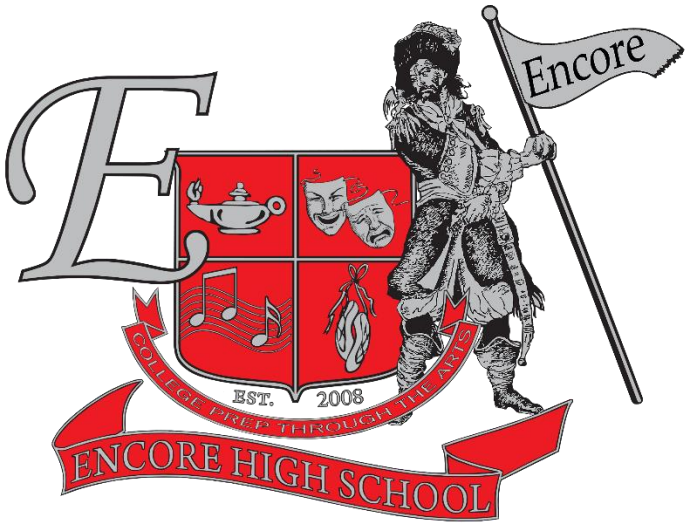

"D" COURSE CATALOG

2020/2021 SCHOOL YEAR

2020/2021

ENCORE EDUCATION CORPORATION
16955 Lemon Street, Hesperia, CA 92345

ENCORE
Junior & Senior High School for the Arts

COURSE CATALOG 2020/2021

Contents

College Board Approved A-G Courses

Science

AP Biology

Basic Course Information:
Title: AP Biology
Length of Course: Full Year
Subject Area: Science (D) / Life Sciences
UC Honors Designation? Yes
Prerequisite: Math I
Co-requisites: None
Integrated (Academics / CTE): No
Grade Levels: 11th & 12th
Course Description: This course is adopted from **The College Board Advanced Placement Program**. Please refer to their course list for a full course description.

Biology

Basic Course Information:
Title: Biology
Length of Course: Full Year
Subject Area: Science (D) / Life Sciences
UC Honors Designation? No
Prerequisite: Math I
Co-requisites: Math II (recommended)
Integrated (Academics / CTE): No
Grade Levels: 9th & 10th
Course Description: ***Semester 1 Laboratory Biology A***, College Prep Correlated directly with the California State Content Standards and the Next Generation Science Standards, *Laboratory Biology A* begins with the study of the cell. The cell cycle and cancer are investigated. Cellular energy including respiration and photosynthesis are investigated. The pivotal role of ATP in energy transfer is studied. Mendelian genetics and genetics since Mendel are investigated. Molecular genetics including DNA analysis, DNA fingerprinting and recombinant DNA are explained. Biomolecules are studied including

carbohydrates, lipids, proteins, and nucleic acids. Enzymes and the factors that affect their activity are explored. The immune system, infectious diseases, and pathogens are investigated. Students are presented with a wide variety of information, activities, and experiences related to major areas of study in the field of Biology.

Semester 2 Laboratory Biology B, College Prep
Correlated directly with the *California State Content Standards* and the *Next Generation Science Standards*, *Laboratory Biology B* includes the study of the human nervous and endocrine systems, reproduction in plants and animals, the domains and kingdoms of life, the Linnaean classification system, the history of life on Earth, the evolution of life, and ecology. With rigor, depth, and breadth of content and through directed assignments, students are presented with a wide variety of information, activities, and experiences related to major areas of study in the field of Biology.

Unit 1 – Cellular Structures and Functions

Unit 1 is an introduction to cell biology. The nature of Science and the Scientific Method will be explored. The Cell Theory states that all living things are made up of cells. The two basic types of cells, prokaryotic and eukaryotic, are explained. The complex structure of eukaryotic cells will be investigated. Students will learn to effectively operate a laboratory microscope and use it to examine a variety of cells. This unit introduces the science of Biology.

- The Cell Theory and the types of cells are explained.
- The make-up and function of genes is explored.
- Cancer is introduced and the role of mutations that upset the normal cell cycle in causing cancer is explained.

Goals: Upon completion of this Unit, students will:

- compare and contrast viruses and living things.
- explain how cancer cells differ from normal cells.
- explain the relationships between genes and proteins.
- explain how cancer cells differ from normal cells.
- interpret scientific data.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- compare and contrast prokaryotic and eukaryotic cells.
- compare and contrast plant cells and animal cells.

- trace the pathway followed by proteins made in a cell to be secreted out of the cell.
- explain the role of the chloroplasts in capturing light energy and transforming it to chemical energy in glucose and other carbohydrates.
- explain the role of mitochondria in transforming chemical energy of carbohydrates into usable chemical energy in the form of ATP.
- describe the normal cell cycle and which key events occur during mitosis and interphase.
- distinguish between benign and malignant tumors.
- define and describe the replication of DNA.
- define and describe the transcription of RNA from DNA.
- define and describe the translation of mRNA to produce a protein.
- use a codon chart to determine the amino acid sequence encoded by a given mRNA sequence.
- given a 4 triplet DNA sequence, determine the sequence of the complementary DNA strand.
- given a 4 triplet DNA sequence, determine the 4 codon sequence of mRNA.
- distinguish between insertions, deletions, and substitution.
- distinguish between a substitution and frameshift mutation.
- compare and contrast missense and nonsense mutations.
- describe how the sequence of nucleotides in DNA determines the amino acid sequence in a protein.
- compare and contrast the structure of DNA and RNA.
- explain the functions of the 3 types of RNA in protein synthesis.

Lab 1: Selective Permeability: Osmosis and Diffusion

Procedures for Lab 1: Selective Permeability

1. Obtain a 5-6 inch piece of dialysis tubing.
2. Place the tubing in water; it will quickly become soft and pliable.
3. Tie a "half hitch" knot near one end of the tubing.
4. Rub the end of the tubing opposite the knot between the thumb and index finger. Keep the tubing under water. You should be able to open the tubing.
5. Using a funnel, fill the tubing about 2/3 full with the starch/glucose mixture.
6. Leaving empty space between the liquid and the knot, tie the open end of the bag with string near the end. Notice how much liquid is in the bag.
7. Rinse the bag thoroughly under running water.
8. Place the bag in a beaker and add just enough water to cover the bag. Try to allow the end of the bag tied with the string to drape over the top of the beaker.
9. After 20-30 minutes, observe the liquid outside and inside the bag. Note the color and amount of the liquids in the bag and outside the bag.
10. Remove the bag from the beaker. Note the color and amount of liquid in the bag. Dispose of the bag.

11. Place a beaker containing about 3 inches of tap water on a hot plate and boil.
12. Pour about 1-2 inches of the water from the beaker that contained the bag into a test tube. NOTE this is water from the beaker NOT the bag.
13. Add several droppers full of Benedict's solution to the test tube. The water should be sky blue in color. If not, add more Benedict's solution.
14. Place the test tube in the beaker of boiling water. After it has boiled, observe the color. If it remains blue, no glucose has diffused out of the bag.
15. Record your observations and results in the data table.

Interpreting the Lab Tests

1. Lugol's solution (iodine) is a test for starch. The color of Lugol's solution changes from yellow-brown to blue-purple/black in the presence of starch. If the color remains yellow/brown, no starch is present.
2. Benedict's solution is a test for glucose. In the presence of glucose, boiled Benedict's solution will change in color from blue to green, yellow, or orange. If boiled Benedict's solution remains blue, no glucose is present.

Lab 2: Introduction to the Microscope

Lab 3: Looking at Eukaryotic Plant and Animal cells

Lab 4: Cell Diversity

Lab 5: Mitosis

Unit 2: Cellular Energy, Respiration, and Circulation

Unit 2 introduces the concept of energy for life. ATP is defined as the universal energy currency of life. The capture of solar energy by autotrophs through photosynthesis and the conversion of the chemical energy of food molecules into usable energy as ATP through cellular respiration are explored. Organ systems are defined and students are introduced to:

- The respiratory and circulatory systems.
- Photosynthesis and respiration.
- The complementary function of the respiratory and circulatory systems in delivering oxygen to all body cells while removing the carbon dioxide waste is studied.

This Unit introduces the concept of energy for life. ATP is defined as the universal energy currency of life. The capture of solar energy by autotrophs through photosynthesis and the conversion of the chemical energy of food molecules into usable energy as ATP through cellular respiration are explored. Organ systems are defined and students are introduced to the respiratory and circulatory systems. The complementary function of the respiratory and circulatory systems in delivering oxygen to all body cells while removing the carbon dioxide

waste is studied.
Goals: Upon completion of this Unit 2, students will:

- define and identify examples of autotrophs and heterotrophs.
- explain the role of photosynthesis in making food and oxygen for all living things.
- explain the forms of cellular work and the energy role of ATP.
- explain the energy transforming roles of the chloroplasts and mitochondria.
- cite the organs and functions of the respiratory system.
- cite the organs and functions of the circulatory system.
- explain how cells are organized to higher levels of organization.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- list the types of cellular work that require ATP.
- list the 3 stages of cellular respiration and identify which stages are aerobic.
- define fermentation and explain how it is beneficial.
- describe how mitochondria use energy release from electron transfer to generate a chemiosmotic gradient and make ATP.
- list the reactants and products for cellular respiration.
- list the products and reactants for photosynthesis.
- list the products of the light-dependent stage of photosynthesis and cite the location of this stage in the chloroplasts.
- describe how the energy from electron transfer is used by the thylakoid membranes to produce a chemiosmotic gradient that ATP Synthase can use to make ATP.
- explain how plants and algae can use light, water, and carbon dioxide to make food and oxygen for themselves and autotrophs.
- explain the gas exchanges that take place in external and internal respiration.
- tell how the diaphragm causes negative pressure breathing.
- identify the chambers of the heart; tell from where each receives its blood and where to blood goes when leaving the chamber.
- list the general types of cells in the blood and the function of each type.

Lab 1: Glycolysis and Fermentation

Procedures for Preparing Sucrose Solutions

1. Label 4 cups: 0%; 1%; 5% and 10%.
2. Add 50 mL of warm water to the cup labeled 0% (use the graduated cylinder to measure the water for each cup).
3. Weigh out 1 g of sucrose and put it in the cup labeled 1%. Add 49 mL of warm water to the cup and stir.
4. Weigh out 5 g of sucrose and put it in the cup labeled 5%. Add 45 mL of warm water to the cup and stir.

Weigh out 10 g of sucrose and put it in the cup labeled 10%. Add 90 mL of warm water to the cup and stir.

Procedures for Preparing Test Tubes

1. Label 5 test tubes with masking tape or a sharpie pen as follows: 0%; 1%; 5% with yeast; 5% NO yeast; 10%.
2. Using the liquid from the cup labeled 0% measure out 15 mL (use graduated cylinder)and place it in the test tube labeled 0%.
3. Using the liquid from the cup labeled 1% measure out 15 mL (use graduated cylinder)and place it in the test tube labeled 1%.
   Be sure to rinse out the cylinder before the next step!
4. Using the liquid from the cup labeled 5% measure out 15 mL (use graduated cylinder)and place it in the test tube labeled 5% with yeast.
5. Using the liquid from the cup labeled 5% measure out 15 mL (use graduated cylinder)and place it in the test tube labeled 5% NO yeast.
   Be sure to rinse out the cylinder before the next step!
6. Using the liquid from the cup labeled 10% measure out 15 mL (use graduated cylinder)and place it in the test tube labeled 10%.

Procedures for Observing the Effects of Sucrose Concentrations on the Rate of Fermentation

1. Add 1/8 teaspoon of dry yeast to the test tube labeled 0%. Place thumb over the mouth of the tube and shake.
2. Quickly place a balloon over the mouth this test tube.
3. Repeat steps 1 and 2 above for all the test tubes except the test tube labeled "5% NO YEAST". DO NOT ADD YEAST TO THIS TEST TUBE. Shake this test tube and add a balloon, but no yeast. This is the control to show what happens without yeast.
4. On your data table, record how the test tubes look before any time has elapsed under "0 Minutes".
5. Wait 10 minutes and measure the depth of bubbles on top of each tube in mm, using the ruler. Record this information on the data table.

6. Observe the balloons for comparative size changes due to the amount of carbon dioxide produced. Which inflated the most? Which inflated least? Record your answers to these questions on your data table.
7. Wait another 10 minutes, and repeat steps 5 and 6 above.

Lab 2: Photosynthesis and Cellular Respiration

Lab 3: Regulation of Breathing

Lab 4: Breathing Capacity

Lab 5: Blood Pressure and Heart Sounds

Unit 3: Genetic Heredity, Variation, and DNA Technology

Unit 3 delves into the branch of Biology called "Genetics." Genetics is the study of heredity. Heredity is the transmission of characteristics, or traits, from parents to their offspring. Asexual reproduction requires only one parent and produces offspring that are genetically identical to each other and the parent.

- The role of sexual reproduction in generating genetic diversity will be examined.
- A detailed study of the special cell division process of meiosis will be done.
- Karyotypes will be made and analyzed.
- Pedigrees will be analyzed.
- The structure of DNA will be investigated and the technology utilized to analyze and alter DNA will be explored.

This Unit examines the study of heredity or how traits are passed from parents to their offspring in an introduction to genetics. The study begins with the role of sexual reproduction in producing the genetic variation that allows species to adapt to changing environments. The special cell division process called meiosis is studied. How gender is determined in humans is explained and the technique of karyotyping is introduced. Then the contributions of Gregor Mendel, the father of genetics, are investigated. The different patterns of inheritance are investigated including patterns discovered after Mendel's time. Students will learn how to predict the genetic traits of offspring from the genes of their parents. DNA technology is examined including recombinant DNA production and uses and DNA fingerprinting and its uses.

Goals: Upon completion of this Unit, students will:

- explain the difference between mitosis and meiosis.
- compare asexual and sexual types of reproduction.
- tell how the gender of of human beings is determined.
- tell why an individual animal inherits half of its DNA from each parent.
- describe the patterns of inheritance.
- define recombinant DNA and explain how it is used to benefit mankind.

- describe how a DNA fingerprint is made using restriction enzymes and gel electrophoresis.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- define genetics as the study of heredity.
- distinguish between autosomes and sex chromosomes.
- explain the difference between haploid and diploid chromosome numbers; given the haploid number, determine the diploid number.
- compare the location and outcomes of mitosis and meiosis.
- classify a selection of human cells as either haploid or diploid.
- tell how the gender of humans is determined and why the male determines the gender of the offspring.
- list two ways meiosis produces genetic variation.
- define crossing-over and know that it only occurs during Prophase I of meiosis.
- recognize normal human karyotypes and recognize karyotypes with an abnormal number of chromosomes.
- using simulated human chromosome diagrams, construct a normal and abnormal karyotype.
- recognize homozygous dominant, homozygous recessive, and heterozygous genotypes.
- explain the difference between genotype and phenotype and give an example of each.
- define the following patterns of heredity and give an example of each: incomplete dominance, codominance, sex-linkage, and multiple alleles.
- given genotypes of parents and pattern of heredity, determine the genotypic and phenotypic ratios expected for offspring for each pattern above.
- explain the relationship between distance apart and crossing-over frequency for linked genes.
- define the product rule and use the product rule to determine phenotypic ratios in a dihybrid cross.
- recognize the 9:3:3:1 phenotypic ratio for a dihybrid cross.
- given a pedigree showing a genetic disorder, determine the inheritance pattern type and genotypes for the individuals shown.
- define independent assortment.
- define recombinant DNA and tell how a recombinant plasmid is made using a restriction enzyme, a human (exogenous DNA) gene, and DNA ligase.
- identify the shortest and longest DNA fragments on a DNA fingerprint resulting from gel electrophoresis.

- list at least 3 proteins being produced using recombinant DNA techniques.
- determine paternity from DNA fingerprints of parents and offspring.

Lab 1: Looking at Karyotypes

Procedures for Making a Karyotype from Normal Chromosomes:

1. **Print a copy of "Answer Sheet for Karyotypes"** (see Answer Sheet tab). Label it "Normal Karyotype". Paste it into your notebook under Unit 3, Lab 1 Normal Karyotype.
2. **Print a copy of the chromosomes for "A Normal Karyotype"** (see Normal Karyotype tab). You will be cutting these chromosomes apart and pasting them or taping them onto your "Normal Karytotype Answer Sheet".
3. Determine if the individual is a male or female from the "A Normal Karyotype." This is easy because there will be two chromosomes that are labeled X, or one that is labeled X and another that is labeled Y. These are the sex chromosomes.
4. **Refer to the Karyotype Chromosome key** that shows the different chromosomes in their correct places (chromosome 1, 2, 3, etc.). Note that this key only shows ONE OF THE TWO matching chromosomes.
5. Look for TWO chromosome on the sheet of normal chromosomes that match chromosome number 1 on the key. **Carefully cut** out these two chromosomes and **paste or tape** them on your answer sheet for a normal karyotype in the No.1 position.
6. Continue to do this for all 22 chromosome pairs.
7. Paste or tape the sex chromosomes in the last place on the answer sheet.

Observations of a Normal Karyotype:
Copy the following questions and answer them in your notebook under "Unit 3, Lab 1: Observations of a Normal Karyotype"

1. Was the normal karyotype for a male or female? How do you know?
2. How many autosomes were there?

Lab 2: Human Traits and Variation

Unit 4: The Digestive System and Biomolecules

This Unit focuses on topics related to the types of biomolecules. Students will use the topic of the digestive system to explore the precursors that make up biomolecules. Biomolecules are digested to precursors and the precursors are absorbed into the blood. Macromolecules are

built by bonding together precursors utilizing condensation reactions. The properties of water and its unique role in living things are examined. Students are introduced to:

- The structure and functions of the digestive system.
- The types of biomolecules, their precursors, and their functions in living systems.
- Enzyme structure and the factors that affect enzyme activity.
- Water structure and unique characteristics.

This Unit begins with a survey of the human digestive system. Mechanical and chemical digestion are introduced and the roles of the organs of the digestive system are explained. The digestive enzymes produced by each digestive organ and their functions are discussed. The important groups of biological molecules are surveyed. The monomers of these biological molecules are reviewed and their functions discussed. Finally, the structure and properties of water are explained.

Goals: Upon completion of this Unit, students will:

- explain why digestion is necessary.
- label the digestive organs on a diagram.
- distinguish between mechanical and chemical digestion.
- list functions of the organs of the digestive system.
- list the monomers of the major groups of biological molecules.
- explain the relationships between enzymes, active sites, substrates, and products.
- describe the properties of water that result from the hydrogen bonding between polar water molecules.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- summarize the digestion that takes place in the mouth cavity.
- explain the action of the enzyme salivary amylase.
- define peristalsis and describe its role in digestion.
- describe the secretions and digestive functions of the stomach.
- explain the role of bile in emulsification of fats and oils.
- list the secretions of the pancreas and their functions.
- list 3 modifications of the small intestine that increase its surface area for digestion and absorption.
- explain why the stomach does not normally digest itself.

- list the digestive end products that can be absorbed into the blood from the villi of the small intestine.
- summarize the functions of the large intestine.
- list the types of carbohydrates and their functions.
- identify amino acids as the monomers of proteins and list the functions of proteins.
- describe the types of lipids and their functions.
- explain that enzymes are proteins that act as catalysts and list conditions that alter enzyme activity.
- tell why excessive heat can stop an enzyme-catalyzed chemical reaction.
- list at least 4 properties of water resulting from hydrogen bonding.

Lab 1: Surface Area

Lab 2: Looking at Amylase

Lab 3: Investigating the Properties of Water

Procedures for Observing Cohesion, Part A:
Polar molecules cling to each other (cohesion), causing surface tension. Non-polar molecules are not attracted to each other and do no cohere to each other.

1. **Print a copy of Data Chart Part A** (see Data Charts tab) **and paste it into your Biology notebook under "Unit 4, Lab 3, Cohesion Data".**
2. On a piece of wax paper, add a drop of water with the medicine dropper. Get down at eye level and look at the drop. Record how it looks on Data Chart Part A.
3. With your finger, **NOT THE MEDICINE DROPPER**, add a drop of vegetable oil to the wax paper (do not allow the 2 drops to mix!). Observe the oil drop at eye level. Note how it compares to the water drop. Record your observations on the Data Chart for Part A. On the Data Chart, state why you think the two drops look different.
4. Place a penny in the center of the wax paper. Make a prediction as to how many drops of water you can add to the top of the penny before water runs off onto the wax paper. Write this prediction on the Data Chart Part A.
5. Get down at eye level and slowly add 1 drop of water at a time. Observe how the water looks as it is placed on the penny. Count the number of drops you can add before water spills onto the wax paper. Record your observations and the number of drops the penny held on the Data Chart Part A.

