evaluate, and use scientific information from a variety of sources.
- 4.2 Contribute both independently and cooperatively with their peers.
- 4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 3: Chemistry in Biology.

1. Students will be God centered thinkers who

- 1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.
- 1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

- 2.1 Express an understanding of the major concepts and principles of science and related technology.
- 2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 4: Ecology.

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 5: Cells.

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 6: Genetics

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 7: Classification of living things.

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 8: Microorganisms and fungi.

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 9: Plants

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 10: Invertebrates.

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 11: Vertebrates.

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Unit 12: Human Body.

1. Students will be God centered thinkers who

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technology.

1.2 Apply God's Word as it relates to science issues

2. Students will be effective communicators who

2.1 Express an understanding of the major concepts and principles of science and related technology.

2.2 Analyze opinions and statements set forth by others.

3. Students will be innovative problem solvers who

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations.

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions.

4. Students will be self directed learners who

4.1 Research, evaluate, and use scientific information from a variety of sources.

4.2 Contribute both independently and cooperatively with their peers.

4.3 Make decisions using scientific knowledge to assess the effect of scientific discoveries on themselves and society.

Wisconsin State High School Science Standards

Unit 1: In the Beginning God created the Heavens and the Earth.

A.12.1 Apply* the underlying themes* of science to develop defensible visions of the future.

A.12.2 Show* how conflicting assumptions about science themes* lead to different opinions and decisions about evolution*, health, population, longevity, education, and use of resources, and show* how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future.

A.12.3 Give examples that show* how partial systems*, models*, and explanations* are used to give quick and reasonable solutions that are accurate enough for basic needs.

A.12.4 Construct* arguments that show* how conflicting models* and explanations* of events can start with similar evidence*.

A.12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.2 Identify* the cultural conditions that are usually present during great periods of discovery, scientific development, and invention.

B.12.3 Relate* the major themes* of science to human progress in understanding science and the world.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

B.12.5 Explain* how science is based on assumptions about the natural world and themes* that describe the natural world.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

E.12.3 Using the science themes*, describe* theories of the origins and evolution of the universe and solar system, including the earth system* as a part of the solar system, and relate these theories and their implications to geologic time on earth.

E.12.5 Using science themes*, understand* that the origin of the universe is not completely understood, but that there are current ideas in science that attempt to explain its origin.

Unit 2: What is Biology?

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.2 Identify* the cultural conditions that are usually present during great periods of discovery, scientific development, and invention.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

C. 12.6 Present the results of investigations* to groups concerned with the issues, explaining* the meaning and implications of the results, answering questions in terms the audience can understand.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

F. 12.11 Investigate* how the complexity and organization* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism.

F. 12.12 Trace how the sensory and nervous systems* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

G. 12.3 Analyze* the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and community.

G. 12.4 Show* how a major scientific or technological change has had an impact on work, leisure, or the home.

Unit 3: Chemistry in Biology.

A.12.2 Show* how conflicting assumptions about science themes* lead to different opinions and decisions about evolution*, health, population, longevity, education, and use of resources, and show* how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future.

A.12.3 Give examples that show* how partial systems*, models*, and explanations* are used to give quick and reasonable solutions that are accurate enough for basic needs.

A.12.4 Construct* arguments that show* how conflicting models* and explanations* of events can start with similar evidence*.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.2 Identify* the cultural conditions that are usually present during great periods of discovery, scientific development, and invention.

B.12.3 Relate* the major themes* of science to human progress in understanding science and the world.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

C. 12.6 Present the results of investigations* to groups concerned with the issues, explaining the meaning and implications of the results, and answering questions in terms the audience can understand.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

D.12.1 Describe* atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions*.

D.12.2 Explain* the forces that hold the atom together and illustrate* how nuclear interactions* change the atom.

D.12.3 Explain* exchanges of energy* in chemical interactions* and exchange of mass and energy in atomic/nuclear reactions.

D.12.4 Explain* how substances, both simple and complex, interact* with one another to produce new substances.

D.12.6 Through investigations*, identify* the types of chemical interactions*, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions.

F. 12.1 Evaluate* the normal structures and the general and special functions* of cells in single-celled and multiple-celled organisms.