Procedures for Surface Tension and the Shape of Ships, Part B:
Ships usually come in two shapes; flat like a barge and "V" shaped like ski boats. Think about why this may be and how the shape of a ship helps to serve the purpose it was designed

for. **CAUTION--DO NOT LET THE DETERGENT NEAR THE WATER OR NEAR THE BOATS YOU ARE GOING TO MAKE AT THIS TIME!!**

1. **Print a copy of Data Chart Part B (see Data Charts tab) and paste it into your Biology notebook under "Unit 4, Lab 3, Shape of Ships Data".**
2. Put about 2 inches of water in a pan. It must be clean and detergent free!!!
3. Cut two pieces of aluminum foil into 4 inch squares. Mold one of the squares into a boat that looks like Shape A. It should be narrow and long with just a little flatness on the bottom. Shape the other piece of foil into a square that is totally flat on the bottom like Shape B.
4. Make sure each boat floats. Adjust their shapes so they do.
5. Place pennies (or other cargo that is being used) into each boat, one at a time. Keep going until the boats sink. If a boat rests on the bottom and doesn't turn over, it is considered to be sunk. Record the number of pennies each boat could hold on Data Chart Part B. Comment on the shape of the boats and why you think one shape held more pennies than the other on Data Chart Part B.
6. Remove both boats and shake off the water they have taken on.
7. Reshape the narrow boat and make sure it can still float.
8. Take the narrow boat OUT of the water. With your finger, paint a good size drop of detergent on the back of the narrow boat where a motor would sit. **MAKE SURE NOT TO TOUCH ANY OTHER PART OF THE BOAT WITH DETERGENT.**
9. Being careful not to put the finger that had detergent on it in the water, lower the boat gently into one side of the pan. **BE SURE THAT THE END WITH THE DROP OF DETERGENT IS THE LAST PART OF THE BOAT TO ENTER THE WATER** and immediately let go. You will only be able to do this one time unless you clean out the tub and put fresh water in it. A tiny amount of detergent breaks the surface tension of water and has to be completely washed out before repeating the process.
10. Record what happened on Data Chart Part B. State why you think it happened.

Unit 5: Homeostasis, the urinary system, and the immune system

This Unit focuses on topics related to homeostasis, disease, and the body's defense mechanism against disease -- the immune system. Students will explore:

- Homeostasis and how the urinary system maintains water balance while removing nitrogenous wastes.
- Types of infectious diseases and types of pathogens.
- The immune system: defense against infections. Non specific and specific defense; active and passive immunity; cellular and humoral immunity.
- Antibiotics and their role in fighting infections.

This Unit begins with an investigation of the process of homeostasis. The role of the urinary system in maintaining homeostasis is examined. The organs and functions of the urinary system are explored. The types of pathogens that can cause infectious diseases are studied. The immune system is presented. The types of immunity are explored including humoral immunity and cellular immunity and specific and non specific immunity. The mechanism by which HIV attacks the immune system is investigated.

Goals: When Unit 5 has been completed, the student should be able to:

- define homeostasis.
- list the organs that comprise the urinary system.
- identify the nephron as the functional unit of kidney.
- define filtration, tubular reabsorption, and tubular secretion.
- compare and contrast specific and non specific immunity.
- list the 4 types of transmission of pathogens.
- explain the difference between antibody-mediated and cell-mediated immunity.
- explain how immunizations affect the immune system.
- describe how infection with HIV disables the immune system.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- given the environment of a cell, predict the direction of osmosis through the cell membrane in or out of the cell.
- label a diagram of the human urinary system including the kidneys, ureters, urinary bladder, and urethra.
- label a diagram of a nephron including the glomerulus, Bowman's capsule, proximal convoluted tubule, loop of Henle, and distal convoluted tubule.
- identify the sites of reabsorption, filtration, and secretion on the diagram of the nephron.
- define pathogens and list five types of pathogens.
- compare and contrast bacteria and viruses.
- explain why bacteria are the only type of pathogens that are treated with antibiotics.
- list 4 types of transmission of pathogens and cite one example of a disease spread by each type.
- describe non-specific resistance to infection and cite examples of non-specific resistance.
- compare and contrast the origin and functions of B and T lymphocytes.
- describe the role of B lymphocytes in providing antibody-mediated immunity.

- describe the role of Killer T lymphocytes and Helper T lymphocytes in providing cell-mediated immunity.
- explain the role of the Helper T lymphocytes in directing the immune system.
- describe the relationship of an antigen to an antibody.
- explain how HIV infection results in results in a lack of immunity as a result of loss of Helper T cells.
- describe how immunizations cause a primary immune response and prepare the body for secondary immune responses.
- explain the origin and function of B and T Memory Cell.
- distinguish between active and passive immunity and recognize examples of each type.

Lab 1: Homeostasis

Lab 2: How Micro organisms are spread

Procedures for Preparing Gelatin Nutrient Cups:

1. Add 4 cups of water to the saucepan.
2. Bring the water to a boil and stir in 4 packets of gelatin.
3. Add the 4 beef or chicken bouillon cubes and stir until dissolved.
4. Stir in 8 teaspoons of table sugar and continue boiling until all ingredients are completely dissolved, then turn off the heat.
5. Allow the pan to cool for 5 minutes.
6. Place 8 aluminum cupcake cups in the cupcake tray. Fill each cup about 1/3 full with the gelatin mixture.
7. Cover the tray with plastic wrap and place in the refrigerator for 2 hours or overnight; this will cause the gelatin to solidify.
8. When the gelatin has solidified, keep them covered with plastic wrap.

Procedures for setting up the experiment:

1. Gently roll back the plastic wrap so **ONLY THE FIRST TWO CUPS ARE UNCOVERED**.
2. For cups 1 & 2: Without washing hands or touching anything intentionally, lightly touch two fingers to the gelatin in both cups.
3. Put each cup in its own ziplock bag and label the bags, “fingers unwashed." Use masking tape to label the bags near the edge.
4. Wipe fingers with a paper towel. **DO NOT WASH YOUR HANDS!**
5. Gently roll back the plastic wrap so **ONLY THE NEXT TWO CUPS ARE UNCOVERED. KEEP THE REMAINING CUPS COVERED.**
6. For cups 3 & 4: Rub a dollar bill across your fingers as if you were washing your hands with it. Gently touch two fingers to the surface of the gelatin in cups 3 & 4.

7. Put each cup in its own ziplock bag and label them, “money." Use masking tape to label the bags near the edge.
8. Now wash your hands with soap and hot water for 30 seconds and dry them on a CLEAN paper towel. Do not not use a dish towel.
9. Gently roll back the plastic wrap so **ONLY THE NEXT TWO CUPS ARE UNCOVERED. KEEP THE REMAINING CUPS COVERED.**
10. For cups 5 & 6: Gently touch two fingers of your washed hands to the surface of the gelatin in both cups.
11. Put each cup in its own ziplock bag and label them, “washed hands." Use masking tape to label the bags near the edge.
12. For cups 7 & 8: **Do not touch the gelatin.** Place each cup in its own ziplock bag and label them "untouched". This is the control for this experiment.
13. Keep the cups in a warm dark place where they will not be disturbed. **DO NOT** put them in the refrigerator. For the next four days, observe the cups. Look for bacteria and fungus colonies on the surface of the gelatin. Bacteria colonies are shiny with a smooth surface. They can be off-white or colored yellow, orange, or red. Fungus colonies look fuzzy and have uneven edges. Be careful not to touch the surface of the gelatin or contaminate the cups.
14. Check for colonies for four consecutive days. Be sure to notice which cups show bacteria or fungi colonies first.
15. Count colonies on the fourth day. Each colony that appears on the gelatin came from one cell that contacted the gelatin. The more bacteria on your fingers, the more colonies will appear. Different colors of colony represent different species of bacteria.
16. **Print the data table (see Data Table tab) on the next page and paste it into your notebook.** Enter the number and different kinds of colonies you see in each cup.

Unit 6: Human Nervous and Endocrine Systems

This Unit is an introduction to the communication, coordination, and control systems of the body. The neuron, the basic unit of structure and function of the nervous system, is investigated. The nerve impulse is explored. The divisions of the nervous system and their functions are examined. The sensory system and motor system are investigated. Experiments are conducted to investigate the senses and reactions. The endocrine system and the various endocrine glands and their hormones are studied. The feedback mechanism utilized by the endocrine system to control body processes is examined. Students are introduced to:

- the neuron and nerve impulse.
- the central and peripheral nervous systems and their respective functions.
- the sensory and motor systems.
- the motor system and the types of muscles.
- the endocrine system and its component glands and hormones.
- endocrine vs. exocrine glands.

- feedback mechanisms.
- laboratory investigations on "Reaction Time," "Touch Receptors", "Location of Taste Buds", and "Chicken Wing Dissection."

This Unit will focus on topics related to the body's ability to detect and respond to changes in both its internal and external environments through the coordinated function of the nervous and endocrine systems. The students will examine the structures and functions of the body's nervous system. In particular, students will explore the variety of sensory systems in humans and other vertebrates. In addition, students will learn how the nervous system and the muscles of the body work together to provide an active response to changing conditions. Finally, students will understand how the hormone-based endocrine system is used to maintain homeostasis and plays a key role in development through coordination with the nervous system.

Goals: Upon completion of this Unit, students will:

- know that the nervous and endocrine systems coordinate and control functioning of the other body systems to maintain homeostasis.
- understand that the nervous system controls functions through nerve impulses which are extremely fast-acting and specific in their targets.
- understand that the endocrine system controls functions utilizing hormones that circulate in the blood but only affect specific target cells.
- describe the branches of the nervous system and the components of each branch.
- know that receptors are cells that change stimulus energy into nerve impulses that are sent to the brain.
- describe the different types of receptors involved in the senses of smell, taste, touch, hearing, vision, and balance.
- explain that there are three types of muscle tissue and explain where each type is located in the body.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- describe the roles of the parts of a generalized neuron.
- describe the three general types of neurons and their functions.
- identify the structures/functions of the central nervous system.
- identify the structures/functions of the peripheral nervous system.
- describe the mechanism of transmission of nerve impulses.

- describe the variety of types of sensory structures and their functions, including senses such as smell, taste, touch, hearing, vision, and balance.
- distinguish between the three muscle types.
- explain the roles of actin, myosin, neurotransmitters and calcium in the generation of a muscle contraction.
- describe the structure of skeletal muscle cells.
- explain the role of hormones and receptors in regulation of blood sugar and in development of reproductive characteristics.
- describe examples of negative feedback systems.
- explain the role of the hypothalamus of the brain in linking the nervous system and the endocrine system.
- explain the difference between an endocrine gland and an exocrine gland and cite an example of each type of gland.

Lab 1 - Reaction Time

Part I: Reaction Time with a Visual Stimulus

1. Have your partner seated with one hand extended.
2. Stand beside your partner holding the ruler with the lowest number at the bottom and the highest number at the upper end. For example, 1 cm at the bottom and 30 cm at the upper end. Hold the ruler from the top between your index finger and thumb.
3. Have your partner place their thumb and index finger of one hand near the bottom of the ruler. They are to keep their thumb and index finger about two inches apart. THEY SHOULD NOT HAVE CONTACT WITH THE RULER. Their index finger and thumb should "surround" the bottom end of the ruler.
4. Holding the ruler from the top, drop the ruler and have your partner "catch" the ruler between their thumb and index finger.
5. Notice the measurement on the ruler. Note the centimeters that the ruler dropped to the nearest millimeter. Measure the centimeters and millimeters at the top edge of the thumb and index finger. This is a practice run.
6. Practice two more times. Since this is a practice, DO NOT record results on data table.
7. Once you have practiced this activity three times, repeat these instructions for the first trial run. Record how many cm the ruler dropped in the data table.
8. Repeat 4 more times. Record the results. Add your 5 measurements and divide by 5 to get your average. Record this information in the data.
9. Change roles with your partner and repeat steps 1-8.

Part II: Reaction time with an Auditory Stimulus

1. Have your partner close his or her eyes and look away from you.
2. Hold the ruler as in part I.

3. As you drop the ruler, say "NOW!" Your partner is to catch the ruler as before. Make sure you say "NOW" at exactly the same time as you release the ruler to drop. Practice the process two more times.
4. Now repeat the process 5 times, recording the cm the ruler drops each time in the data table. Add your 5 measurements and divide by 5 to get your average. Record in the data.
5. Switch roles with your partner and repeat steps 1-4.

Part III: Reaction time with a Tactile (Touch) stimulus

1. Again, have your partner close his or her eyes and look away.
2. Hold the ruler and as you did in parts I and II.
3. As you drop the ruler, tap your partner lightly on the arm or leg. Be sure to tap at exactly the same time as you release the ruler.
4. Practice the process two more times.
5. Now repeat the process 5 times, recording the cm the ruler drops each time in the data table. Calculate and record your average.
6. Switch roles with your partner and repeat steps 1-5.

Lab 2 - Locating Light Touch Receptors

Lab 3 - Mapping the taste buds

Lab 4 - Chicken Wing Dissection

Unit 7: Reproduction

This Unit introduces the concept of reproduction. All living things must reproduce to continue to exist. There are two fundamental types of reproduction, sexual reproduction and asexual reproduction. Sexual reproduction involves the processes of meiosis and fertilization and produces genetic variation. Asexual reproduction involves only a single parent which produces genetic clones of itself. Plants have life cycles involving alternation of diploid and haploid generations. Students are introduced to:

- sexual and asexual reproduction.
- meiosis and fertilization.
- external and internal fertilization.
- sexual reproduction in plants.
- flowers, seeds, and fruits.
- plant structures and functions.
- plant tropisms.
- laboratory investigations on "Flower Structure and Function," "Classification of Fruits," "Leaf Structure and Function," "Stem Structure and Function," "Root Structure and Function," and "Geotropism."

This Unit addresses asexual and sexual reproduction in plants and animals. The advantages of asexual and sexual reproduction are considered. The vegetative propagation of agricultural tree fruits is examined. The structure and functions of the organs of the flowering plants, also known as angiosperms, is investigated. Students will complete laboratory activities on flowers, fruits, leaves, stems, and roots. Tropisms of plants are examined and a laboratory activity investigates geotropism in corn seedlings.

Goals: Upon completion of this Unit, students will:

- describe asexual reproductive strategies in animals.
- describe asexual reproductive strategies in plants.
- describe the roles of meiosis and fertilization in sexual reproduction.
- describe the process of asexual plant propagation.
- understand why sex is maintained as a reproductive strategy in so many organisms.
- describe the role of the flower in sexual reproduction of flowering plants.
- tell why many vegetables are actually fruits.
- list the four major organs of plants and their functions.
- compare and contrast monocots and dicots.
- define tropism and describe the geotropisms of shoots and roots.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- explain the difference between sexual and asexual reproduction.
- list four forms of asexual reproduction that occur in plants.
- list four forms of asexual reproduction that occur in animals.
- list two ways meiosis generates variation.
- explain the difference between external fertilization and internal fertilization.
- tell why internal fertilization is necessary for most terrestrial animals and plants.
- identify the parts of a complete flower and list the function of each part.
- define pollination.
- tell how flowering plants undergo double fertilization.
- explain the difference between a seed and a fruit.
- explain the role of the stomata of leaves.
- describe the structure of a typical leaf.
- describe the functions of stems.
- describe the functions of roots.
- explain four differences between monocots and dicots.
- describe geotropism in shoots and roots.

- explain the difference between positive and negative tropisms.

Lab 1 - Flower Structure and Function

Lab 2 - Classification of Fruit

Lab 3 - Leaf Structure and Function

Lab 4 - Observing Vascular Bundles

Lab 5 - Stems of Dicots and Monocots

Lab 6 - Herbaceous Dicot Root Structure and Function

Lab 7 - Geotrophism in Germinating Seeds

Procedures:

1. Place 8 corn seeds in a cup and add enough water to cover them.
2. Soak the seeds in water overnight
3. Saturate 8 cotton balls with water
4. Open a CD case and place a saturated cotton ball at 9 O'clock, 12 O'clock, 3 O'clock, and 6 O'clock positions. It is important that the cotton balls are VERY wet.
5. At the 9 O'clock position, place a corn seed horizontally with its pointed end directed to the middle of the case.
6. At the 12 O'clock position, place a corn seed with its pointed end directed straight down.
7. At the 3 O'clock position, place a corn seed horizontally with its pointed end directed toward the center of the case.
8. At the 6 O'clock position, place a corn seed with its pointed end directed straight up.
9. Carefully close the CD case. Be sure the corn seeds do not move. The seeds should be held in place by the case pressing against the cotton balls.
10. Repeat with the 2nd CD case.
11. Use tape to attach the CD cases to the inside of the cardboard box. When the cardboard box is turned upside-down, the 12 O'clock seed should be on top of each CD case. It is important that NO light enters the box.
12. Continue observing each day until a white root and a shoot emerge from each seed. Note the direction (up or down) that the root and shoot of each seed it growing. If the roots and shoots are not present, wait another day and observe again.

Unit 8: The Diversity and Classification of Life

This Unit investigates the branch of Biology called "taxonomy." Taxonomy is the branch of Biology that deals with classification. Classification is the placing of living things into groups.

The plant and animal kingdoms are examined in detail while the other kingdoms are surveyed. The Linnaean system of classification is introduced and a brief history of life on Earth is outlined. Topics of study include:

- what makes a plant a plant.
- Bryophytes.
- ferns.
- Gymnosperms.
- Angiosperms.
- alternation of generations.
- the Linnaean system of classification.
- the three domains.
- a six kingdom classification.
- the history of life on Earth.
- laboratory investigations "Plant Diversity," "Classification of Animal Phyla," and "Classes of Chordata and Arthropoda."

The unit begins with a study of the plant kingdom. Plants are multicellular eukaryotic autotrophs whose cells contain chloroplasts and are surrounded by cellulose cell walls. The main groups that make up the plant kingdom are explored. The modern classification system was devised in the 18th century by Karl Linnaeus. The Linnaean Classification System is introduced in this Unit. The three domains and six kingdoms of living things are explored. The history of life on earth is briefly examined.
Goals: Upon completion of this Unit, students will:

- describe the four main groups of plants.
- list four characteristics of members of the plant kingdom.
- list three characteristics of members of the animal kingdom.
- list the eight levels of the Linnaean System from the most general to the most specific.
- tell why it is believed that the first cells were anaerobic heterotrophs.
- cite the age of the earth and the age of the oldest fossil life.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- list three characteristics of the bryophytes.
- list two advancements of the ferns over the bryophytes.
- describe how the gymnosperms are more advanced than the ferns.

- explain how angiosperms are more advanced and successful than the gymnosperms.
- list the levels of the Linnaean System from most general to most specific.
- explain the binomial nomenclature of species names using Homo sapiens as an example.
- name and describe the three domains of living things.
- identify the domain Eukarya as the only domain made up of organisms with eukaryotic cells.
- tell how insects and arachnids differ in their legs and antennae.
- describe how the atmosphere of the earth at the dawn of life differed from the present day atmosphere.
- tell why it is thought that the first cells could not have carried out photosynthesis.
- list some adaptations needed for plants to colonize the land.
- list the adaptations needed for animals to colonize the land.
- explain why plants had to colonize the land before animals.

Lab 1 - Diversity in Plants

Lab 2 - Classification of Representative Animals

Lab 3 - Classes of Arthropoda and Chordata

Procedures

1. Print the data sheet and the Identification Keys to the Classes.
2. Find the first Chordata specimen--chordates have an endoskeleton (skeleton on the inside)
3. Write the common name of the animal. Use the Class Identification Key to determine its class. Record the class name on the data sheet. Continue until all the Chordate specimens have been classified.
4. Find the first Arthropoda specimen--arthropods have exoskeletons (skeletons on the outside)
5. Write the common name of the animal on the data sheet.
6. Use the Class Identification Key to the Classes of Arthropoda to determine the class of the specimen. Record the class on the data sheet.
7. Continue until all specimens have been classified.

Project - What Happened to the Dinosaurs?

Unit 9: Evolution of Life

This Unit focuses on topics related to the evolution of life. Charles Darwin and the scientists who influenced his Theory of Evolution are studied. Natural selection and artificial selection are compared and contrasted. Evidence for evolution is examined. Population genetics is

introduced and the Hardy-Weinberg equation is explained. Patterns of evolution are outlined. Topics of study include:

- early ideas about evolution.
- Lamarck and the theories of Inheritance of Acquired Characteristics, Use and Disuse, and Need.
- natural selection and fitness.
- evidence for evolution.
- genotype vs. phenotype.
- Hardy-Weinberg equation and populations that are not undergoing evolution.
- genetic drift.
- patterns of evolution.
- molecular clocks and the pace of evolution.
- laboratory investigation of "Bird Bills and Natural Selection" and "Genetic Drift."

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Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- describe Darwin's Theory of evolution.
- explain Lamarck's idea of inheritance of acquired characteristics.

- define fitness as differential survival and reproduction among the members of a population.
- define species, population, genotype, phenotype, gene pool, and allele frequency.
- explain why natural selection works on the phenotype rather than the genotype of organisms.
- list the five assumptions for the Hardy-Weinberg Equilibrium.
- calculate an allele frequency when given the frequency of the alternate allele.
- given the frequency of one allele, calculate the percent of each genotype in a Hardy-Weinberg population.
- understand that reproductive isolation must occur before speciation can take place.
- distinguish between artificial and natural selection.
- define genetic drift and explain why it only affects small populations.
- cite four types of evidence that supports an evolutionary view of life.
- know that mutually dependent species undergo coevolution.
- know that analogous structures result from convergent evolution.

Lab 1 - Natural Selection

Lab 2 - Genetic Drift

Procedure for setting up the original small population:

1. In one brown paper lunch bag, place 10 of EACH color marble. You will have a total of 20 marbles in the bag.
2. Each marble represents an individual allele in the population.
3. The allele frequency for each color is 0.5 or 50%.
4. Use a bag for each color marble for your "supply bags." They will hold the extra marbles of the two colors used. They must be kept separate.
5. The allele frequencies for this original population are recorded on the data table.

Procedures for producing the second generation of the population:

1. Without looking, randomly pick a marble from the original population.
2. From your supply bag of marbles, pick a "parent" marble of the same color as the offspring you already selected.
3. Place both the parent and offspring marbles in a second bag to begin the next generation.
4. Continue randomly picking an offspring from the original population and a parent of the same color from the supply bags.
5. When the new population reaches 20, determine the allele frequencies for the new population (count how many of each color you have).
6. Calculate the allele frequencies by dividing the number of each color by 20 (the total number of alleles).

7. Record the allele frequencies for the two colors of marble on the data table for the second generation.

Procedures for producing the third generation of the population:

1. Without looking, randomly pick a marble from the second generation bag to be an offspring.
2. From your supply bags, pick a parent of the same color as the offspring.
3. Place both offspring and parent into a third lunch bag representing the third generation of the population.
4. Continue randomly (do not look!) picking offspring from the second generation bag and parents of the same color from the supply bags.
5. When the population of the third generation reaches 20 total marbles, stop and determine the allele frequencies for the third generation.
6. Record the allele frequencies for the third generation on the data table.

Procedures for producing the fourth and fifth generations of the population:

1. Use a fourth lunch bag to produce the fourth generation of the population.
2. Select offspring from the third generation bag and parents of the same color from the supply bags.
3. When the population reaches 20 marbles, stop and calculate the allele frequency for each color.
4. Record the allele frequencies on the data table for the fourth generation.
5. If you are running out of marbles from your supply bags, you can use marbles from the first and second generation bags.
6. Use a fifth lunch bag to produce the fifth generation of the population.
7. Select offspring from the fourth generation bag and a parent of the same color from the supply bags.
8. Continue randomly picking offspring from the fourth generation bag and a matching parent from the supply bags.
9. When the population of the fifth genration reaches 20 marbles, determine the allele frequencies for each color marble and record in the data table for the fifth generation of the population.

Project - Types of Speciation

Unit 10: Ecology

This Unit focuses on topics related to ecology, the interrelationships between living things and their environment. The study begins with populations. How do populations grow and what prevents populations from growing too large? Biotic potential and environmental resistance are explained. The flow of energy from the sun through ecosystems is examined. The trophic structure of ecosystems is studied. Unlike energy, nutrients such as carbon, nitrogen, oxygen,

and water must be cycled through the biosphere. The nutrient cycles are studied. The major biomes of the Earth are surveyed. Topics of study include:

- population growth determiners; natality, mortality, emigration, and immigration.
- biotic potential and environmental resistance.
- density-dependent and density-independent limiting factors.
- exponential growth of populations.
- j-shaped and logistic growth curves.
- carrying capacity of the environment.
- predatory-prey population cycles.
- trophic structure of ecosystems; producers, consumers, decomposers.
- food chains and food webs.
- habitat and ecological niche.
- nutrient cycles.
- symbiosis.
- major biomes of the Earth.

This Unit investigates ecology, the study of the interrelationships between living things and their environment The unit begins with an examination of population dynamics. The factors that cause populations to grow are examined. The limits on population growth are examined and the concept of carrying capacity is introduced. Biotic communities are examined and the relationships that take place in communities are investigated. The flow of energy through ecosystems is outlined. The carbon, nitrogen, and water cycles are presented. The major terrestrial biomes of the world are surveyed.

Goals: Upon completion of this Unit, students will:

- define a population.
- explain the four determiners of population growth.
- graph population data and interpret the graph.
- explain how a community differs from a population.
- explain how an ecosystem differs from a community.
- explain why energy is used up as it passes through an ecosystem while matter must be recycled.
- know that the most energy in a community is stored in the producers or autotrophs.

Objectives: Utilizing multiple measures of assessment, as measured by rubric score, progress reports, peer/self-assessments, authentic assessments, quizzes/exams, official transcripts and/or teacher input, 95% of students who enroll in and complete all five (5) Units of this course will demonstrate a success rate in response to the multiple measures of assessment that apply to each Unit of this course. In addition, each student will achieve at least 70% accuracy

and a score of at least 4 on the rubric for the final essay. ***The wet lab component of the course is worth 20% of the student's final grade.*** By the end of this Unit, the student will be able to:

- define biotic potential and explain why species rarely grow at their biotic potential.
- list examples of biotic and abiotic factors.
- define environmental resistance and list factors that make up the environmental resistance.
- examine population age structure pyramids to determine whether a population will grow rapidly, remain stable, or decrease.
- define the carrying capacity.
- identify density-dependent and density-independent limiting factors.
- calculate population density when given population size and the area available.
- identify the carrying capacity on the population graph of a stable population.
- recognize the J-shaped exponential growth curve and the S-shaped or logistic growth curves on a population graph.
- explain why only about 10 percent of the energy in one trophic level is available to the next trophic level.
- define and give examples of autotrophs or producers, heterotrophs or consumers, herbivores, carnivores, and omnivores.
- explain why a food web is more realistic than a food chain.
- explain why there isn't enough energy to support food chains with more than three or four links.
- define symbiosis and distinguish between parasitism, commensalism, and mutualism.describe how photosynthesis and respiration cycle carbon dioxide and oxygen between living things and the atmosphere.
- define exotic species and explain the danger of releasing them into a new environment.
- determine population growth rate when given natality, mortality, immigration, and emigration.
- distinguish between an organism's habitat and its ecological niche.
- distinguish between a climax community and a successional stage.
- match the major terrestrial biomes with their climate and community.

Lab 1 - Population Growth and Carrying Capacity

Graph of the Kaibab Plateau Deer Population:

1. Print the graph paper for the Kaibab Deer Population. Title the graph "Kaibab Deer Population."
2. Label the X (horizontal) axis "Years." Use one square for each year (1905, 1906, etc) even years when the population is not counted. You should have 34 years.
3. Label the Y (vertical) axis, "Population size." Use 10,000 deer per square.

4. Use the data table below to plot the points on the graph and use a straight-edge to connect the points. DO NOT use a bar graph!

Year	Population size
1905	4000
1910	9,000
1915	25,000
1920	65,000
1924	100,000
1925	60,000
1926	40,000
1927	37,000
1928	35,000
1929	30,000
1930	25,000
1931	20,000
1939	10,000

Graph the Ring-necked Pheasant data:
The ring-necked pheasant population was located on an island. The population was counted in the spring and fall for six years after the pheasants were introduced on the island. Like most birds, pheasants nest and lay eggs in the spring.

1. Print the graph paper for the Ring-necked pheasant population from the Data page for this lab.
2. Label the vertical axis "Population size."
3. Label the horizontal axis "Year." You will need spring and fall for each year. Begin with 1937 spring, then 1937 fall. Then 1938 spring followed by 1938 fall. Locate all the spring points and connect them with straight lines, point-to-point.
4. Locate the 6 fall points. Connect them, in order with straight lines using a different color pen or pencil.
5. Use a third color pen or pencil to connect spring-to-fall-to-spring points in order.

Year	Season	Population size	Year	Season	Population size
1937	Spring	8	1937	Fall	40
1938	Spring	30	1938	Fall	100
1939	Spring	90	1939	Fall	425
1940	Spring	300	1940	Fall	825
1941	Spring	600	1941	Fall	1520
1942	Spring	1325	1942	Fall	1900

Lab 2 - Determining Population Size by Sampling

Project - Pack your Bags!

Chemistry

Basic Course Information:
Title: Chemistry
Length of Course: Full Year
Subject Area: Science (D) / Chemistry
UC Honors Designation? No
Prerequisite: Algebra I or Math I (C or better required) / Biology (C or better required)
Co-requisites: None
Integrated (Academics / CTE): No
Grade Levels: 10th & 11th
Course Description: This is a college preparatory course in theories and concepts of modern chemistry. The course emphasizes the structure of the atom, solutions and equilibrium, periodic properties, bonding and common reactions, acid-base reactions, and oxidation-reduction reactions. The student will be introduced to quantum mechanics, nuclear chemistry, and stoichiometry. The laboratory work will develop students reasoning power, the ability to apply chemical principles; as well as acquaint students with chemical laboratory techniques. COURSE GOALS AND/OR MAJOR STUDENT OUTCOMES 1.To motivate, instruct, and excite students about the science of chemistry 2.To provide comprehensive scope and in-depth coverage of major topics appropriate for a high school chemistry course 3.To address the spirit and specifics of the California Science Content Standards in a clear and comprehensive manner 4.To emphasizes process and higher-order thinking skills in ways that engage and reward students 5.To use real, familiar, and frequent examples of chemistry concepts that involve students in learning and ensure their success 6.To provide a unique and attractive design that enhances content presentation, concept development, and visual-learning opportunities 7.To support heterogeneous student populations and diverse teaching styles with a wide range of instructional tools 8.To incorporate a full-spectrum technology program into the course COURSE OBJECTIVES The course objectives are the mandatory requirements of the California Chemistry Content Standards for Grades 9-12. "Standards without asterisks represent those that all students are expected to achieve in the course of their studies. Standards with asterisks represent those that all students should have the opportunity to learn." Atomic and Molecular Structure Definition: The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of elements relates to the atomic structures. Objectives: The following course objectives will

constitute the basis of this concept, students will learn: a. how to relate the position of an element in the periodic table to its atomic number and atomic mass. b. how to use the periodic table to identify metals, semimetals, nonmetals, and halogens. c. how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electro-negativity, and the relative sizes of ions and atoms. d. how to use the periodic table to determine the number of electrons available for bonding. e. That the nucleus of the atom is much smaller than the atom yet contains most of its mass. f. how to use the periodic table to identify the lanthanide, actinide, and transactinide elements and know that the transuranium elements were synthesized and identified in laboratory experiments through the use of nuclear accelerators. g. how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table. i. the experimental basis for Thomson's discovery of the electron, Rutherford's nuclear atom, Millikan's oil drop experiment, and Einstein's explanation of the photoelectric effect. j. the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom. j. that spectral lines are the result of transitions of electrons between energy levels and that these lines correspond to photons with a frequency related to the energy spacing between levels by using Planck's relationship (E_= hv). Chemical Bonds Definition: The Formation of Compound from Atoms Biological, chemical and chemical properties of matter result from the ability to atoms to form from electrostatic forces between electrons and protons and between atoms and molecules. Objectives: The following course objectives will constitute the basis of this concept, students will learn: a. atoms combine to form molecules by sharing electrons to form covalent or metallic bonds, or by exchanging electrons to form ionic bonds. b. chemical bonds between atoms in molecules such as H2, CH4, NH3, H2CCH2, N2, Cl2, and many large biological molecules are covalent. c. salt crystals such as NaCl are repeating patterns of positive and negative ions held together by electrostatic attraction. d. in a liquid the inter-molecular forces are weaker than in a solid, so that the molecules can move in a random pattern relative to one-another. e. how to draw Lewis dot structures. f.* how to predict the shape of simple molecules and their polarity from Lewis dot structures. g.* how electronegativity and ionization energy relate to bond formation. h.* how to identify solids and liquids held together by Van der Waals forces or hydrogen bonding, and relate these forces to volatility and boiling/melting point temperatures. Conservation of Matter and Stoichiometry Definition: The conservation of atoms in chemical reactions lead to the conservation of matter and the ability to calculate the mass of product and reactants. Objectives: The following course objectives will constitute the basis of this concept, students will learn: a. how to describe chemical reactions by writing balanced equations. b. the quantity one mole is defined so that one mole of carbon 12 atoms has a mass of exactly 12 grams. c. one mole equals 6.02 x 1023 particles (atoms or molecules). d. how to determine molar mass of a molecule from its chemical formula and a table of atomic masses, and how to convert the mass of a molecular substance to moles, number of particles or volume of gas at standard temperature and pressure. e. how to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products, and the relevant atomic masses. f.* how to calculate percent yield in a chemical reaction. g.* how to identify reactions that involve oxidation and reduction and how to balance oxidation-reduction

reactions. Gases and Their Properties Definition: The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases. Objectives: As a basis for understanding this concept, students will learn: a. the random motion of molecules and their collisions with a surface create the observable pressure on that surface. b. the random motion of molecules explains the diffusion of gases. c. how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases. d. the values and meanings of standard temperature and pressure (STP). e. how to convert between Celsius and Kelvin temperature scales. f. there is no temperature lower than 0 Kelvin. g.* the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms. h.* how to solve problems using the ideal gas law in the form PV=nRT. i.* how to apply Dalton's Law of Partial Pressures to describe the composition gases, and Graham's Law to describe diffusion of gases. Acids and Bases Definition: Acids, bases, and salts are the classes of compounds that form ions in water solutions Objectives: As a basis for understanding this concept, students will learn: a. the observable properties of acids, bases and salt solutions. b. acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances. c. strong acids and bases fully dissociate and weak acids and bases partially dissociate. d. how to use the pH scale to characterize acid and base solutions. e.* the Arrhenius, Bronsted-Lowry, and Lewis acid-base definitions. f.* how to calculate pH from the hydrogen ion concentration. g.* buffers stabilize pH in acid-base reactions. Solutions Definition: Solutions are homogeneous mixtures of two or more substances. Solutions. Objectives: As a basis for understanding this concept, students will learn know: a. definitions of solute and solvent. b. how to describe the dissolving process as a result of random molecular motion. c. temperature, pressure, and surface area affect the dissolving process. d. how to calculate the concentration of a solute in terms of grams per liter, molarity, parts per million and percent composition. e.* the relationship between the molality of solute in a solution, and the solution's depressed freezing point or elevated boiling point. f.* how molecules in solution are separated or purified by the methods of chromatography and distillation. Chemical Thermodynamics Definition: Energy is exchanges or transformed in all chemical reactions and physical changes of matter. Objectives: As a basis for understanding this concept, students will learn know: a. how to describe temperature and heat flow in terms of the motion of molecules (or atoms). b. chemical processes can either release (exothermic) or absorb (endothermic) thermal energy. c. energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts. d. how to solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change. Reaction Rates Definition: Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules. Objectives: As a basis for understanding this concept, students will learn know: a. the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time. b. how reaction rates depend on such factors as concentration, temperature, and pressure. c. the role a catalyst plays in increasing the reaction rate. d. the definition and role of activation energy in a chemical reaction. Chemical Equilibrium Definition: Chemical equilibrium is a dynamic process at the molecular level. Objectives: As a basis for understanding this concept, students will learn know: a. Students know how to use Le_Chatelier’s principle to predict the effect of

changes in concentration, temperature, and pressure. b. Students know equilibrium is established when forward and reverse reaction rates are equal. c. how to write and calculate an equilibrium constant expression for a reaction. Organic and Biochemistry Definition: The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. Objectives: As a basis for understanding this concept, students will learn know: a. large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits. b. the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules. c. amino acids are the building blocks of proteins. d. the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds, simple hydrocarbons with double and triple bonds, and simple molecules that contain a benzene ring. e. how to identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids. f. the R-group structure of amino acids and know how they combine to form the polypeptide backbone structure of proteins. Nuclear Process Definition: Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of natural occurring and human made isotopes, nuclear fission, and nuclear fusion. Objectives: As a basis for understanding this concept, students will learn know: a. protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons. b. the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by E_=_ mc 2) is small but significant in nuclear reactions. c. some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions. d. the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay. e. alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations. f. how to calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. g. protons and neutrons have substructures and consist of particles called quarks. INVESTIGATION AND EXPERIMENTATION Objectives: Students will learn how: a. That scientific progress is made by asking meaningful questions and conducting careful investigations. b. To select and use appropriate tools and technology, such as computer-linked probes, spreadsheets, and graphing calculators, to perform tests, collect data, analyze relationships, and display data. . . . m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California. n. Know that when an observation does not agree with accepted scientific theory, the observation is sometimes mistaken or fraudulent (example, the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (example, the Ptolemaic model of the movement of the Sun, Moon, and planets).
1.Homework 2.Individual exams and quizzes 3.Laboratory practicum's 4.Laboratory experiments and reports 5.Research Projects, both Interdisciplinary and Chemistry Specific

6.Oral presentation, individual and group 7.Cumulative written and practical Midterm Examination and Cumulative Final Examination.
COURSE OUTLINES College preparation chemistry consist of twenty five thematic units that mutual reinforce the study of chemistry required by the California Chemistry Content Standards for Grades 9-12. I. Introduction to Chemistry A. Chemistry B. Chemistry Far and Wide C. Thinking Like a Scientist D. Problem Solving in Chemistry II. Matter and Changes A. Properties of Matter B. Mixtures C. Elements and Compounds D. Chemical Reactions III. Scientific Measurements A. Measurements and Their Uncertainty B. The International System of Units C. Conversion Problems D. Density IV. Atomic Structure A. Defining the Atom B. Structure of the Nuclear Atom C. Distinguishing Among Atoms V. Electrons in Atoms A. Models of the Atom B. Electron Arrangement in Atoms C. Physics and the Quantum Mechanical Model VI. The Periodic Table of Elements A. Organizing the Elements B. Classifying the Elements C. Periodic Trends VII. Ionic and Metallic Bonding A. Ions B. Ionic Bonds and Ionic Compounds C. Bonding in Metals VIII. Covalent Bonding A. Covalent Bonding B. Molecular Compounds C. The Nature of Covalent Bonding D. Bonding Theories E. Polar Bonds and Molecules IX. Chemical Names and Formulas A. Naming Ions B. Naming and Writing Formulas for Ionic Compounds C. Naming and Writing Formulas for Molecular Compounds D. Naming and Writing Formulas for Acids and Bases E. The Laws Governing Formulas and Names X. Chemical Quantities A. The Mole: A Measurement of Matter B. Mole-Mass and Mole-Volume Relationships C. Percent Composition and Chemical Formulas XI. Chemical Reactions A. Describing Chemical Reactions B. Types of Chemical Reactions C. Reactions in Aqueous Solutions XII. Stoichiometry A. The Arithmetic of Equations B. Chemical Calculations C. Limiting Reagent and Percent Yield XIII. States of Matter A. The Nature of Gases B. The Nature of Liquids C. The Nature of Solids D. Change of State XIV. The Behavior of Gases A. The Nature of Gases B. The Nature of Liquids C. The Nature of Solids D. Change of State XV. Water and Aqueous Systems A. Water and Its Properties B. Homogeneous Aqueous Systems C. Heterogeneous Aqueous System XVI. Solutions A. Properties of Solutions B. Concentrations of Solutions C. Colligative Properties of Solutions D. Calculations Involving Colligative Properties XVII. Thermochemistry A. The Flow of Energy—Heat and Work B. Measuring and Expressing Enthalpy Changes C. Heat in Changes of State XVIII. Reaction Rates and Equilibrium A. Rates of Reaction B. Reversible Reactions and Equilibrium C. Solubility Equilibrium D. Entropy and Free Energy E. The Progress of Chemical Reactions XIX. Acids, Bases, and Salts A. Acid-Bases Theories B. Hydrogen Ions and Acidity C. Strengths of Acids and Bases D. Neutralization Reactions E. Salts in Solution XX. Oxidation-Reductions Reactions A. The Meaning of Oxidation and Reduction B. Oxidation Numbers C. Balancing Redox Equations XXI. Electrochemistry A. Electrochemical Cells B. Half-Cell and Cell Potentials C. Electrolytic Cells XXII. Nuclear Chemistry A. Nuclear Radiation B. Nuclear Transformations C. Fission and Fusion of Atomic Nuclei XXIII. Hydrocarbon Compounds A. Hydrocarbons B. Unsaturated Hydrocarbons C. Isomers D. Hydrocarbon Rings E. Hydrocarbons from Earth's Crust XXIV. Functional Groups A. Introduction to Functional Groups B. Alcohols and Ethers C. Carbon Compounds D. Polymerization XXV. The Chemistry of Life A. A Strategy for Life B. Carbohydrates D. Amino Acids and Their Polymers E. Lipids F. Nucleic Acids G. Metabolism

Chemistry Lab Description

* Classifying Matter:

Students will test different substances of similar appearance for their physical properties. Density will be calculated using a fix volume and corresponding mass. Solubility will be tested by mixing the substances with water. Students will learn how chemists take data, measurements, and calculations in the laboratory. Students will demonstrate how different substances have different properties, even though the substances may look similar. Students will make conclusions based on results as to the identity of four white solids (sugar, baking powder, flour, baking soda).

* Molecular Structure

Students will learn how atoms react and bond to form molecules and the importance of valence electrons in this bonding. Students will learn to predict what kinds of molecules different types of elements can form. Students will learn to name these molecules. Students will learn how some common molecules look using molecular modeling kits. Students will learn about different kinds of bonding including single, double, and triple bonding and how to predict when each of these types of bonding will occur.

* Compounds and their formation

Students will learn how atoms form predictable ions, or charged atoms. Students will learn how ions of opposite charges form ionic compounds. Students will learn to name these compounds. Students will learn how to predict formulas for several ionic compounds. Students will observe the formation of several compounds by mixing certain chemicals.

* Physical and Chemical Changes

Students will perform some examples of physical and chemical changes. They will learn to observe the difference between these two types of changes and will be able to identify what kind of change each example is. Students will also give their reasoning for assigning each example as either physical or chemical changes. Finally, students will learn what kinds of evidence they can observe during physical and chemical changes.

* Mass, Volume and Density

Students will measure the mass of a fixed volume of several different fluids and calculate their densities. After creating the layers within a graduated cylinder, the students will drop in a few items to test where they settle. Using these observations, the students will assign a density range to each object. Student will learn how to calculate density. Students will learn that less dense solutions will float on top of more dense solutions. Students will learn that if an item floats between two layers of solutions, that object's density lies between the densities of those solutions.

* Distillation:

Students will learn the difference between melting point and boiling point. Students will learn that these are physical characteristics that are different for each substances. Students will learn the process of distillation to separate substances of different boiling points. Students will perform a distillation of two different substances. Students will learn that distillation is possible only if the substances have distinct boiling points.