F. 12.2 Understand* how cells differentiate and how cells are regulated.

F. 12.10 Understand* the impact of energy* on organisms in living systems*.

F. 12.11 Investigate* how the complexity and organization* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

G. 12.3 Analyze* the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and community.

Unit four: Ecology.

A.12.1 Apply* the underlying themes* of science to develop defensible visions of the future.

A.12.2 Show* how conflicting assumptions about science themes* lead to different opinions and decisions about evolution*, health, population, longevity, education, and use of resources, and show* how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future.

A.12.3 Give examples that show* how partial systems*, models*, and explanations* are used to give quick and reasonable solutions that are accurate enough for basic needs.

A.12.4 Construct* arguments that show* how conflicting models* and explanations* of events can start with similar evidence*.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*.

B.12.3 Relate* the major themes* of science to human progress in understanding science and the world.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

E. 12.1 Using the science themes*, distinguish between internal energies* (decay of radioactive isotopes, gravity) and external energies (sun) in the earth's systems and show* how these sources of energy have an impact on those systems.

E. 12.2 Analyze* the geochemical and physical cycles of the earth and use them to describe* movements of matter.

E. 12.4 Analyze* the benefits, costs, and limitations of past, present, and projected use of resources and technology and explain* the consequences to the environment.

G. 12.5 Choose a specific problem in our society, identify* alternative scientific or technological solutions to that problem and argue its merits.

H. 12.1 Using the science themes* and knowledge of the earth and space, life and environmental, and physical sciences, analyze* the costs, risks, benefits, and consequences of a proposal concerning resource management in the community and determine the potential impact of the proposal on life in the community and the region.

H. 12.2 Evaluate* proposed policy recommendations (local, state, and/or national) in science and technology for validity, evidence, reasoning, and implications, both short and long-term.

H. 12.3 Show * how policy decisions in science depend on social values, ethics, beliefs, and time-frames as well as considerations of science and technology.

H. 12.4 Advocate a solution or combination of solutions to a problem in science or technology.

H. 12.5 Investigate* how current plans or proposals concerning resource management, scientific knowledge, or technological development will have an impact on the environment, ecology, and quality of life in a community or region.

H.12.6 Evaluate* data and sources of information when using scientific information to make decisions.

Unit five: Cells.

A.12.1 Apply* the underlying themes* of science to develop defensible visions of the future.

A.12.2 Show* how conflicting assumptions about science themes* lead to different opinions and decisions about evolution*, health, population, longevity, education, and use of resources, and show* how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future.

A.12.3 Give examples that show* how partial systems*, models*, and explanations* are used to give quick and reasonable solutions that are accurate enough for basic needs.

A.12.4 Construct* arguments that show* how conflicting models* and explanations* of events can start with similar evidence*.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

C. 12.6 Present the results of investigations* to groups concerned with the issues, explaining the meaning and implications of the results, and answering questions in terms the audience can understand.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

D.12.1 Describe* atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions*.

D.12.2 Explain* the forces that hold the atom together and illustrate* how nuclear interactions* change the atom.

D.12.3 Explain* exchanges of energy* in chemical interactions* and exchange of mass and energy in atomic/nuclear reactions.

D.12.4 Explain* how substances, both simple and complex, interact* with one another to produce new substances.

D.12.6 Through investigations*, identify* the types of chemical interactions*, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions.

F. 12.1 Evaluate* the normal structures and the general and special functions* of cells in single-celled and multiple-celled organisms.

F. 12.2 Understand* how cells differentiate and how cells are regulated.

F. 12.10 Understand* the impact of energy* on organisms in living systems*.

F. 12.11 Investigate* how the complexity and organization* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

G. 12.3 Analyze* the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and community.

Unit six: Genetics.

A.12.2 Show* how conflicting assumptions about science themes* lead to different opinions and decisions about evolution*, health, population, longevity, education, and use of resources, and show* how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future.

A.12.3 Give examples that show* how partial systems*, models*, and explanations* are used to give quick and reasonable solutions that are accurate enough for basic needs.