* Chemical Reactivity

Students will learn that different elements have different abilities to react with other elements. Students will learn to predict the reactivity of certain elements based on their position in the periodic table. Students will test a series of metals for their reactivity and based on their results they will develop an activity series for these metals. Students

will recognize the exceptions to the general activity rules based on position in the periodic table.

* Percent Composition

Students will learn how to calculate percent composition of a substance. Students will measure the percent of water in a series of crystalline compounds called hydrates. Students will analyze the weight of these compounds at a fixed volume. Students will calculate the expected molecular mass for the compound and use this information to calculate the percent composition of water in the hydrate. Students will learn that certain solids form hydrates because at room temperature, these solids absorb water from the atmosphere.

* Reaction Types:

Students will learn that there are 5 types of chemical reactions that can be identified by their chemical reaction equations. Students will perform each type of reaction and observe the reaction. Students will observe, identify, and write balanced equations for examples of the 5 types of reactions including Synthesis, Decomposition, Combustion, Single Replacement and Double replacement.

* Conservation of Mass:

Students will learn how the law of conservation of mass relates to balanced equations. Students will learn how to calculate the theoretical yield of the product in a chemical reactions given the mass of the limiting reactant. Students will learn how to calculate percent yield of a chemical reaction using actual yield and theoretical yield. Students will perform a precipitation reaction, collect the precipitate, dry and weigh it, then calculate the percent yield of the reaction they performed.

* Stoichiometry

Students will learn how to use a chemical equation to make stoichiometric calculations. Students will perform a certain chemical reaction following the equation. Students will be asked to produce a certain number of grams of a certain product. Students will calculate the theoretical number of grams for each of the reactants that they will have to use in order to produce the desired grams of product. Students will learn to make compensations in the reactant grams calculated due to the difference between actual and theoretical yields. Students will collect and measure the product to determine if they were able to produce the desired amount.

* Crystalline Structures

Students will learn about the different types of crystal structures and how these relate to the solid state of matter. Students will learn about the unit cell and how it determines the structure. Students will grow several different types of crystals and observe the differences in shape and size. Students will also observe the similarities between all types of crystal structures. Students will learn how to compare and contrast these different types of crystals. Student will learn how to draw or diagram crystal structures that they observe.

* Gases and Their Properties

Students will learn how pressure, temperature, and volume are related in the gas laws. Students will understand how a change in temperature will change the volume of a gas. Students will observe how hot and cold conditions effect the volume of contained air. Students will measure the volume of the contained air as well as the temperature change from one condition to another and use this information to calculate the resulting volume of the air.

* Chemical Thermodynamics:

Students will learn about the heats of fusion and vaporization. Students will learn the properties of a substance that determines the heat needed for fusion or vaporization.

Students will learn how to estimate heats of fusion and vaporization. Students will measure temperature of melting ice and calculate the heat of fusion for ice. Students will measure temperature of heated water until it boils. Students will graph temperature as a function of heat supplied. Students will observe the heats of fusion and vaporization for water using the leveling off points in temperature from the graph.

* Reaction of Acids

Students will learn that acids commonly undergo single and double replacement reactions. Students will learn that acids donate H+ ions that can produce gases in their reactions with other chemicals. Students will observe and identify the reactions of carbonates that produce CO2 gas, and reactions of metals that produce hydrogen gas.

* Acid/Base Titration

Students will learn that strong acids can neutralize strong bases and visa versa. Students will learn how to calculate the volume of base needed to neutralize a certain volume of base at a known concentration. Students will study an example titration and practice calculating the concentration of a known volume of acid by titration with a strong base with known concentration and volume. Students will perform their own titration and use their data to calculate the concentration of the unknown acid solution.

* Solutions:

Students will learn about solutions and what solutions contain. Students will learn that there are several methods to calculate the concentration of solutions. Students will make a solution and be able to identity the solute and the solvent. Students will measure the solute in grams and the final volume of the solution in milliliters and use this information to calculate the concentration of the solution in Molarity, Molality, parts per million, and density.

* Reaction Rates:

Students will learn that different reactions proceed at different rates. Students will learn how temperature and other factors effect reaction rates and product formation. Students will measure the reaction rate of a reaction at four different temperatures. Students will measure the temperature and reaction rates, then determine the effect of temperature on reaction rate.

* Chemical Equilibrium:

Students will learn the formula for calculating chemical equilibrium. Students will calculate chemical equilibrium given reactant and product concentrations. Students will observe an oscillating reaction observable through a color change. Students will measure the time the reaction is at each color and using this data make a conclusion to which side of the reaction is favored in when the reaction reaches equilibrium.

* Oxidation-Reduction Half-Reactions

Students will learn how to identify oxidation reduction reactions. Students will be able to identify the oxidizer and the reducer in these reactions. Students will write oxidation reduction equations using half-reactions. Students will observe redox reactions and write half-reactions that describe them.

* Organic Chemistry:

Students will learn the different types of basic organic molecules. Students will learn to identify different functional groups found in larger organic molecules. Students will distinguish an aldehyde from an alcohol or a ketone using Tollens's reagent.

* Biochemistry:

Students will learn the 4 major biochemical macromolecules. Students will learn how polymerization is involved in the formation of each macromolecule group and what kind of subunits are involved. Students will test a variety of food substances for each of 3 macromolecules (lipids, carbohydrates, proteins). Students will learn examples of each kind of macromolecule.
INSTRUCTIONAL METHODS AND/OR STRATEGIES Instruction will include the following methods and strategies 1. Inquiry technique 2. Direction instruction 3. Teacher demonstration 4. Laboratory investigation and experimentation 5. Cooperative learning and problem solving 6. Research projects 7. Guest Speakers 8. CD-ROMs, Videotapes, and other multimedia 9. Student Presentation

Chemistry Honors

Basic Course Information:
Title: Chemistry Honors
Length of Course: Full Year
Subject Area: Science (D) / CHemistry
UC Honors Designation? Yes
Prerequisite: Math I / Biology
Co-requisites: None
Integrated (Academics / CTE): No
Grade Levels: 11th & 12th
Course Description: Chemistry is concerned with the composition, structure, and properties of substances, the transformations of these substances into others by reactions, and the kinds of energy changes that accompany these reactions. Fundamental concepts on the atomic and molecular structure, chemical bonding, conservation of matter and stoichiometry, gases and their properties, acids and bases, solutions, chemical thermodynamics, reaction rates, chemical equilibrium, organic chemistry and biochemistry, and nuclear processes.Emphasis on scientific investigation, analysis, and critical thinking of content through labs, research and media. The goals and expected outcomes of the Chemistry Honors are the following: • To motivate, instruct, and excite students about the science of chemistry • To provide comprehensive scope and in-depth coverage of major topics appropriate for a high school chemistry course • To address the spirit and specifics of the California Science Content Standards in a clear and comprehensive manner

- To emphasize process and higher-order thinking skills in ways that engage and reward students
- To use real, familiar, and frequent examples of chemistry concepts that involve students in learning and ensure their success
- To provide a unique and attractive design that enhances content presentation, concept development, and visual-learning opportunities
- To support heterogeneous student populations and diverse teaching styles with a wide range of instructional tools
- To incorporate laboratory activities and research into the course

Introduction to Chemistry, Matter and Change, Scientific Measurement and Problem Solving in Chemistry are the introductory chapters (1 to 4) of the book. The different states of matter are further explained on Chapter 10. It describes the nature of solid, liquid, and gas together with their phase changes.

Atomic and Molecular Structure on Chapter 5 describe the atom and its structure (protons, neutrons, and electrons). Atomic number and mass number are distiguished. Explain how isotopes differ and why atomic masses are not whole numbers. The origin of the periodic table is described and identified the position of groups, periods, and transition metals. Electrons in Atoms of Chapter 13 explain the models of atoms, rules governing the electron configuration of atoms, explore physics and quantum mechanical model. Chemical periodicity on Chapter 14, explains the classification of elements (noble gases, representative elements, transition metals, and inner transition metals) and periodic trends (atomic radii, ionic radii, ionization energies, and electronegativities)

Chemical bonding topics include Chemical Names and Formulas, Ionic Bonding and Ionic Compounds, and Covalent Bonding (Chapter 6, 15, 16, respectively). In Chapter 6, ionic and molecular compounds are distinguished. Writing and naming the chemical compounds were practiced in this chapter. In chapters 15 and 16, an in-depth discussion of ionic and covalent bonding was discussed.

Conservation of matter and stoichiometry on chapters 7, 8, 9 describe the mole as the measurement of matter. Mole is used to convert among measurement of mass, volume, and number of particles. Percent composition and chemical formulas are also discusssed. Chapter 8 focuses on chemical reactions, describes the chemical change and types of reactions namely combination, decomposition, single-replacement, double-displacement, and combustion. Solubility rules predict whether a precipitate will be formed in double displacement reactions. Stoichiometry, on chapter 9, involves the mathematical equation of a chemical reaction. The amounts of reactant and/or product are calculated in the process. Stoichiometric quantities using units of moles, mass, representative particles, and volume of gases at STP are used as conversion units. Limiting reagent and percent yield are identified and calculated.

Gases and their properties, as discussed on Chapter 12, describe the properties of gases. Explain how kinetic energy of gas particles relate to Kelvin temperature, factors affecting gas pressure are identified and gas laws problems are practiced.

Acids and bases, on Chapter 20 and 21, describes properties of acids and bases, how to name an acid and a base. Hydrogen ions and how it relates to acidity and the pH scale. Acid-base theories are stated and strengths of acid and bases are calculated. Neutralization reactions explain how acid-base titration is used to calculate the concentration of an acid. Study the effects of salt (buffer solutions) resisting changes in pH.

Solutions on Chapter 17 and 18, initially highlights the unique properties of water. Existence of its 3 states and corresponding properties are explores. Solutions, on chapter 18, identify the factors that determine the rate at which solute dissolves. Different concentration problems such as molarity, percent by mass, and percent by volume are discussed and practiced. The colligative properties of solutions are described and explain how it affects freezing point and melting point of compounds.

Chemical thermodynamics on Chapter 11 involves heat and chemical change. It explains the relationship between energy and heat. This amount of heat in the reaction is measured and classified as whether it is a physical ot chemical process.

Reaction rates and equilibrium on chapter 19, explains the rate of reactions at the molecular level. It includes reversible reactions and how equilibrium is achieved. Predicting whether a reaction will occur through entropy and free energy.

Organic chemistry and biochemistry includes the hydrocarbon compounds, functional groups and organic reactions and chemistry of living things. Students will learn the 4 major biochemical macromolecules. Students will learn how polymerization is involved in the formation of each macromolecule group and what subunits are involved. Students will test a variety of food substances for each of 3 macromolecules (lipids, carbohydrates, proteins). Students will learn examples of each kind of macromolecule.

Nuclear Chemistry on Chapter 28, discuss the processes of radioactivity and radioactive decay. Characteristics of alpha, beta and gamma rays are identified. Nuclear transformation such as half-life information of radioisotope. Fission and fusion of atomic nuclei and radiation in life.

Assessment Methods and Tools

Problem Solving on concepts detailed on course outline - solve problems after each concept

Laboratory Practice and Participation - effective use of laboratory safety and practices

Laboratory Report - generated a summative report on the experiment performed

Project Oral Presentation - students will choose a topic from the course outline and discuss in detail by explaining, providing examples, and applying concepts to real world

Test and Quizzes (includes summative assessments)

Single, written, comprehensive, full-year final exam

Key Assignments include the following:

- Students will complete all laboratory report for the laboratory activities
- Complete all vocabulary terms and problem solving activities
- Research on scientists who had a major contribution in Chemistry (example: Dmitri Mendeleev, Robert Boyle, James Chadwick, Albert Einstein)
- Discover It! (example: exploring density, modeling chemical reactions, making the slimiest polymer)
- Project Presentation? -informative and relevant project on the topics discussed (topics on Atomic and Molecular Structure, Chemical Bonds, Acids and Bases, Stoichiometry, Organic Chemistry and Biochemistry, etc.)
- Construct/Model/ Devise concepts learned in chemistry (example: lemon battery, light emission from wintergreen mints, candle making lab)

The list of laboratory activities includes hands-on activities, inquiry, observation, analysis, and laboratory report. It accounts for 20% of class time.

- Introduction to Small-Scale Chemistry- designed to help students learn chemistry by doing chemistry. Provides an opportunity to interact with matter, interpret what students see, solve problems, and become more inventive and creative. Students are encouraged to ask questions, find ways to answer them, and contribute original ideas and discoveries to chemistry. This small-scale experiments are designed to minimize the risk of injury and practice laboratory safety.
- In the Bubbles Mini-lab, the scientific method is utilized by testing the hypothesis that bubble-making can be affected by adding chemicals (namely sugar and salt) to a bubble-blowing mixture.
- 1+2+3=Black! This lab is designed to allow students to familiarize themselves with small-scale equipment and methodology. The purpose of this lab is to make macroscopic observations of chemical reactions and use them to solve problems. Students can do qualitative analysis on household chemicals by knowing only that a mixture of KI + NaOCl + starch produces a black color. If these two of these solutions added to an unknown produce black, then starch is present. Students explore the presence of the starch in samples of cereal, laundry detergents, iodized and non-iodized salt, paper, and automatic dish washing liquid and cleansers.

- Measurement lab purpose is to make precise and accurate measurements and to use fundamental data to calculate derived quantities. It is designed to give students practice in measurements and practice in using significant figures in calculations involving measured data. In this lab, dimensions (length, width, height) and mass of a rectangular block is measured.
- Now What Do I Do? The purpose of the lab is to solve problems in divergent ways, making accurate measurements and applying mathematics. In this lab, ??the mass of a single drop of water is measured by using different approaches discussed by students. Also, the mass of a pre-1982 penny is compared to a post-1982 penny and discuss sources of differences. Students design their own experiments in measuring the following : determining the volume of aluminum used to make an aluminum soda can, determining the volume of liquid that an aluminum soda can hold, determining the volume of air a room can contain, determining the volume of the human body.
- Atomic Mass of Candium. The purpose of this lab is to analyze the isotopes of candium and its atomic mass. Students make measurements to calculate the relative abundances of three types of candy in a mixture. They use their data to calculate the average mass of one piece of their sample. This exercise is analogous to determining the atomic mass. Each pair receives a clean plastic cup with a mixture of three kinds of candy.
- Names and Formulas of Ionic Compounds. The purpose of the lab is to observe the formation of compounds, and to write their names and formulas.Students mix solutions of aqueous ions and observe precipitates. They write the formulas and name the precipitates formed. The net ionic equations are written for each precipitate formed. Ions written as reactants and precipitate formed as the product.
- Weighing as Means of Counting. The purpose of the lab is to determine the mass of several chemical compound samples and use the data to count atoms. Students measure masses of common chemicals (water, sodium chloride, and calcium carbonate, and chalk) and convert their data to moles and atoms. They explore the quantitative chemical compositions of common objects.
- Precipitation Reactions: Formation of Solids. The purpose of the lab is to observe, identify, and write balanced equations for precipitation reactions. Students can practice in writing balanced chemical equations to describe precipitation reactions. Solutions of nitrates, chlorides, carbonates, phosphates, hydroxides, sulfates are mixed and precipitation are observed.
- Analysis of Baking Soda. The purpose of the lab is to determine the mass of sodium hydrogen carbonate in a sample of baking soda using stoichiometry. Students react a known mass of baking soda with a measured amount of HCl and use stoichiometry to determine the mass of $NaHCO_3$ in baking soda. Extension lab involves designing and carrying out an experiment to determing the percentage of baking soda in baking powder.
- Kinetic Theory in Action. The purpose of the lab is to observe color changes in the chemical reactions of gases and to interpret these changes on terms of kinetic theory. Students generate different gases and use indicators to visualize gas diffusion. Interpret

their results in terms of kinetic molecular theory. Drops of bromothymol blue (BTB) is used in the petri dish with mixing of HCl and $NaHSO_3$ at the center of the dish. Students then observe the changes occured upon placing the cover of the petri dish. Extension lab is to mix drops of NaOH and NH_4Cl and observing the changes on the BTB.

- Heat of Combustion of a Candle. The purpose of the lab is to observe a burning candle and calculate the heat associated with the combustion reaction. Students make simple observations of a candle, explore how a candle works, and apply basic principles of thermodynamics. The mass and length of the candle are measured on timed, consistent burning. Factors affecting combustion are explored and heat of combustion is calculated.
- Reaction of Acids with Carbonates. The purpose of the lab is to observe and identify the reactions of carbonates that produce carbon dioxide gas. Students explore the reactions of acids with carbonates, learn to write chemical equations to describe the reactions, and apply what they learn to the analysis if household chemicals. Materials used include various samples of laundry detergent, chalk, antacid tablets, sea shells, baking powder, baking soda, limestone, and marble. Students should note that acid and carbonates always produce carbon dioxide gas and water. The presence of bubbles is a good analytical clue to the presence of of acid when carbonate is added and presence of carbonate when acid is added.
- Electron Configurations of Atoms and Ions. The purpose of the lab is to make observations of metal ions solutions and relate them to electron configurations. Students practice writing electron configurations for metal atoms and metal ions; they learn that colored transition metal ions are associated with partially filled d orbitals. Solutions of ??NaCl, $MgSO_4$, $AlCl_3$, $FeCl_3$, $CaCl_2$, $NiSO_4$, $CuSO_4$, $ZnCl_2$, $AgNO_3$, NaOH, Na_2CO_3 are utilized in this experiment.
- Chemical Properties of Halides. The purpose of the lab is to observe some properties of halide ions and to use those data to predict trends. Students observe some chemical properties of halide ions and use their results to predict family trends. Solutions of silver nitrate and lead nitrate were mixed with potassium fluoride, potassium chloride, potassium bromide, and potassium iodide.
- Analysis of Cations and Anions. The purpose of the lab is to develop test for various ions and use the tests to analyze unknown substances. Students perform qualitative analysis on aqueous mixtures of ionic compounds and apply what they learn to the analysis of lawn and garden fertilizers. Anion solutions used are nitrate, chloride, sulfate, and phosphate. Cation solutions include sodium, potassium, ammonium and iron.
- Paper Chromatography of Food Dyes. The purpose of the lab is to use paper chromatography to separate and identify food dyes in various samples. Students use techniques of paper chromatography to separate and identify common covalently bonded dyes in candy, soft drinks, and water soluble pens. Materials used are chromatography paper dipped in a 0.1% NaCl solvent, jelly beans, small candy coated chocolates, and unsweetened powdered soft drinks.

- Electrolytes. The purpose of the lab is to classify compounds as electrolytes by testing rheir conductivity in aqueous solutions. Students test solids and liquids for conductivity and find that ionic compounds that dissolve in water are electrolytes. They interpret their results in terms of ions that are free to move about in solution. A conductivity tester is used to measure solid and aqueous solutions of the following samples: NaCl, $MgSO_4$, Na_2CO_3, $NaHCO_3$, KCl, sugar, cornstarch, and KI. An extension of this lab is to test various liquids for conductivity such as soft drinks, orange juice, pickle juice, and coffee.
- Making a Solution. The purpose of the lab is to make a solution and use carefully measured data to calculate the solution's concentration in various units. Students make a solution, collect the measurements to measure molarity, molality, percent by mass, and mole fraction. Solid NaCl is dissolved in water using a volumetric bottle. With this NaCl sample, the percent by mass, mole fraction, molality, molarity, and density are calculated.
- Small-scale titration. The purpose of the lab is to measure and compare the molar concentrations of acids thorugh various titration techniques. Students will both use volumetric and mass titrations to measure molar titrations to measure the molar concentrations of acids solutions. They will learn techniques in calibration and quantitative experimental design. Acid base titration is utilized in this lab with HCl, H_2SO_4, NaOH, CH_3COOH, HNO_3, and phenolphthalein as materials.
- Half-reactions. The purpose of the lab is to observe redox reactions and to write half-reactions that describe them. Students will observe reduction-oxidation (redox) reactions between acids and metals and learn to write half reactions to describe what is happening. Acids (HCl,??HNO_3,??H_2SO_4) reacted with the following metals Zn, Mg, Cu, Fe.
- Electrolysis of water.The purpose of the lab is to electrolyze solutions and interpret observations in terms of chemical reactions and equations. Students will apply an electrolysis device to pure water and aqueous solutions; interpret their observations in terms of chemical equations. Solutions used are water, Na_2SO_4, Na_2SO_4 +BTB. An extension of the lab is carrying out the electrolysis using KI, KI + starch, and KI +BTB.

- Complex Ions. The purpose of the lab is to observe some chemical reations of metal ions to form complex ions. Students test metal ion solutions to determine which form complex ions with hydroxides. Metal ions used are calcium, aluminum, iron, and zinc. Each of metal ions are reacted with KOH, KOH + HNO_3, and KOH + NaOH.
- Hydrocarbon Isomer. The purpose of the lab is to draw line-angle formulas and name some of the isomers of gasoline. This lab teaches students to write line-angle formulas for hydrocarbons. It gives them practice in naming alkanes and determining the different structures of isomers. Materials used are pencil, paper, toothpicks, and modeling clay in creating the hydrocarbon isomers (C_5H_{12}) in gasoline. Extension of the lab is determining the isomers of hexane (C_6H_{14}).

- Polymers. The purpose of the lab is to cross-link some polymers and examine their properties. Students will use the borax solution to cross link carbohydrate polymers. They will learn how to write structures if cross-linked polymers. Materials used are borax solution, powdered guar gum, liquid starch, and white glue.
- The Egg:A Biochemical Storehouse. The purpose of the lab is to explore the physical and chemical properties of a chicken egg. Physical properties include measurement of egg's shape, length, width, volume, surface area. Chemical properties include testing the carbonate in egg shell by reacting with HCl. Protein testing by reacting with aqueous solutions of copper (II) sulfate and NaOH to the sample. Positive result would be a violet color.
- Radioactivity and Half-lives.The purpose of the lab is to simulate the chemical conversion of a reactant over time and to graph the data and relate it to radioactive decay and half-lives. Students will flip a coin and plot the disapperance of heads over time. They will graph their data and relate it to half-lives and radioactive decay. Then, students will learn how to write and balance nuclear equations. Radioisotopes undergo alpha and beta decay are used an extension in this lab.

These various instructional methods and/or strategies support the delivery of the curriculum.

Direct Instruction on the basic concepts and laws - teach the concept, ask a question, pause or pair-share, pick a non-volunteer, listen for the answer, and provide effective feedback.

PowerPoint presentation of topics discussed- concepts are presented using slides and sample problem and questions provided at the end of each section

Problem solving on topics cited on the course outline- practice problems on the concept learned

Computer simulated labs

Hands-on laboratory experiments

Cooperative learning / Groupwork

Multimedia Presentations/ DVDs related to topics

A cumulative final exam is given at the end of each semester. The final exam consists of a written component and a practical (lab) component.

Students complete various research projects each semester. The first semester project is a research paper on a specific element or compound and it's importance in the world. Semester two has two projects: Candle Making and "The Science of Food" project.

Chemistry II Honors

Basic Course Information:
Title: Chemistry II Honors
Length of Course: Full Year
Subject Area: Science (D) / Life Sciences
UC Honors Designation? Yes
Prerequisite: A grade of B or higher in Chemistry OR grade C or higher for Chemistry Honors (required)
Co-requisites: Grade a for Math II or at least a B grade for Math II Honors (recommended)
Integrated (Academics / CTE): No
Grade Levels: 11th & 12th
Course Description: This course is designed to build upon the Honors Chemistry curriculum. This second year of chemistry will conduct an extended laboratory and provide an in-depth investigation of more specialized areas of chemistry. Areas of study may include, but are not limited to, chemical reactions, the behavior of gases, solutions, thermochemistry, kinetics, oxidation-reduction reactions, electrochemistry, nuclear, organic chemistry, and biochemistry. Students participate in laboratory exercises, small group activities and discussions.
Chemical Reactions
The five general types of chemical reactions are combination, decomposition, single-replacement, double-replacement, and combustion. Each chemical reactions have certain reactants and products in place in which balancing the chemical equations is essential. Balanced equations allow chemists to control reactions quantitatively. The coefficients in a balanced equation represent the ideal molar ratio for the reactants in the given reaction. Students should be able to balance a chemical reaction and calculate how much of a certain product will be formed in a reaction or how much of a certain reactant will be needed to perform the reaction.
Students will be able to predict the 5 types of reaction types using an online identification practice. They will be predicting reaction products when two reactants are combined using online simulation. An online resource will be used to view several examples of metals reacting with various solutions. After choosing a metal and a solution, student will be shown a picture of the resulting reaction. Students will be able to identify the different reactants and products involved in the 5 types of reactions based on online videos.
• The Foiled Again! demonstration of aluminum foil with copper(II) chloride offers clues for students to predict products. • Use the Classifying Chemical Reactions experiment to help students makes sense of the great variety of chemical reactions. Students perform eight chemical reactions, identify patterns and classify the reactions. • Reinforce the reasoning and analysis for classifying reactions with Types of Chemical Reactions, a great POGIL activity.
The Behavior of Gases
The properties of gases and the mathematical relationships between the pressure, temperature, and the amount of a gas. Gases are compressible because of the large amounts of empty space between particles. The condition of a gas sample can be described by four variables: pressure, volume, temperature, and amount of gas. Use of Boyle's Law, Charles' Law, Gay-Lussac's law, Avogadro's law,

Dalton's law and combined gas law to solve problems based on the the variable changes with a constant.
The relationships between pressure, volume, temperature, and amount of gas can be treated mathematically in a set of equations called the gas laws. Students will be able to note the relationship between two of the variables and verify if a single gas law relate all of the variables to one another. Explore the real world application of gas laws through experience and research. Relate what factors are being considered and how each factor affects the behavior of another. Students will watch an online animation that exhibits the gas laws. Online demonstrations can also be shown to exemplify the relationship of variables in gas laws. There is one equation that relates the pressure to the volume, temperature, and the number of moles when the gas is assumed to be ideal. Students will inquire what situations is the ideal gas law more useful than the other gas laws and under what conditions can a gas assumed to be ideal.
The properties of gases and the gas laws are important in many areas of science and real life, including physiology, meteorology, scuba diving, even hot air ballooning! In this properties of gases and gas laws activity-stations kit, students will investigate the properties of gases, derive the mathematical relationships among the gas variables, and use the kinetic-molecular theory to explain the behavior of gases. There are four “mini-lab” activities, each one focusing on a specific principle or topic: • Diffusion of Gas Molecules • Atmospheric Pressure • Boyle's Law • Charles' Law Each activity is a self-contained unit designed to take about 10 minutes to complete—student groups may rotate through the stations in any order.
Solutions
A great chemical reactions take place within aqueous solutions. Some solutes dissolve quite easily in water, while others do not dissolve very well at all. The ability of a solute to dissolve is affected by external factors like temperature and pressure. Solutions have different physical properties from pure solvents. the amount of solute contained within solutions must be measured so that reactions can be followed quantitatively. In this solutions unit, many aspects of solutions, including their formation and their physical and chemical behavior will be explored.
In this unit, students will be performing dilutions in the laboratory. Concentrated and dilute are qualitative terms that reflect the relative concentration of a solution, which is the amount of solute dissolved in a given amount of solvent. Molarity will also be discussed as the most commonly used way to express the concentration of a solution that is used in a chemical reaction. Dilution is the process of adding solvent to a solution in order to decrease its concentration. The dilution equation can be used to calculate molarity of diluted solutions or to determine the volume of a stock solution needed for dilution.
In this Preparing and Diluting Solutions kit, detailed laboratory procedure walks students step-by-step through the process of accurately preparing solutions of various concentrations. Students must calculate how to prepare several solutions before making them and also must calculate the resulting concentrations of solutions prepared according to given recipes.

Laboratory procedure covers preparation of stock solutions, serial dilutions and dilutions of a given molarity. Additional practice calculations are included for student practice or as a post-test.
Thermochemistry
This unit is about heat flow and how some chemical reactions naturally release energy while some reactions absorb energy. It will show heat changes in chemical equations and perform calculations in order to determine the heat being absorbed or released in all sorts of chemical reactions, changes of state, and other physical processes. Describe how chemical potential energy relates to heat and work, describe the law of conservation of energy and how heat flows between system and surroundings during both endothermic and exothermic processes. Use specific heat equation to perform calculations that relate mass, specific heat, change i
A complete understanding of a chemical reaction requires knowledge of the amount of heat that is absorbed or released during a reaction. Students will explore using online resources the energy in chemical reactions, endothermic and exothermic processes, heat flow, and specific heat. Using primary textbook, students will define enthalpy, know the conditions under which enthalpy change in a reaction is equal to the heat absorbed or released. Describe the principles behind calorimetry, and be able to calculate the heat absorbed or released during a process that occurs in a calorimeter. Write and solve problems with thermochemical equations.
Thermochemistry Package is a comprehensive set of activities introducing concepts of heat, temperature and energy while allowing students to find examples of thermodynamics in their own lives. The only thing constant in life is change. This is certainly true in chemistry, where physical, chemical and energy changes are all interrelated. Fully explore these relationships with this comprehensive set of activities—two demonstrations, one experiment and two POGIL™ activities. Students will learn the concepts of heat, temperature and energy and build connections between these concepts and interesting applications in their daily lives. • The Specific Heat demonstration shows how different substances store heat energy, a unique concept for students. • The Calorimetry POGIL activity reinforces the logic behind these experiments and calculations. • Apply these skills using Discovering Instant Cold Packs, a guided-inquiry experiment. Students design a procedure to determine the energy change that occurs when a “cold pack solid” dissolves in water. • The Whoosh Bottle is a powerful demonstration of the most important application of chemistry in society—the energy produced in combustion reactions.
Kinetics
Chemical kinetics is the study of the rates of chemical reactions. Reaction rates vary widely from one reaction to another. In addition, the rate of the reaction can be influenced by changes in the reaction conditions, such as the concentration of the reactants and the temperature. Knowledge of reaction

rates help chemists better understand and control the reactions to the study both in and out of the laboratory.
In this Kinetics unit, students will be able to express the rate of a chemical reaction. Describe the collision theory as it relates to chemical reactions. Draw and analyze a potential energy diagram for a reaction, including heat of reaction, activation energy, and the activated complex. Describe and explain various factors (concentration, pressure, surface area, temperature, catalysts) that influence the rates of reactions. Explore and use the rate law to describe the concentration dependence of a reaction rate.
How fast will a chemical reaction occur? Too slow, and it may not be practical. Too fast, and it may explode! In this Kinetics and Reaction Rates Chemistry Activity-Stations Kit lab, students investigate effects of surface area, reactant concentration, temperature, and nature of reactants and catalysts on reaction rates that influence the rate of chemical reactions. Five independent mini-lab activities are set up around the classroom. Each activity is designed to take about 10 minutes to complete, and students may rotate through the five stations in any order. Students study the effects of surface area, reactant concentration, temperature, nature of reactants and catalysts on reaction rates.
Oxidation-Reduction Reactions
Rusting is one specific example of a chemical process called corrosion. Corrosion happens to many metals besides iron, such as copper, silver, and zinc. When metallic iron forms rust, known as iron III oxide, its identity is changed due to transfer of electrons. In this oxidation and reduction reaction unit, the general terms given to the processes in which electrons are lost or gained by reacting substances.
Using primary textbook, define oxidation and reduction in terms of a gain or loss of electrons. Identify the oxidizing and reducing agents in the redox reaction as evidenced by online videos and simulations. Describe oxidation and reduction as it occurs in both ionic and molecular reactions. Describe corrosion and some of the ways to prevent it or slow it down. Learn the concept on oxidation number rule to determine the oxidation number of an atom of any element in a pure substance. Balance a redox equation using the oxidation-number-change method.
Beautiful chemistry! Create stunning silver ornaments to demonstrate a practical application of a classic redox reaction. Simply mix dextrose, a reducing sugar, with a basic solution containing silver-ammonia complex ions in a glass ornament ball, swirl, and voilá—a lustrous silver mirror plates out on the inside of the ornament. The resulting silver holiday ornaments “reflect” the way silver mirrors are actually produced! Can you imagine how thin the silver coating actually is? Maybe not, but students can estimate the number of silver atoms in the thickness of the silver mirror using atomic mass, radius, and density calculations.
Electrochemistry
Electrochemistry involves the interrelationship between electrical energy and chemical energy in redox reaction. Aluminum metal is now prepared by a process called electrolysis, which consists of passing an electric current through molten aluminum oxide.
Students will use the activity series to identify elements that are more easily oxidized than others and write oxidation and reduction half-reactions.Describe the general features of a dry cell, a lead storage battery, and fuel cell. Students will research using the internet about aluminum that is widely used in all sorts of modern materials from beverage cans to airplanes.Research and investigate why was pure

aluminum metal so difficult and expensive to obtain prior to the development of electrolysis on an industrial scale. Research on how much energy savings comes from recycling aluminum instead of producing it from aluminum ore. Articulate findings to the class in presentation form.
What happens when an electric current flows through water? How does electricity cause chemical reactions to occur? Students build simple electrochemical cells using a Petri dish, pencil leads, and a 9-volt battery, and then investigate the chemical reaction that occurs when current is forced through water. By comparing the amount of gas and indicator color changes at each electrode, students identify individual reactions that occur and determine the overall chemical reaction. This safe and economical experiment is also a great "classifying matter" activity to prove water is a compound.
Organic Chemistry
The chemistry of carbon containing compounds is called organic chemistry. Students will learn about the basics of organic chemistry including the types of organic compounds, the system of nomenclature used in organic chemistry, and some basic organic reactions.
Students will describe the bonding correct there is six of carbon that led to a large number of organic compounds. For the first type known as hydrocarbons, students will be able to Describe name in the draw structures of Straight chain and branched alkanes, differentiate between saturated and unsaturated hydrocarbon, describe alkenes and alkynes. Carbon is capable of making cyclic structures called cyclic hydrocarbons. Benzene is an unusually stable type of cyclic hydrocarbon that is referred to as an aromatic ring. Students will be able to identify what are cycloalkanes and how they are named. Identify the system of naming aromatic compounds with substituents attached to a benzene ring. A wide variation in the reactivity of organic compounds are due to specific groups in the molecule most of which contain Adams other than hydrogen and carbon. These are called functional groups. Students will be identifying the most common functional groups and how are functional groups indicated in the name of an organic compound. With their knowledge on the different organic structures, some common organic chemical reactions can be studied and analyze. Some of these reactions include substitution, hydrogenation,oxidation, condensation, and polymerization.
Organic chemistry is easy to understand using unique molecular models that shows how electrons behave during bond formation. Students will build their easy to make paper models of atoms and electrons. They use these to form organic molecules by sharing electrons between the atoms. The differently coloured electrons make it easy to see how the bonds are formed.

The models can then be used to show simple organic molecules, how organic compounds are named, the formula of organic compounds, functional groups and isomers.

Biochemistry

Students will describe the bonding correct there is six of carbon that led to a large number of organic compounds. For the first type known as hydrocarbons, students will be able to Describe name in the draw structures of Straight chain and branched alkanes, differentiate between saturated and unsaturated hydrocarbon, describe alkenes and alkynes.

Carbon is capable of making cyclic structures called cyclic hydrocarbons. Benzene is an unusually stable type of cyclic hydrocarbon that is referred to as an aromatic ring. Students will be able to identify what are cycloalkanes and how they are named. Identify the system of naming aromatic compounds with substituents attached to a benzene ring.

A wide variation in the reactivity of organic compounds are due to specific groups in the molecule most of which contain Adams other than hydrogen and carbon. These are called functional groups. Students will be identifying the most common functional groups and how are functional groups indicated in the name of an organic compound.

With their knowledge on the different organic structures, some common organic chemical reactions can be studied and analyze. Some of these reactions include substitution, hydrogenation,oxidation, condensation, and polymerization.

In the carbohydrates section, students will describe the general structures of simple sugars, glucose and fructose. Identify the structure and function function of the polysaccharides namely starch, glycogen, and cellulose.

Proteins are polymers of another class of biomolecules called amino acids. Students will know how many naturally occurring amino acids are used to form proteins and what is the function of an enzyme in biological reactions using online resources and videos.

The class of biomolecules called lipids is comprised of fats, oils, and other water insoluble compounds. Students will be able to know and create a model of the structure of triglyceride and phospholipids.

In this laboratory kit, Food Analysis - Testing Some Common Foods, students will test food samples for starches, sugars, lipids (fats), proteins, and Vitamin C. Students gain an understanding of the chemical makeup of substances in foods commonly found in the home. It allows students to relate terms like "fats," "vitamins," and "proteins" to foods you eat every

day. Includes all test solutions, samples for conducting control tests, test tubes, droppers, detailed instructions, supplementary background material, and suggestions for further study.
Honors Final Exam Deetails
Formative assessments that will be used to assist the teacher ascertain student learning so instructional modifications may done include daily homework assignments, quizzes, laboratory practical tests and laboratory reports. Summative assessments that are given for each unit include free response problems and multiple choice problems. Additionally, concepts from previous units will also be tested with each unit test to assure that students maintain mastery of all concepts throughout the year. Many of the questions on these tests will be constructed using lab scenarios where students must evaluate and process data to obtain correct answers. Projects will include a multimedia presentation in which students will choose a topic from the course outlin. Discuss in detail by explaining, providing examples, and applying concepts to real world. It should provide detailed research about an existing problem and how to actively provide solutions using the chemical concepts and skills learned from the course. The final exam will be comprehensive for the entire year and will include both multiple and free response style questions. As with the unit tests, many of the questions will be designed as lab scenarios.

Environmental Science

Basic Course Information:
Title: Environmental Science
Length of Course: Full Year
Subject Area: Science (D) / Interdisciplinary Sciences
UC Honors Designation? No
Prerequisite: None
Co-requisites: Math I
Integrated (Academics / CTE): No
Grade Levels: 9^{th}, 10^{th}, 11^{th}, 12^{th}
Course Description: This course is designed to provide students with a solid foundation in environmental science topics, laboratory science techniques, fieldwork, data analysis, and critical scientific thought. The teaching medium is the natural world which means students will explore their local and global environment and view it through a scientific lens. During the course students will identify and analyze problems within the natural world, both natural and man-made, analyze data sets (either collected or researched) and develop and design solutions and ideas for preventing, reducing, or solving the identified problems. This course provides students with the strong,

interdisciplinary science background necessary to understand, critically evaluate, and mitigate environmental problems. The laboratory component of the course will include field trips, discussions, and in-lab activities. Students will spend 25% of their time in labs and / or critical thinking research based projects.

Unit 1: Carbon: The Building Block of Life

The key ideas from Unit 1 is an understanding of chemistry is necessary to understand life, carbon is the building block of life, and most of the materials necessary for life are composed of smaller components. Students cover a review of Chemistry, biomolecules, macromolecules, ecosystems, ecosystem ecology, sunlight as a vital abiotic plant, habitats, systems, the water cycle, the carbon-oxygen cycle, photosynthesis, hydrologic and carbon cycles, nitrogen and phosporus cycles, and biochemical cycles.

The cycling of matter, carbon, nitrogen, phosphorus and water an explanation of how each element is recycled as well as interactions between the cycles. This section will also include a study of factors that may hinder the natural cycling of such materials

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

ASSIGNMENTS:

1. Unit 1 vocabulary words - covering 20 words from lipids to organic molecules
2. Web Connection - Research about the periodic table and elements
3. The Big 4 Elements in Life - Worksheet to identify the chemical elements using the periodic table
4. More about elements - Discusses where elements are in abundance within the earth (plants, earth's crust, water, air)
5. Comprehension - Review worksheet of reading
6. Identify lipids, carbohydrates, and proteins on a food label
7. Draw the Big 4 elements in diagram
8. Quiz 1: Carbon - The Building Block of Life
9. Science World Vol. 74 no 11 - Running Dry
10. Find biotic and abiotic factors within your own school
11. Ecosystem Ecology video notes
12. Science News
13. Aquarium and Terrarium Observation and Research activity

14. Organization worksheet - Identifying biomes, communities, ecosystems, species, individuals, and populations
15. Activity - Organizing your school as an ecosystem
16. Science in the News - Research worksheet regarding global ecosystems
17. Human Impacts on the Environment
18. Activity Habitats
19. Ecology research worksheet - Students use the internet to research what an ecologist might research and present results to the class
20. Reading comprehension worksheet on primary reading about ecology
21. Reading a graph - students study the affects of rat habitat movement on a graph
22. Quiz 2: Introduction to Life and Ecology
23. Chapter Preview - 13 vocabulary words and definitions
24. Water - Liquid Awesome video and notes
25. Comprehension worksheet on the water cycle
26. Worksheet - Energy within Ecosystems
27. Worksheet - Food webs
28. Quiz 3 - Life within an ecosystem
29. Hydrologic and carbon cycles journaling
30. Nitrogen Phosporus Cycles writing assignment
31. Quiz 4 Biochemical Cycles
32. Final Quiz: Unit 1

LAB 1 - Sunlight as a vital Abiotic Plant Lab - In this lab, students will set up plants in the sunlight, artifical light, and no light over the course of a four week period. They will keep active lab notes on the affects of different lighting on the plants and report their findings.

PROJECT - Simple Ecosystems - Students will research and create simple Ecosystems that will have living organisms from this ecosystem. Students will create a presentation and share their research with the class.

LAB 2 - Water Leaf Lab (cellular respiration and photosynthesis) Students take a glass of water and place a leaf in the water in a sunny location. Students will record the results.

Unit 2: Producer Organisms and Other Mysteries of Life

This Unit will explore some of the background in other disciplines needed to fully move toward an understanding of environmental science. Ecosystems and their physical environments depend on living things – particularly the plants and the decomposers. Plants form the basis of all ecosystems, providing food to other organisms and releasing oxygen into the air. Decomposers keep the ecosystem in clean and working order by breaking down dead and decaying material to return nutrients to the soil. This Unit investigates these important organisms. The Unit also contains basic information about living things, cells, and the way that genetic information is passed to future generations. An understanding of these topics now will allow for thoughtful investigations about environmental issues in the future. Topics such as genetically modified foods, the movement of disease through a population through

contaminated ground water, or the flow of energy through an ecosystem are discussed in environmental science. A deeper understanding of the basics of life science will make these environmental topics more powerful.

1. Using mathematics and computational thinking.
2. Constructing explanations (for science) and designing solutions (for engineering).
3. Engaging in argument from evidence.
4. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

Student will learn about the importance of decomposers within the ecosystems. They will attend class for lectures and class discussions and then complete the following assignments, labs, projects, and quizzes.