A.12.4 Construct* arguments that show* how conflicting models* and explanations* of events can start with similar evidence*.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

C. 12.6 Present the results of investigations* to groups concerned with the issues, explaining the meaning and implications of the results, and answering questions in terms the audience can understand.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

F. 12.3 Explain* current scientific ideas and information about molecular and genetic basis of heredity.

F. 12.4 State the relationships between functions* of the cell and functions of the organism as related to genetics and heredity.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

G. 12.3 Analyze* the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and community.

Unit seven: Classification.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.2 Identify* the cultural conditions that are usually present during great periods of discovery, scientific development, and invention.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

Unit eight: Microorganisms and fungi.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.2 Identify* the cultural conditions that are usually present during great periods of discovery, scientific development, and invention.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

C. 12.6 Present the results of investigations* to groups concerned with the issues, explaining the meaning and implications of the results, and answering questions in terms the audience can understand.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

F. 12.1 Evaluate* the normal structures and the general and special functions* of cells in single-celled and multiple-celled organisms.

F. 12.2 Understand* how cells differentiate and how cells are regulated.

F. 12.7 Investigate* how organisms both cooperate and compete in ecosystems.

F. 12.8 Using the science themes*, infer* changes in ecosystems prompted by the introduction of new species, environmental conditions, chemicals, and air, water, or earth pollution.

F. 12.9 Using the science themes*, investigate* energy* systems* (related to food chains) to show* how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism.

F. 12.11 Investigate* how the complexity and organization* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism.

F. 12.12 Trace how the sensory and nervous systems* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

G. 12.3 Analyze* the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and community.

G. 12.4 Show* how a major scientific or technological change has had an impact on work, leisure, or the home.

Unit nine: Plants

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

C. 12.6 Present the results of investigations* to groups concerned with the issues, explaining the meaning and implications of the results, and answering questions in terms the audience can understand.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

F. 12.6 Using the concepts of evolution* and heredity, account for changes* in species and the diversity of species, include the influence of these changes on science, e.g. breeding of plants or animals.

F. 12.7 Investigate* how organisms both cooperate and compete in ecosystems.

F. 12.9 Using the science themes*, investigate* energy* systems* (related to food chains) to show* how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism.

F. 12.11 Investigate* how the complexity and organization* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism.

F. 12.12 Trace how the sensory and nervous systems* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

G. 12.4 Show* how a major scientific or technological change has had an impact on work, leisure, or the home.

Unit ten: Invertebrates.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

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C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

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C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

F. 12.7 Investigate* how organisms both cooperate and compete in ecosystems.

F. 12.9 Using the science themes*, investigate* energy* systems* (related to food chains) to show* how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism.

F. 12.12 Trace how the sensory and nervous systems* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

Unit eleven: Vertebrates.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

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C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

F. 12.6 Using the concepts of evolution* and heredity, account for changes* in species and the diversity of species, include the influence of these changes on science, e.g. breeding of plants or animals.

F. 12.7 Investigate* how organisms both cooperate and compete in ecosystems.

F. 12.9 Using the science themes*, investigate* energy* systems* (related to food chains) to show* how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism.

F. 12.12 Trace how the sensory and nervous systems* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

Unit twelve: The Human Body.

A. 12.5 Show* how the ideas and themes* of science can be used to make real life decisions about careers, work places, life-styles, and use of resources.

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events.

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*.

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences.

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications.

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations.

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data.

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*.

C. 12.6 Present the results of investigations* to groups concerned with the issues, explaining the meaning and implications of the results, and answering questions in terms the audience can understand.

C. 12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design.

D.12.4 Explain* how substances, both simple and complex, interact* with one another to produce new substances.

D.12.6 Through investigations*, identify* the types of chemical interactions*, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions.

D. 12.7 Qualitatively and quantitatively analyze* changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically.

F. 12.2 Understand* how cells differentiate and how cells are regulated.

F. 12.7 Investigate* how organisms both cooperate and compete in ecosystems.

F. 12.9 Using the science themes*, investigate* energy* systems* (related to food chains) to show* how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism.

F. 12.10 Understand* the impact of energy* on organisms in living systems*.

F. 12.11 Investigate* how the complexity and organization* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism.

F. 12.12 Trace how the sensory and nervous systems* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses.

G. 12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered.

G. 12.5 Choose a specific problem in our society, identify* alternative scientific or technological solutions to that problem and argue its merits.