1. Class notes "Population Ecology: The Texas Mosquito Mystery"
2. Vocabulary words
3. Class notes Characteristics of living organisms
4. Comprehension worksheet - living, nonliving, once living now dead
5. Vocabulary worksheet
6. History of Life on Earth video questions
7. Class notes - Spontaneous Generation
8. Class notes - Louis Pasteur
9. Worksheet - Pasteur's Experiment
10. Quiz 1: Life as we know it
11. Vocabulary worksheet
12. Human Population Growth video notes
13. class notes - nucleic acids, DNA
14. Read RNA, compare and contrast DNA versus RNA
15. class notes - amino acids, lipids, carbohydrates
16. Quiz 2: The Molecules of Life
17. Vocabulary Worksheet
18. Plant cells video questions
19. class notes - the cell, cell parts
20. vocabulary worksheet
21. diffusion worksheet
22. In Da Club - Membranes & Transport" video notes
23. Diffusion Worksheet
24. Quiz 3: Cells
25. Vocabulary worksheet
26. Class notes - producers, compare and contrast, and plant diversity
27. Comprehension Worksheet
28. Decomposers Activity
29. "Fungi: Death Becomes Them" - Video Notes

30. Class discussion - bacteria
31. Quiz 4: Producers and Decomposers
32. Vocabulary worksheet
33. Class notes - inherited traits, punnet squares
34. "heredity" video notes
35. "DNA Structure and Replicaton" video notes
36. Quiz 5: A word about genetics
37. Final Quiz: Unit 2

LAB: Candle Lab - characteristics of living and nonliving things - Students will learn how to record experiments by lighting the candle, placing it in different conditions (wind, under a glass dome) to see how it is affected. After several minutes, students will record the differences of the candle. When the wick is cooled, students will record the changes in the wick. Students will touch the cooled wax and record the changes to the wax after it has been melted in fire.

LAB: Formation of a DNA strand - Illustrate DNA strands - using candy and other household objects, students will create DNA chains of the following - cytosine, thymine, adenine, guanine, guanine, thymine, and cytosine. Research will be completed on DNA molecule structures by identifying what makes up the sides and the rungs of DNA strands.

LAB: Carrot Lab - Osmosis Observation - two beakers or clear jars, water, salt, two carrots of similar size, a ruler, a teaspoon measure, and thread.

- STEP 1: Fill each beaker half way. Add three teaspoons of salt to one beaker.
- STEP 2: Carefully cut both carrots in half. Discard the thinner portion of both carrots. Tie a small piece of thread about one inch from the cut end of each of the thicker portions of the carrots.
- STEP 3: Place each carrot, cut side down, in the bottom of one beaker. Let the carrots and the beakers sit for a day.
- STEP 4: Remove the carrots. Observe the tightness of the strings and the appearance of the carrots.
- Record and share the results. Use a microscope to find more in depth finding.

LAB: Lettuce Leaf Lab - The effects of bacteria - Students will place lettuce leaves in different locations (warm place, refrigerator, sunlight) and record the affects of the environment over a five day period.

Unit 3: The World of Animals

Plants live without struggle. Their food comes to them in the form of sunlight. They don't resist being eaten. Animals, in contrast, face the stresses of finding their food, and of trying not

to be eaten. Since they eat complex substances, they must have ways of changing those substances into simpler substances that can reach their cells.
The world of animals is diverse and complex. But, the role of animals in their environment depends on adaptations that help animals in their roles as prey and predators. Many adaptations that allow animals to survive depend on their individual body systems.
The study of how animals adapt to their habitat differs depending on the type of animal involved. The vertebrates are the animals with backbones. These include amphibians, reptiles, fish, birds, and mammals. Invertebrates are the other major group of animals; they do not have a backbone. They may have an external skeleton, shell(s) or nothing at all. Familiar examples are sponges, jellyfish, corals, starfish, mollusks, insects, worms, and crustaceans.

An animal's survival depends on more than adaptions. Often, the survival of an animal species depends on humans. The interaction of humans with the environment can alter the existing balance. This unit also explores the modern threats to biodiversity and what can be done to help preserve what is on Earth today.

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

ASSIGNMENTS:

1. Class notes - 50 vocabulary words
2. Class notes - organ systems
3. Organ systems worksheet
4. "the Nervous System" video notes
5. class notes - the nervous system, nervous system vocabulary
6. Class notes - The Digestive System
7. Worksheet - The Digestive System
8. Project - Web Research Presentation on the digestive system
9. Class notes - The Female Reproductive System, The Male Reproductive System, Fertilization

10. Homework - Read The Respiratory and circulatory systems, complete reading questions
11. "Circulatory & Respiratory Systems" video notes
12. Worksheet - labeling diagrams
13. Quiz 1: The Systems of Living Things
14. Vocabulary worksheet
15. class notes - competition, predation
16. "Community Ecology II: Predators" video notes
17. Class notes - Symbiosis, adaptations, vision
18. Read "Teeth" answer worksheets
19. Teeth project
20. "Natural Selection" video notes
21. Quiz 2: Interactions and Adaptations
22. Vocabulary worksheet
23. class notes - diverse world of animals, identifying animal species
24. Read binomial nomenclature, invertebrates, vertebrates
25. "Taxonomy: Life's Filing System" video notes
26. class notes - threats to biodiversity, how a species becomes extinct: the critical level, species extinction and the law
27. "Conservation and Restoration Ecology" video notes
28. Quiz 3: Diversity of Species
29. Final Quiz: Unit 3

LAB - SYSTEM OF ANIMALS - Using a microscope, students will investigate living specimens under the direction of the teacher. Students will record the differences between the specimens from alternate biomes. (Aquatic, desert, forest). Students will also classify the living things based on information learned from this unit.

LAB - COTTON BALL LAB - Investigate characteristics of living and non living things - This lab covers reactions of living things by challenging students to not blink when cotton balls are thrown at them. Partners will work together to count how many times a person blinks without stimuli and then how many times they blink when stimulated with cotton balls thrown at them. Students will research how involuntary reactions happen and draw conclusions based on experiment and research.

LAB - ZEBRA PROJECT - Coloration and pattern as camouflage for living organisms - investigate how coloration and pattern can help an organism remain hidden. Students will create "Skins" of animals that have been identified as a means of camouflage for the animal to ensure their sustainability. Students will take the "Skins" and try to find locations on campus where the "skins" would be used to help an animal hide. Students will also research

indigenous areas where the animals are from to find how the camouflage works for the animals.

LAB - VISION LAB - Differences between monocular and binocular vision - investigate the differences between monocular and binocular vision. Students will use tubes and covers to research and record the differences in their own vision. Students will record the results then research the reasons why appearances change with different tools.

LAB - SHOW US YOUR TEETH - Using different kinds of foods, students will identify the use and purpose of teeth in their mouth and what each tooth is most effective for. Students will draw a diagram, label each tooth, and then identify what the use if for that tooth.

LAB - BLOOD PRESSURE LAB - Students will learn about blood pressure and will learn how to use a blood pressure cuff. Students will record blood pressures within a group of students and see how exercise affects their blood pressure.

Unit 4: Populations

Living things do not live alone. Living things act on each other and their surroundings. They are affected by their surroundings. All organisms need air, food, water, and space – which may include a shelter – to survive. There is plenty of air to provide land animals and plants with oxygen and carbon dioxide. However, organisms may compete for food, water, and space. A plant can make its own food, but it may compete with other plants for trace elements in the soil or sunlight. If we really want to understand an organism, we must know how it organizes with other organisms like itself to form a population.
A population grows, changes, and shrinks over time. Many factors and influences change the size of a population or the rate at which a population grows. These factors can be abiotic, biotic, or involve other climatic factors. This unit explores the different changes that a population may experience and investigates the reasons for the changes.
The population of humans on Earth is changing as well. Demography is the study of statistics concerning the growth of the human population. As it grows and changes, the effect that humans have on the environment becomes more pronounced. This unit also begins to explore some of the specific impacts that human behavior can have on the environment and the consequences felt by us and other organisms.

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.

6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

1. "Human Population Growth" Video Notes
2. Vocabulary worksheet
3. "The Plants & Bees: Plan Reproduction" Video Notes
4. Class notes - population density, sampling a population, calculate, logistical growth, compare and contrast
5. Worksheet - check your understanding
6. Read - Changes in Human Population
7. Research essay changes in human population
8. "5 Human Impacts on the Environment: Crash Course Ecology" video notes
9. Class notes - studying population growth with age-structure diagrams
10. Quiz 1: Population Grown
11. Class notes - Factors affecting population growth, cycles of population growth, other factors controlling populations of plants and animals
12. Comprehension worksheet
13. Quiz 2: Nature in Balance
14. "Population Genetics: When Darwin met Mendel" video notes
15. class notes - population stability in communities, primary succession, secondary succession
16. Worksheet on ordering populations
17. Read: SUccession in Aqueous Environments, Biodiversity, biomass, ecological succession
18. Comprehension worksheet
19. quiz 3: population stability
20. "Ecology - Rules for living on Earth" video notes
21. Class notes - el nino, El nino and La nina SOuthern Oscillation Cycle, La Nina, Predicting El Nino and La Nina
22. Comprehension worksheet
23. Florida Everglades Group Project
24. Class notes - adaptation, people often negatively influence nature
25. Quiz 4: The Human Impact on Ecosystems
26. "El Nino 101/National Geographic" video notes
27. "Achieving Environmental Balance: FIU research in the Florida Everglades" video notes
28. Final Quiz: Unit 4

LAB: POPULATION - Estimating the size of populations - investigate how the mark-and-recapture method is used to estimate the size of a population.

- **STEP 1**: Carefully cut out 64 squares of paper. On 19 of the squares, write a letter G and place all of the squares in the empty box (or hat). The box represents the field and the pieces of paper are the groundhogs living there. The 19 squares marked with the G represent the groundhogs that have been marked, as recorded in Year 4 of the data table. The blank squares of paper are groundhogs not captured until now.
- **STEP 2**: Randomly choose one groundhog from the box. This represents the "capture." Put the captured groundhog aside.
- **STEP 3**: Repeat Step 2 nine more times, until you have captured 10 groundhogs total. Record that number in the data table.
- **STEP 4**: Examine each of the captured groundhogs. Count how many have been "recaptured" (these are the ones that were previously captured and marked with the G). Record this number.
- **STEP 5:** To find the estimated total population, you will want to multiply the first capture by the 2nd capture on your calculator. Then divide that product by the number of marked individuals recaptured. You may need to round your answer to the nearest whole number. Then answer the questions below.

LAB: PLANT POPULATION COMPETITION - investigate competition that might exist between plants.

- **STEP 1**: Fill both small pots about three-quarters full of potting soil.
- **STEP 2**: In one pot, place three seeds. Space the seeds so they are as far apart as possible and still away from the sides of the pot.
- **STEP 3**: In the second pot, place 10 – 20 seeds.
- **STEP 4**: Water each plant. Place them both in a sunny location and water as needed over the next few weeks.

Unit 5: Biomes

All organisms have a "home." This unit is essentially a survey of the different homes that organisms can occupy on Earth. The biosphere is the culmination of all these different homes. This is the largest organizational division of living things on Earth.
Different biomes make up the Earth's biosphere. Biomes can be on land (terrestrial) or aquatic. Each biome is classified according to its different characteristics – temperature, climate, rainfall, soil type, and the organisms living there.

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).

2. Developing and using models. 3. Planning and carrying out investigations. 4. Analyzing and interpreting data. 5. Using mathematics and computational thinking. 6. Constructing explanations (for science) and designing solutions (for engineering). 7. Engaging in argument from evidence. 8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)
1. class notes - biosphere 2. Read: Temperature Zones, comprehension worksheet 3. "The Sun: Crash Course Astronomy" video notes 4. Quiz 1: The Biosphere 5. Vocabulary worksheet 6. class notes - biomes, the tropical rainforest biome, the savanna biome, the desert biomes, the chaparral biome, the temperate grassland biome, the temperate deciduous forest biome 7. Worksheet comprehension of biomes 8. "Biomes of the world for children: Oceans, mountains, grassland, rainforest, desert" video notes 9. "Coniferous Forest Biome Explained" video notes 10. class notes - coniferous forest (taiga) Biome 11. "Arctic Tundra Biome" video notes 12. class notes - tundra 13. Vocabulary worksheet 14. Quiz 2: Terrestrial Biomes 15. class notes - freshwater biomes, marine biomes 16. "The Intertidal / Under H2O" video notes 17. Quiz 3: Aquatic Biomes 18. "Aquatic Biomes" video notes 19. "Great Barrier Reef" video notes 20. "Aquatic Biomes FReshwater / Biology / Ecology" video notes 21. "Aquatic Biomes Wetlands / biology / ecology" video notes 22. Read: California's climate zones 23. worksheet on climate zones 24. Read: Animal life in California's Biomes 25. Worksheet on CA animal life 26. "Climate change is part of California's perfect recipe for intense wildfire" video notes 27. class notes - mammals, animals in the wetlands, california grasslands 28. Comprehension worksheet 29. Quiz 4: California Biomes 30. "Ecosystems and biomes / ecology" video notes

31. Final Quiz: Unit 5

LAB - Sun's rays lab - how the sun's ray create different heating of the earth - Using incandescent light bulbs and thermometers, students will research the amount of time it takes to generate heat from a light source. They will test different items to see how long an incandescent light takes to light up the item and to what degree the item's temperature is raised.

LAB - Ordering Biomes Project

LAB - Building Estuaries - Test tube snail project

LAB - California climate zones model

LAB - Marshes model project

LAB - Biomes Project

Unit 6: Pollution

Environmental pollution is a term that refers to all the ways that people contaminate their surroundings. People dirty the air with gases and smoke; poison the water with chemicals and toxic substances; and damage the soil with too many fertilizers and pesticides. People ruin the natural beauty around them by littering. They operate machines and motor vehicles that fill the air with disturbing noise. Nearly everyone causes pollution in some way.
Environmental pollution is one of the most serious problems facing the ecosystem today. Air, water, and soil, all of which are harmed by pollution, are necessary to the survival of all living things. Badly polluted air can cause illness, and even death. Polluted water kills fish and other marine life. Pollution of soil reduces the amount of land available for growing food.
Everyone wants to reduce pollution, but the pollution problem is as complicated as it is serious. This problem is compounded by the fact that so much pollution is caused by things that benefit people and society as a whole. For example, exhaust from automobiles causes a large percentage of all air pollution. On the other hand, automobiles provide transportation for millions of people. Factories discharge much of the material that pollutes the air and water, but factories provide jobs and products. Too much fertilizer and pesticides can ruin soil, but these are important aids to growing crops.
This Unit seeks to explain some of the issues that are facing the biosphere today with respect to pollution. An understanding of the causes and effects of pollution, through specific examples, will hopefully lead to a deeper appreciation for the complicated balance of our planet today.

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

1. "Reveal earth's Atmosphere" video notes
2. class notes - composition of the Earth's atmosphere, the layers of the atmosphere
3. Vocabulary worksheet
4. Read: Incoming solar radiation, the greenhouse effect
5. Quiz 1: Earth as a closed system
6. "The Greenhouse Effect" video notes
7. class notes - pollution
8. Read - smog, temperature inversion, acid rain, indoor air pollution
9. "Buffers, the Acid Rain Slayer" video notes
10. Quiz 2: Air Pollution
11. Class notes - water pollution
12. comprehension worksheet
13. Groundwater Contamination essay
14. "Pollution" video notes
15. class notes - sources of water pollution
16. Quiz 3: Water Pollution
17. "Hearing & Balance" video notes
18. class notes - noise pollution, hearing loss, other effects of noise on organisms.
19. Comprehension essay
20. class notes - light pollution
21. Quiz 4: Noise and Light Pollution
22. class notes - waste, composition of municipal solid waste, solid waste in the US
23. "Plastics 101" video notes
24. "Trash of a Human Lifetime" video notes
25. "Hers' how much plastic trash is littering the earth" video notes
26. "Living in our own waste" video notes
27. comprehension essay
28. class discussion - methods of waste disposal, hazardous waste, understanding waste

29. Quiz 5: Wastes
30. "50 years ago, this was a wasteland" video notes
31. Final Quiz: Unit 6

LAB - Atmosphere model

LAB - Air quality Lab - Investigate the quality of the air where you currently live.

- STEP 1: Identify three different locations indoors or outdoors. You will be taking air samples at these three locations over the next five days.
- STEP 2: Place a coffee filter over the nozzle of the vacuum cleaner hose. Secure it with a rubber band. The air should pass through the coffee filter as it passes into the hose.
- STEP 3: Before taking the reading, note the temperature and weather conditions. For example, is it warm, windy, cold, calm, raining, etc.?
- STEP 4: Hold the vacuum cleaner hose about one meter (three feet) above the ground. Turn it on for 30 seconds.
- STEP 5: After the 30 seconds has passed, turn the vacuum off and carefully remove the filter.
- STEP 6: Label the filter with the time, location, and current weather conditions.
- STEP 7: Examine the filter and notice any pollutants.
- Report findings and draw conclusions

LAB - Smog Lab - Determine how smog forms.

- STEP 1: Place one bottle in the hot water and the other in the ice.
- STEP 2: Light two matches and drop one in each bottle.
- STEP 3: Observe what happens
- Report findings and draw conclusions

LAB - Groundwater Lab - Investigate the movement of water underground

- STEP 1: Fill the jar one-third of the way with pebbles.
- STEP 2: Carefully add the sand to the jar until it is about two-thirds of the way filled.
- STEP 3: Simulate rain falling on the surface by pouring water out of the can onto the surface of the sand in the jar
- Report findings and draw conclusions

Unit 7: Conservation

Once a week, large, noisy trucks across America roll through cities, suburbs, and farmlands. Some of these trucks pick up the garbage or trash that a family, school, or business creates. Other trucks pick up bottles, cans, and paper that people have accumulated in containers and

placed at the curb. The trucks, as they stop and go at each building or home on a block, emit fumes and clouds of pollution as the gasoline in their engines burns. The garbage and recycling trucks are using resources to pick up materials for potential recycling. It is an endless cycle of use and reuse of natural resources.

Each day we use natural resources. Some sort of natural resource generated the electricity we use to power our computers, lights, toasters, and electric toothbrushes. Perhaps it was a resource, such as coal, which is in finite supply within the Earth. Alternatively, perhaps it was generated by wind or waterpower, both of which are in abundant supply. No matter which type of resource generates our power, there is still some sort of natural resource consumed to give us the conveniences necessary for our daily lives.

This Unit will explore the different types of resources found on Earth. And it will look at the wise and thoughtful use of these resources. As the human population continues to grow and we begin to realize the full extent of our impact on the environment and biosphere as a whole, it becomes necessary to recognize where our resources are coming from and how we use them. Alternatives and conservation attempts must be made to secure the health of the planet and to ensure that future generations will have access to the same resources as we have today.

1. class notes - introduction to conservation, nonrenewable resources, sources of energy, fossil fuels, oil
2. Unit 7 Vocabulary Worksheet
3. Activity - Resources modeline
4. "The Global Carbon Cycle" video notes
5. "Looking for Killer Whales 26 years after the Exxon Valdez Oil Spill Parts 1 & 2" video notes and discussion
6. "There's still oil on this beach 26 years after Exxon Valdez" video notes and discussion
7. class notes - natural gas, conserving nonrenewable energy resources
8. "The Ideal Gas Law" Video Essay
9. "Real Gases" Video notes
10. Class discussion - energy conservation, renewable resources
11. Three Gorges Dam in China essay
12. Worksheet on wind power, hydroelectric power, and hydroelectric dams
13. Nuclear Energy worksheet
14. Vocabulary worksheet on Nuclear Energy
15. "Energy & Chemistry" video notes
16. Quiz 1: Conservation of Energy
17. Vocabulary worksheet on metal and nonmetal renewable resources
18. "Conservations and Restoration Ecology" video notes and class discussion
19. Class notes - conserving resources, biodegradable or not, composting, recycling
20. Comprehension essay on recycling
21. Quiz 2: Conservation and Recycling
22. "Kids take action against ocean plastic" video notes and discussion
23. Vocabulary worksheet on conservation biology

24. "Let's Take Bold Steps Forward to Protect Our Planet" video notes and discussion
25. Class notes - How do you think we could best protect our planet, conservation biology, recent extinctions
26. Activities - A move toward sustainable development, local conservation
27. "What is sustainable development? by the United Nations" video notes and class discussion
28. Quiz 3: Conservation Biology
29. Final Quiz: Unit 7

LAB - Oil Lab - Oil spills and the environmental significance - predict why these events are so difficult to clean up and why they have such a significant impact on Earth's ecosystems.

- **STEP 1**: Put 30 mL of molasses into an empty paper cup. Pour the molasses from this cup into the other cup.
- **STEP 2**: Observe what happens to the molasses as you pour it into the empty cup. Think about adjectives that you would use to describe this material.
- **STEP 3**: Pour a small amount of the molasses into the pan. Sprinkle the sand into the molasses and dip the feather into it.
- **STEP 4**: Now try to clean off the sand on the feather. Use your fingers and the paper towel.
- Record and report your results, then draw conclusions.

LAB - Lightbulb Lab - Energy and Electricity usage - defining the difference between LED and incandescent - explore light bulb efficiency

- **STEP 1**: Place the incandescent bulb into the lamp socket. Carefully plug the lamp in.
- **STEP 2**: Turn on the lamp and leave it on for five minutes.
- **STEP 3**: After five minutes have passed, hold the thermometer about 10 cm from the end of the bulb and record the temperature.
- **STEP 4**: Turn off the lamp and allow the bulb to cool.
- **STEP 5**: Repeat steps 1 – 4 using the fluorescent bulb
- Record and report results, then draw conclusions

PROJECT - Conservation - Determine how to conserve energy at school and to create a proposal for the school administration that encourages them to use energy more efficiently. This may include changing the times that your school operates. For instance, if you are in a colder climate it might be more economical to have more time off in the winter and less time in the summer to save money on heating. Likewise, if you are in a hotter climate it might make more sense to have more time off in the summer months. You also may need to change the times that the school day starts and ends. If the school day starts when it is still dark outside it would be better to start later when there is more sun to save on electricity generated by

lighting each of the classrooms. Presentations must include research and will be presented using multi media. Cite at least five references used for the research of this project.

LAB - Banana peel lab - predict how long it takes for a banana peel to biodegrade

- **STEP 1**: After enjoying a banana, place the peel in an area where it will not be disturbed and nobody will slip on it. It is best if this area is outside, perhaps on a balcony or patio.
- **STEP 2**: Place a small screen over the peel and weight it down along the edges with rocks or bricks. However, this step is not necessary.
- **STEP 3**: Observe the banana peel over the next few weeks, checking on it every other day.
- **STEP 4**: Each time you check it, write down the date and time of day, and make a note of the peel's appearance.

LAB - Trash separation and composting lab - investigate what you can recycle or reuse in your home or school

- **STEP 1**: Spread newspapers out on a table or on the floor.
- **STEP 2**: After putting on a pair of rubber or non-latex gloves, carefully dump one bag of household or classroom trash onto the newspaper. Be careful of spills or sharp objects.
- **STEP 3**: Begin to separate the materials into piles. Create one pile of materials that can be composted, one of materials that can be recycled according to the city of San Diego's program (outlined in the section above), and one pile of materials that can be neither composted nor recycled.
- **STEP 4**: Make a note of the materials in each pile and the approximate size of each pile
- Record and report results. Draw conclusions from the experiment.

PROJECT - Extinction data - Groups will research hot spots and the bald eagle. They will create graphs showing the rate of extinction of endangered species and discuss with the class their findings.

Unit 8: Survival Skills

This Unit explores maps, latitude and longitude, as well as the natural hazards that face people in California. Knowing how to administer basic first aid and understanding how to stay safe is empowering to any hiker, camper, or person who enjoys the outdoors.

Objectives

Upon completion of this Unit, students will be able to:

- discuss the elevation and relief on Earth's surface.
- read and interpret topographic maps.
- read the latitude and longitude on a map.
- use a compass.
- describe the first aid practices necessary in the wilderness.
- identify some of the natural hazards that people encounter in California.
- describe the different types of faults.
- compare and contrast the damage done by earthquakes along the San Andreas Fault.
- identify examples of biodiversity.

1. class notes - a new look at the Earth's surface, contour lines, calculating contours
2. "The Earth: Crash Course Astronomy #11" video notes and class discussion
3. class notes - the scale of a map, symbols on a map, special features on a topographic map, steep hill or gradual incline
4. class notes - additional topographic map rules
5. "Scientists See Ocean Floor via Sonar / National Geographic" video notes and class discussion
6. "First ever 3D VR Filmed in Space / One Strange Rock" video notes and class discussion
7. Quiz 1: Earth in #d
8. "Experience the Magic of Redwood National Park / Short Film" video notes and class discussion
9. class notes - hemispheres on Earth's surface, latitude and longitude, using a compass, wilderness safety, First Aid Kit, shock, burns, hypothermia, heat exhaustion, altitude
10. Quiz 2: Finding your way in the wilderness
11. "Finding Freedom in a Frontier Life" video notes and class discussion
12. Vocabulary worksheet on natural hazards in California
13. class notes - earthquakes, the San Andreas fault, Biodiversity in California
14. "Here's what earthquakes look like from inside the earth / National Geographic" video notes and class discussion
15. "Earthquakes 101 / National Geographic" video notes and class discussion
16. "San Andreas Fault (Discovery Channel)" video notes and class discussion
17. Quiz 3: Survival in California
18. Final Quiz: Unit 8

PROJECT - regional topographical map - students will create a topographical map of a region

LAB - Topographical Map Lab

LAB - Using a Compass

RESEARCH PROJECT - California Biodiversity - Essay and presentation

- Which natural hazard described in the chapter do you think is most dangerous and why?
- Do you have any personal experience with a natural hazard or disaster? If so, what was it and what did you do to protect yourself?
- How do you think people can best prepare for and protect themselves against these hazards?

Unit 9: Living in the Modern World

This Unit provides a look at the hazards, both human generated and natural, that challenge people in today's society. We are exposed to some hazards because of the actions of others. Some potential hazards are completely in our own personal control.
Upon completion of this Unit, students will:

- understand the role that the United States Environmental Protection Agency played in the crisis at Love Canal.
- explain the nuclear disaster at the Chernobyl Nuclear Facility.
- describe the causes and effects of air pollution in Mexico City.
- understand the dangers and symptoms of drug addiction.
- identify the chemicals in tobacco.
- understand various aspects of alcohol abuse and its impact on the human body.
- compare and contrast other types of drugs.
- describe some of the advances in farming and agriculture.
- explain how biotechnology has been applied to agriculture.
- compare and contrast organically and conventionally grown foods.
- describe the different types of aquaculture.

1. Research essay about the Love Canal
2. Read: Chernobyl
3. "The Animals of Chernobyl / New York Times" video notes and discussion
4. Class Discussion - Air Pollution Crisis in Mexico City
5. Quiz 1: Environmental Hazards
6. Chapter Preview - 25 vocabulary words
7. Class notes - the cost of smoking
8. "Turning Cigarette Butts Into Park Benches / National Geographic" video notes and class discussion
9. Class notes - alcohol use and abuse, other drugs
10. Quiz 2: Hazardous Choices

11. "This is what happens to your brain on Opioids / Short Film Showcase" video notes and class discussion
12. Class notes - advances in farming, biotechnology in agriculture, issues surrounding genetically modified foods, organic foods, aquaculture
13. "A Plan to Feed the World / Future of Food" video notes and class discussion
14. "From Farm to Table / Nat Geo Live" video notes and class discussion
15. "Evolutionary Development: Chicken Teeth" video notes and class discussion
16. Quiz 3: Feeding the World
17. Final Quiz: Unit 9

PROJECT: Model of the Chernobyl Incident and the effects on the region

RESEARCH PROJECT: Find and create a group presentation regarding the marketing of alcohol and cigarettes

RESEARCH ESSAY: Genetically Modified Foods

Unit 10: Case Studies and Research

This unit delves into specific case studies to further explore concepts researched and taught in prior units. Using the in class textbook, students will learn how to critically think to develop ideas about the controversial topics of conservation and environmental science. Students will be called to research specific case studies and create research and lab projects to solidify their views supported by cited sources and specific research.

1. Case study - Field experiences test value of Biodiversity
2. "Three New Marine Parks Protect Stunning Biodiversity / National Geographic" video notes and class discussion
3. Case study - Why Trees need Salmon
4. "The Salmon's Life Mission / Destination WILD" video notes and class discussion covering the river and forest biomes
5. Case study - Darwin's Voyage of Discovery
6. "Darwin in the Galapagos / Nat Geo Wild" video notes and class discussion
    1. How does evolution produce species diversity?
    2. How do species interaction shape biological communities?
    3. How do community properties affect species and populations?
    4. Why are communities dynamic and how do they change over time?
7. Cast study - How many fish in the sea?
8. "7 Billion, National Geographic Magazine / National Geographic" video notes and class discussion
9. Case Study: Becoming a Locavore in the Dining Hall
10. Essay - Why do you think it would be important to be a Locavore?
11. Case study: Farming the Cerrado

12. Essay - What are the differences between conventional and sustainable practices in farming?
13. Case Study: Job Destroyer or Forest Protector?
14. "Killing One Owl to Save Another Owl? / National Geographic" video notes and class discussion
    1. Although extinction is a natural process, what are ways that people accelerate the process?
    2. Should we be trying to save animals that are becoming extinct, or is this a choice of natural selection?
15. Case study - Restoring Louisiana's Coastal Defenses
16. Research and respond to "Reviewing Learning Outcomes" from the textbook
17. Quiz on Case Studies
18. Case study - Leaching Gold
19. "How Gold is Made Documentary Gold Mining National Geographic Documentary" video notes and class discussion
20. Case study - When Wedges do More Than Silver Bullets
21. Quiz on case study
22. Case study - Controlling Mercury Pollution
23. Class discussion and essays - a) what is the air like around us? b) What are natural pollutants for air pollution? c) How do humans cause air pollution? d) How does climate topography and atmospheric processes affect air quality? e) What are the effects of air pollution? f) How do people work on controlling air pollution?
24. Case study - Sharing the Klamath, 3 paragraph essay
25. Class Discussion - a)What is water pollution? b)Describe types of water pollution and the effects it has on the environment. c) How can people be a part of water pollution control.
26. Case Study - A natural system for wastewater treatment
27. "Chasing Rivers, Part 1: The Colorado / Nat Geo Live" video notes and class discussion
28. 5 paragraph essay on Water Legislation

PROJECT - Research the way that humans affect biodiversity. Create an advertisement poster and a 30 second multi media commercial to present views of human affects of biodiversity.

PROJECT - Create a diorama of the correlation between the river biome and forest biome. Talk about the relationship and the importance of the two working together.

GROUP PROJECT - How does human population affect natural resources? Each group will study a natural resource, the group will provide a creative way to describe how humans affect the natural resource. Describe ways that the human race hurts natural resources. Describe ways that people have worked for the conservation and renewable resources.

POINT / COUNTERPOINT PROJECT - Discuss the pros and cons of conventional and sustainable farming PROJECT - Using an animal that is on the endangered species list, create a newspaper page page about the endangered animal. There must be at least one photo of the animal. There must be at least two "news articles" pertaining to the endangered animal. The page must include: a) why the animal is on the endangered list. b) Information about the species and how it contributes to the planet. c) What group(s) are aiding in the conservation efforts of this animal. d) Any laws or legislation that is working to help the preservation of the species. e) Photos and/or drawings of the species. GROUP PROJECT - Make a kids' television show segment on "Air Pollution." Define what Air Pollution is. Give ways that air pollution happens. Talk about ways that people can help air pollution.

Environmental Science Honors

Basic Course Information:
Title: Environmental Science Honors
Length of Course: Full Year
Subject Area: Science (D) / Interdisciplinary Science
UC Honors Designation? Yes
Prerequisite: Math I
Co-requisites: None
Integrated (Academics / CTE): No
Grade Levels: 9th, 10th, 11th & 12th
Course Description: This course is designed to provide students with a solid foundation in environmental science topics, laboratory science techniques, fieldwork, data analysis, and critical scientific thought. The teaching medium is the natural world which means students will explore their local and global environment and view it through a scientific lens. During the course students will identify and analyze problems within the natural world, both natural and man-made, analyze data sets (either collected or researched) and develop and design solutions and ideas for preventing, reducing, or solving the identified problems. This course provides students with the strong, interdisciplinary science background necessary to understand, critically evaluate, and mitigate environmental problems. The laboratory component of the course will include field trips, discussions, and in-lab activities. Students will spend 25% of their time in labs and / or critical thinking research based projects.
Unit 1: Carbon – The Building Block of Life
The key ideas from Unit 1 is an understanding of chemistry is necessary to understand life, carbon is the building block of life, and most of the materials necessary for life are composed of smaller components. Students cover a review of Chemistry, biomolecules, macromolecules, ecosystems, ecosystem ecology, sunlight as a vital abiotic plant, habitats, systems, the water

cycle, the carbon-oxygen cycle, photosynthesis, hydrologic and carbon cycles, nitrogen and phosporus cycles, and biochemical cycles.

The cycling of matter, carbon, nitrogen, phosphorus and water an explanation of how each element is recycled as well as interactions between the cycles. This section will also include a study of factors that may hinder the natural cycling of such materials

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

ASSIGNMENTS:

1. Unit 1 vocabulary words - covering 20 words from lipids to organic molecules
2. Web Connection - Research about the periodic table and elements
3. The Big 4 Elements in Life - Worksheet to identify the chemical elements using the periodic table
4. More about elements - Discusses where elements are in abundance within the earth (plants, earth's crust, water, air)
5. Comprehension - Review worksheet of reading
6. Identify lipids, carbohydrates, and proteins on a food label
7. Draw the Big 4 elements in diagram
8. Quiz 1: Carbon - The Building Block of Life
9. Science World Vol. 74 no 11 - Running Dry
10. Find biotic and abiotic factors within your own school
11. Ecosystem Ecology video notes
12. Science News
13. Aquarium and Terrarium Observation and Research activity
14. Organization worksheet - Identifying biomes, communities, ecosystems, species, individuals, and populations
15. Activity - Organizing your school as an ecosystem
16. Science in the News - Research worksheet regarding global ecosystems
17. Human Impacts on the Environment
18. Activity Habitats

19. Ecology research worksheet - Students use the internet to research what an ecologist might research and present results to the class
20. Reading comprehension worksheet on primary reading about ecology
21. Reading a graph - students study the affects of rat habitat movement on a graph
22. Quiz 2: Introduction to Life and Ecology
23. Chapter Preview - 13 vocabulary words and definitions
24. Water - Liquid Awesome video and notes
25. Comprehension worksheet on the water cycle
26. Worksheet - Energy within Ecosystems
27. Worksheet - Food webs
28. Quiz 3 - Life within an ecosystem
29. Hydrologic and carbon cycles journaling
30. Nitrogen Phosporus Cycles writing assignment
31. Quiz 4 Biochemical Cycles
32. Final Quiz: Unit 1

LAB 1 - Sunlight as a vital Abiotic Plant Lab - In this lab, students will set up plants in the sunlight, artifical light, and no light over the course of a four week period. They will keep active lab notes on the affects of different lighting on the plants and report their findings.

PROJECT - Simple Ecosystems - Students will research and create simple Ecosystems that will have living organisms from this ecosystem. Students will create a presentation and share their research with the class.

LAB 2 - Water Leaf Lab (cellular respiration and photosynthesis) Students take a glass of water and place a leaf in the water in a sunny location. Students will record the results.

Unit 1.5: Honors Project Inventor's Competition

Students must create an invention that would help in the area of conservation or ecology. The purpose of this project is to help students think critically about what they can do, or things that can be done to work in saving the environment.

- Students must complete a research portion to the project that cites at least ten references. They must write an essay research paper that covers the conservation or ecology issue that they are addressing within the project. Students will learn how to deduce information and combine reference with personal opinion.
- Students will create a presentation based on a mock model or prototype of the invention created to address the ecology or conservation issue.

Students are required to create a protoype of their invention so they can try their invention and work to prove the effectiveness within the ecology and conservation realm of the project.

Teachers will give critiques of the inventions and offer ideas on how to improve on prototypes.

Unit 2: Producer of Organisms and other mysteries of life

This Unit will explore some of the background in other disciplines needed to fully move toward an understanding of environmental science. Ecosystems and their physical environments depend on living things – particularly the plants and the decomposers. Plants form the basis of all ecosystems, providing food to other organisms and releasing oxygen into the air. Decomposers keep the ecosystem in clean and working order by breaking down dead and decaying material to return nutrients to the soil. This Unit investigates these important organisms. The Unit also contains basic information about living things, cells, and the way that genetic information is passed to future generations. An understanding of these topics now will allow for thoughtful investigations about environmental issues in the future. Topics such as genetically modified foods, the movement of disease through a population through contaminated ground water, or the flow of energy through an ecosystem are discussed in environmental science. A deeper understanding of the basics of life science will make these environmental topics more powerful.

1. Using mathematics and computational thinking.
2. Constructing explanations (for science) and designing solutions (for engineering).
3. Engaging in argument from evidence.
4. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

Student will learn about the importance of decomposers within the ecosystems. They will attend class for lectures and class discussions and then complete the following assignments, labs, projects, and quizzes.

1. Class notes "Population Ecology: The Texas Mosquito Mystery"
2. Vocabulary words
3. Class notes Characteristics of living organisms
4. Comprehension worksheet - living, nonliving, once living now dead
5. Vocabulary worksheet
6. History of Life on Earth video questions
7. Class notes - Spontaneous Generation
8. Class notes - Louis Pasteur
9. Worksheet - Pasteur's Experiment
10. Quiz 1: Life as we know it
11. Vocabulary worksheet

12. Human Population Growth video notes
13. class notes - nucleic acids, DNA
14. Read RNA, compare and contrast DNA versus RNA
15. class notes - amino acids, lipids, carbohydrates
16. Quiz 2: The Molecules of Life
17. Vocabulary Worksheet
18. Plant cells video questions
19. class notes - the cell, cell parts
20. vocabulary worksheet
21. diffusion worksheet
22. In Da Club - Membranes & Transport" video notes
23. Diffusion Worksheet
24. Quiz 3: Cells
25. Vocabulary worksheet
26. Class notes - producers, compare and contrast, and plant diversity
27. Comprehension Worksheet
28. Decomposers Activity
29. "Fungi: Death Becomes Them" - Video Notes
30. Class discussion - bacteria
31. Quiz 4: Producers and Decomposers
32. Vocabulary worksheet
33. Class notes - inherited traits, punnet squares
34. "heredity" video notes
35. "DNA Structure and Replicaton" video notes
36. Quiz 5: A word about genetics
37. Final Quiz: Unit 2

LAB: Candle Lab - characteristics of living and nonliving things - Students will learn how to record experiments by lighting the candle, placing it in different conditions (wind, under a glass dome) to see how it is affected. After several minutes, students will record the differences of the candle. When the wick is cooled, students will record the changes in the wick. Students will touch the cooled wax and record the changes to the wax after it has been melted in fire.

LAB: Formation of a DNA strand - Illustrate DNA strands - using candy and other household objects, students will create DNA chains of the following - cytosine, thymine, adenine, guanine, guanine, thymine, and cytosine. Research will be completed on DNA molecule structures by identifying what makes up the sides and the rungs of DNA strands.

LAB: Carrot Lab - Osmosis Observation - two beakers or clear jars, water, salt, two carrots of similar size, a ruler, a teaspoon measure, and thread.

- STEP 1: Fill each beaker half way. Add three teaspoons of salt to one beaker.
- STEP 2: Carefully cut both carrots in half. Discard the thinner portion of both carrots. Tie a small piece of thread about one inch from the cut end of each of the thicker portions of the carrots.
- STEP 3: Place each carrot, cut side down, in the bottom of one beaker. Let the carrots and the beakers sit for a day.
- STEP 4: Remove the carrots. Observe the tightness of the strings and the appearance of the carrots.
- Record and share the results. Use a microscope to find more in depth finding.

LAB: Lettuce Leaf Lab - The effects of bacteria - Students will place lettuce leaves in different locations (warm place, refrigerator, sunlight) and record the affects of the environment over a five day period.

Unit 3: The World of Animals

Plants live without struggle. Their food comes to them in the form of sunlight. They don't resist being eaten. Animals, in contrast, face the stresses of finding their food, and of trying not to be eaten. Since they eat complex substances, they must have ways of changing those substances into simpler substances that can reach their cells.
The world of animals is diverse and complex. But, the role of animals in their environment depends on adaptations that help animals in their roles as prey and predators. Many adaptations that allow animals to survive depend on their individual body systems.
The study of how animals adapt to their habitat differs depending on the type of animal involved. The vertebrates are the animals with backbones. These include amphibians, reptiles, fish, birds, and mammals. Invertebrates are the other major group of animals; they do not have a backbone. They may have an external skeleton, shell(s) or nothing at all. Familiar examples are sponges, jellyfish, corals, starfish, mollusks, insects, worms, and crustaceans.

An animal's survival depends on more than adaptions. Often, the survival of an animal species depends on humans. The interaction of humans with the environment can alter the existing balance. This unit also explores the modern threats to biodiversity and what can be done to help preserve what is on Earth today.

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.

6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

ASSIGNMENTS:

1. Class notes - 50 vocabulary words
2. Class notes - organ systems
3. Organ systems worksheet
4. "the Nervous System" video notes
5. class notes - the nervous system, nervous system vocabulary
6. Class notes - The Digestive System
7. Worksheet - The Digestive System
8. Project - Web Research Presentation on the digestive system
9. Class notes - The Female Reproductive System, The Male Reproductive System, Fertilization
10. Homework - Read The Respiratory and circulatory systems, complete reading questions
11. "Circulatory & Respiratory Systems" video notes
12. Worksheet - labeling diagrams
13. Quiz 1: The Systems of Living Things
14. Vocabulary worksheet
15. class notes - competition, predation
16. "Community Ecology II: Predators" video notes
17. Class notes - Symbiosis, adaptations, vision
18. Read "Teeth" answer worksheets
19. Teeth project
20. "Natural Selection" video notes
21. Quiz 2: Interactions and Adaptations
22. Vocabulary worksheet
23. class notes - diverse world of animals, identifying animal species
24. Read binomial nomenclature, invertebrates, vertebrates
25. "Taxonomy: Life's Filing System" video notes
26. class notes - threats to biodiversity, how a species becomes extinct: the critical level, species extinction and the law
27. "Conservation and Restoration Ecology" video notes
28. Quiz 3: Diversity of Species
29. Final Quiz: Unit 3

LAB - SYSTEM OF ANIMALS - Using a microscope, students will investigate living specimens under the direction of the teacher. Students will record the differences between the

specimens from alternate biomes. (Aquatic, desert, forest). Students will also classify the living things based on information learned from this unit.

LAB - COTTON BALL LAB - Investigate characteristics of living and non living things - This lab covers reactions of living things by challenging students to not blink when cotton balls are thrown at them. Partners will work together to count how many times a person blinks without stimuli and then how many times they blink when stimulated with cotton balls thrown at them. Students will research how involuntary reactions happen and draw conclusions based on experiment and research.

LAB - ZEBRA PROJECT - Coloration and pattern as camouflage for living organisms - investigate how coloration and pattern can help an organism remain hidden. Students will create "Skins" of animals that have been identified as a means of camouflage for the animal to ensure their sustainability. Students will take the "Skins" and try to find locations on campus where the "skins" would be used to help an animal hide. Students will also research indigenous areas where the animals are from to find how the camouflage works for the animals.

LAB - VISION LAB - Differences between monocular and binocular vision - investigate the differences between monocular and binocular vision. Students will use tubes and covers to research and record the differences in their own vision. Students will record the results then research the reasons why appearances change with different tools.

LAB - SHOW US YOUR TEETH - Using different kinds of foods, students will identify the use and purpose of teeth in their mouth and what each tooth is most effective for. Students will draw a diagram, label each tooth, and then identify what the use if for that tooth.

LAB - BLOOD PRESSURE LAB - Students will learn about blood pressure and will learn how to use a blood pressure cuff. Students will record blood pressures within a group of students and see how exercise affects their blood pressure.

Unit 3.5: Honors Project – Classification of Animals

This unit will go into more depth of how to classify living organisms. Students will work to create a project that will identify how animals are classified.

Class Project: Students will create an interactive museum style presentation that helps elementary school aged children understand the concept of filing organisms. The project will include:

- An aesthetic presentation that will appeal to children K-6
- Research based on how to file living organisms
- interactive stations with specimens to help illustrate the ideals of filing organisms
- Cited sources for research

- A comprehensive tour presentation on how children can get the most out of the museum display

INTERACTIVE DISPLAY - After completion of the interactive museum exhibit, students will engage elementary aged children to take part in the exhibit. They will take part in the active filing and teach how to file using the museum display.

Unit 4: Populations

Living things do not live alone. Living things act on each other and their surroundings. They are affected by their surroundings. All organisms need air, food, water, and space – which may include a shelter – to survive. There is plenty of air to provide land animals and plants with oxygen and carbon dioxide. However, organisms may compete for food, water, and space. A plant can make its own food, but it may compete with other plants for trace elements in the soil or sunlight. If we really want to understand an organism, we must know how it organizes with other organisms like itself to form a population.

A population grows, changes, and shrinks over time. Many factors and influences change the size of a population or the rate at which a population grows. These factors can be abiotic, biotic, or involve other climatic factors. This unit explores the different changes that a population may experience and investigates the reasons for the changes.

The population of humans on Earth is changing as well. Demography is the study of statistics concerning the growth of the human population. As it grows and changes, the effect that humans have on the environment becomes more pronounced. This unit also begins to explore some of the specific impacts that human behavior can have on the environment and the consequences felt by us and other organisms.

1. "Human Population Growth" Video Notes
2. Vocabulary worksheet
3. "The Plants & Bees: Plan Reproduction" Video Notes
4. Class notes - population density, sampling a population, calculate, logistical growth, compare and contrast
5. Worksheet - check your understanding
6. Read - Changes in Human Population
7. Research essay changes in human population
8. "5 Human Impacts on the Environment: Crash Course Ecology" video notes
9. Class notes - studying population growth with age-structure diagrams
10. Quiz 1: Population Grown
11. Class notes - Factors affecting population growth, cycles of population growth, other factors controlling populations of plants and animals
12. Comprehension worksheet
13. Quiz 2: Nature in Balance
14. "Population Genetics: When Darwin met Mendel" video notes

15. class notes - population stability in communities, primary succession, secondary succession
16. Worksheet on ordering populations
17. Read: SUccession in Aqueous Environments, Biodiversity, biomass, ecological succession
18. Comprehension worksheet
19. quiz 3: population stability
20. "Ecology - Rules for living on Earth" video notes
21. Class notes - el nino, El nino and La nina SOuthern Oscillation Cycle, La Nina, Predicting El Nino and La Nina
22. Comprehension worksheet
23. Florida Everglades Group Project
24. Class notes - adaptation, people often negatively influence nature
25. Quiz 4: The Human Impact on Ecosystems
26. "El Nino 101/National Geographic" video notes
27. "Achieving Environmental Balance: FIU research in the Florida Everglades" video notes
28. Final Quiz: Unit 4

LAB: POPULATION - Estimating the size of populations - investigate how the mark-and-recapture method is used to estimate the size of a population.

- **STEP 1**: Carefully cut out 64 squares of paper. On 19 of the squares, write a letter G and place all of the squares in the empty box (or hat). The box represents the field and the pieces of paper are the groundhogs living there. The 19 squares marked with the G represent the groundhogs that have been marked, as recorded in Year 4 of the data table. The blank squares of paper are groundhogs not captured until now.
- **STEP 2**: Randomly choose one groundhog from the box. This represents the "capture." Put the captured groundhog aside.
- **STEP 3**: Repeat Step 2 nine more times, until you have captured 10 groundhogs total. Record that number in the data table.
- **STEP 4**: Examine each of the captured groundhogs. Count how many have been "recaptured" (these are the ones that were previously captured and marked with the G). Record this number.
- **STEP 5:** To find the estimated total population, you will want to multiply the first capture by the 2nd capture on your calculator. Then divide that product by the number of marked individuals recaptured. You may need to round your answer to the nearest whole number. Then answer the questions below.

LAB: PLANT POPULATION COMPETITION - investigate competition that might exist between plants.

- **STEP 1**: Fill both small pots about three-quarters full of potting soil.
- **STEP 2**: In one pot, place three seeds. Space the seeds so they are as far apart as possible and still away from the sides of the pot.
- **STEP 3**: In the second pot, place 10 – 20 seeds.
- **STEP 4**: Water each plant. Place them both in a sunny location and water as needed over the next few weeks.

Unit 5: Biomes

All organisms have a "home." This unit is essentially a survey of the different homes that organisms can occupy on Earth. The biosphere is the culmination of all these different homes. This is the largest organizational division of living things on Earth.
Different biomes make up the Earth's biosphere. Biomes can be on land (terrestrial) or aquatic. Each biome is classified according to its different characteristics – temperature, climate, rainfall, soil type, and the organisms living there.

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

1. class notes - biosphere
2. Read: Temperature Zones, comprehension worksheet
3. "The Sun: Crash Course Astronomy" video notes
4. Quiz 1: The Biosphere
5. Vocabulary worksheet
6. class notes - biomes, the tropical rainforest biome, the savanna biome, the desert biomes, the chaparral biome, the temperate grassland biome, the temperate deciduous forest biome
7. Worksheet comprehension of biomes
8. "Biomes of the world for children: Oceans, mountains, grassland, rainforest, desert" video notes
9. "Coniferous Forest Biome Explained" video notes
10. class notes - coniferous forest (taiga) Biome
11. "Arctic Tundra Biome" video notes

12. class notes - tundra
13. Vocabulary worksheet
14. Quiz 2: Terrestrial Biomes
15. class notes - freshwater biomes, marine biomes
16. "The Intertidal / Under H2O" video notes
17. Quiz 3: Aquatic Biomes
18. "Aquatic Biomes" video notes
19. "Great Barrier Reef" video notes
20. "Aquatic Biomes FReshwater / Biology / Ecology" video notes
21. "Aquatic Biomes Wetlands / biology / ecology" video notes
22. Read: California's climate zones
23. worksheet on climate zones
24. Read: Animal life in California's Biomes
25. Worksheet on CA animal life
26. "Climate change is part of California's perfect recipe for intense wildfire" video notes
27. class notes - mammals, animals in the wetlands, california grasslands
28. Comprehension worksheet
29. Quiz 4: California Biomes
30. "Ecosystems and biomes / ecology" video notes
31. Final Quiz: Unit 5

LAB - Sun's rays lab - how the sun's ray create different heating of the earth - Using incandescent light bulbs and thermometers, students will research the amount of time it takes to generate heat from a light source. They will test different items to see how long an incandescent light takes to light up the item and to what degree the item's temperature is raised.

LAB - Ordering Biomes Project

LAB - Building Estuaries - Test tube snail project

LAB - California climate zones model

LAB - Marshes model project

LAB - Biomes Project

Unit 6: Pollutions

Environmental pollution is a term that refers to all the ways that people contaminate their surroundings. People dirty the air with gases and smoke; poison the water with chemicals and toxic substances; and damage the soil with too many fertilizers and pesticides. People ruin the

natural beauty around them by littering. They operate machines and motor vehicles that fill the air with disturbing noise. Nearly everyone causes pollution in some way.
Environmental pollution is one of the most serious problems facing the ecosystem today. Air, water, and soil, all of which are harmed by pollution, are necessary to the survival of all living things. Badly polluted air can cause illness, and even death. Polluted water kills fish and other marine life. Pollution of soil reduces the amount of land available for growing food.
Everyone wants to reduce pollution, but the pollution problem is as complicated as it is serious. This problem is compounded by the fact that so much pollution is caused by things that benefit people and society as a whole. For example, exhaust from automobiles causes a large percentage of all air pollution. On the other hand, automobiles provide transportation for millions of people. Factories discharge much of the material that pollutes the air and water, but factories provide jobs and products. Too much fertilizer and pesticides can ruin soil, but these are important aids to growing crops.
This Unit seeks to explain some of the issues that are facing the biosphere today with respect to pollution. An understanding of the causes and effects of pollution, through specific examples, will hopefully lead to a deeper appreciation for the complicated balance of our planet today.

Students will learn:

1. Asking questions (for science) and defining problems (for engineering).
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations (for science) and designing solutions (for engineering).
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information. (CCSS Literacy Standards)

1. "Reveal earth's Atmosphere" video notes
2. class notes - composition of the Earth's atmosphere, the layers of the atmosphere
3. Vocabulary worksheet
4. Read: Incoming solar radiation, the greenhouse effect
5. Quiz 1: Earth as a closed system
6. "The Greenhouse Effect" video notes
7. class notes - pollution
8. Read - smog, temperature inversion, acid rain, indoor air pollution
9. "Buffers, the Acid Rain Slayer" video notes
10. Quiz 2: Air Pollution

11. Class notes - water pollution
12. comprehension worksheet
13. Groundwater Contamination essay
14. "Pollution" video notes
15. class notes - sources of water pollution
16. Quiz 3: Water Pollution
17. "Hearing & Balance" video notes
18. class notes - noise pollution, hearing loss, other effects of noise on organisms.
19. Comprehension essay
20. class notes - light pollution
21. Quiz 4: Noise and Light Pollution
22. class notes - waste, composition of municipal solid waste, solid waste in the US
23. "Plastics 101" video notes
24. "Trash of a Human Lifetime" video notes
25. "Hers' how much plastic trash is littering the earth" video notes
26. "Living in our own waste" video notes
27. comprehension essay
28. class discussion - methods of waste disposal, hazardous waste, understanding waste
29. Quiz 5: Wastes
30. "50 years ago, this was a wasteland" video notes
31. Final Quiz: Unit 6

LAB - Atmosphere model

LAB - Air quality Lab - Investigate the quality of the air where you currently live.

- STEP 1: Identify three different locations indoors or outdoors. You will be taking air samples at these three locations over the next five days.
- STEP 2: Place a coffee filter over the nozzle of the vacuum cleaner hose. Secure it with a rubber band. The air should pass through the coffee filter as it passes into the hose.
- STEP 3: Before taking the reading, note the temperature and weather conditions. For example, is it warm, windy, cold, calm, raining, etc.?
- STEP 4: Hold the vacuum cleaner hose about one meter (three feet) above the ground. Turn it on for 30 seconds.
- STEP 5: After the 30 seconds has passed, turn the vacuum off and carefully remove the filter.
- STEP 6: Label the filter with the time, location, and current weather conditions.
- STEP 7: Examine the filter and notice any pollutants.
- Report findings and draw conclusions

LAB - Smog Lab - Determine how smog forms.

- STEP 1: Place one bottle in the hot water and the other in the ice.
- STEP 2: Light two matches and drop one in each bottle.
- STEP 3: Observe what happens
- Report findings and draw conclusions

LAB - Groundwater Lab - Investigate the movement of water underground

- STEP 1: Fill the jar one-third of the way with pebbles.
- STEP 2: Carefully add the sand to the jar until it is about two-thirds of the way filled.
- STEP 3: Simulate rain falling on the surface by pouring water out of the can onto the surface of the sand in the jar
- Report findings and draw conclusions

Unit 6.5: Honors Research Project Groundwater Contamination

In this unit, students will visit a water plant or other conservation based site to go over and research groundwater contamination. This unit builds on the elements of Unit 6 and helps identify depth of concept.

Groundwater Contamination essay and report. Must cite at least 5 sources and have the basis of the essay surround the findings from the field trip.

Students will attend a field trip to the appropriate groundwater plant to work with technicians and inquire about how humans affect groundwater. They will participate in on site experiments and research outcomes and effectiveness of the plant. Students will record and report their findings.

Unit 7: Conservation

Once a week, large, noisy trucks across America roll through cities, suburbs, and farmlands. Some of these trucks pick up the garbage or trash that a family, school, or business creates. Other trucks pick up bottles, cans, and paper that people have accumulated in containers and placed at the curb. The trucks, as they stop and go at each building or home on a block, emit fumes and clouds of pollution as the gasoline in their engines burns. The garbage and recycling trucks are using resources to pick up materials for potential recycling. It is an endless cycle of use and reuse of natural resources.

Each day we use natural resources. Some sort of natural resource generated the electricity we use to power our computers, lights, toasters, and electric toothbrushes. Perhaps it was a resource, such as coal, which is in finite supply within the Earth. Alternatively, perhaps it was generated by wind or waterpower, both of which are in abundant supply. No matter which type of resource generates our power, there is still some sort of natural resource consumed to give us the conveniences necessary for our daily lives.

This Unit will explore the different types of resources found on Earth. And it will look at the wise and thoughtful use of these resources. As the human population continues to grow and we begin to realize the full extent of our impact on the environment and biosphere as a whole, it becomes necessary to recognize where our resources are coming from and how we use them. Alternatives and conservation attempts must be made to secure the health of the planet and to ensure that future generations will have access to the same resources as we have today.

1. class notes - introduction to conservation, nonrenewable resources, sources of energy, fossil fuels, oil
2. Unit 7 Vocabulary Worksheet
3. Activity - Resources modeline
4. "The Global Carbon Cycle" video notes
5. "Looking for Killer Whales 26 years after the Exxon Valdez Oil Spill Parts 1 & 2" video notes and discussion
6. "There's still oil on this beach 26 years after Exxon Valdez" video notes and discussion
7. class notes - natural gas, conserving nonrenewable energy resources
8. "The Ideal Gas Law" Video Essay
9. "Real Gases" Video notes
10. Class discussion - energy conservation, renewable resources
11. Three Gorges Dam in China essay
12. Worksheet on wind power, hydroelectric power, and hydroelectric dams
13. Nuclear Energy worksheet
14. Vocabulary worksheet on Nuclear Energy
15. "Energy & Chemistry" video notes
16. Quiz 1: Conservation of Energy
17. Vocabulary worksheet on metal and nonmetal renewable resources
18. "Conservations and Restoration Ecology" video notes and class discussion
19. Class notes - conserving resources, biodegradable or not, composting, recycling
20. Comprehension essay on recycling
21. Quiz 2: Conservation and Recycling
22. "Kids take action against ocean plastic" video notes and discussion
23. Vocabulary worksheet on conservation biology
24. "Let's Take Bold Steps Forward to Protect Our Planet" video notes and discussion
25. Class notes - How do you think we could best protect our planet, conservation biology, recent extinctions
26. Activities - A move toward sustainable development, local conservation
27. "What is sustainable development? by the United Nations" video notes and class discussion
28. Quiz 3: Conservation Biology
29. Final Quiz: Unit 7

LAB - Oil Lab - Oil spills and the environmental significance - predict why these events are so difficult to clean up and why they have such a significant impact on Earth’s ecosystems.

- **STEP 1**: Put 30 mL of molasses into an empty paper cup. Pour the molasses from this cup into the other cup.

- **STEP 2**: Observe what happens to the molasses as you pour it into the empty cup. Think about adjectives that you would use to describe this material.
- **STEP 3**: Pour a small amount of the molasses into the pan. Sprinkle the sand into the molasses and dip the feather into it.
- **STEP 4**: Now try to clean off the sand on the feather. Use your fingers and the paper towel.
- Record and report your results, then draw conclusions.

LAB - Lightbulb Lab - Energy and Electricity usage - defining the difference between LED and incandescent - explore light bulb efficiency

- **STEP 1**: Place the incandescent bulb into the lamp socket. Carefully plug the lamp in.
- **STEP 2**: Turn on the lamp and leave it on for five minutes.
- **STEP 3**: After five minutes have passed, hold the thermometer about 10 cm from the end of the bulb and record the temperature.
- **STEP 4**: Turn off the lamp and allow the bulb to cool.
- **STEP 5**: Repeat steps 1 – 4 using the fluorescent bulb
- Record and report results, then draw conclusions

PROJECT - Conservation - Determine how to conserve energy at school and to create a proposal for the school administration that encourages them to use energy more efficiently. This may include changing the times that your school operates. For instance, if you are in a colder climate it might be more economical to have more time off in the winter and less time in the summer to save money on heating. Likewise, if you are in a hotter climate it might make more sense to have more time off in the summer months. You also may need to change the times that the school day starts and ends. If the school day starts when it is still dark outside it would be better to start later when there is more sun to save on electricity generated by lighting each of the classrooms. Presentations must include research and will be presented using multi media. Cite at least five references used for the research of this project.

LAB - Banana peel lab - predict how long it takes for a banana peel to biodegrade

- **STEP 1**: After enjoying a banana, place the peel in an area where it will not be disturbed and nobody will slip on it. It is best if this area is outside, perhaps on a balcony or patio.
- **STEP 2**: Place a small screen over the peel and weight it down along the edges with rocks or bricks. However, this step is not necessary.
- **STEP 3**: Observe the banana peel over the next few weeks, checking on it every other day.
- **STEP 4**: Each time you check it, write down the date and time of day, and make a note of the peel's appearance.

LAB - Trash separation and composting lab - investigate what you can recycle or reuse in your home or school

- **STEP 1**: Spread newspapers out on a table or on the floor.
- **STEP 2**: After putting on a pair of rubber or non-latex gloves, carefully dump one bag of household or classroom trash onto the newspaper. Be careful of spills or sharp objects.
- **STEP 3**: Begin to separate the materials into piles. Create one pile of materials that can be composted, one of materials that can be recycled according to the city of San Diego's program (outlined in the section above), and one pile of materials that can be neither composted nor recycled.
- **STEP 4**: Make a note of the materials in each pile and the approximate size of each pile
- Record and report results. Draw conclusions from the experiment.

PROJECT - Extinction data - Groups will research hot spots and the bald eagle. They will create graphs showing the rate of extinction of endangered species and discuss with the class their findings.

Unit 8: Survival Skills

This Unit explores maps, latitude and longitude, as well as the natural hazards that face people in California. Knowing how to administer basic first aid and understanding how to stay safe is empowering to any hiker, camper, or person who enjoys the outdoors.

Objectives

Upon completion of this Unit, students will be able to:

- discuss the elevation and relief on Earth's surface.
- read and interpret topographic maps.
- read the latitude and longitude on a map.
- use a compass.
- describe the first aid practices necessary in the wilderness.
- identify some of the natural hazards that people encounter in California.
- describe the different types of faults.
- compare and contrast the damage done by earthquakes along the San Andreas Fault.
- identify examples of biodiversity.

1. class notes - a new look at the Earth's surface, contour lines, calculating contours
2. "The Earth: Crash Course Astronomy #11" video notes and class discussion
3. class notes - the scale of a map, symbols on a map, special features on a topographic map, steep hill or gradual incline

4. class notes - additional topographic map rules
5. "Scientists See Ocean Floor via Sonar / National Geographic" video notes and class discussion
6. "First ever 3D VR Filmed in Space / One Strange Rock" video notes and class discussion
7. Quiz 1: Earth in #d
8. "Experience the Magic of Redwood National Park / Short Film" video notes and class discussion
9. class notes - hemispheres on Earth's surface, latitude and longitude, using a compass, wilderness safety, First Aid Kit, shock, burns, hypothermia, heat exhaustion, altitude
10. Quiz 2: Finding your way in the wilderness
11. "Finding Freedom in a Frontier Life" video notes and class discussion
12. Vocabulary worksheet on natural hazards in California
13. class notes - earthquakes, the San Andreas fault, Biodiversity in California
14. "Here's what earthquakes look like from inside the earth / National Geographic" video notes and class discussion
15. "Earthquakes 101 / National Geographic" video notes and class discussion
16. "San Andreas Fault (Discovery Channel)" video notes and class discussion
17. Quiz 3: Survival in California
18. Final Quiz: Unit 8

PROJECT - regional topographical map - students will create a topographical map of a region

LAB - Topographical Map Lab

LAB - Using a Compass

RESEARCH PROJECT - California Biodiversity - Essay and presentation

- Which natural hazard described in the chapter do you think is most dangerous and why?
- Do you have any personal experience with a natural hazard or disaster? If so, what was it and what did you do to protect yourself?
- How do you think people can best prepare for and protect themselves against these hazards?

Unit 8.5: Honors Extension – Red Cross First Aid

In conjunction with Unit 8, Honors students will complete the First Aid course given by Red Cross to become certified in First Aid Training.

Red Cross First Aid / CPR Certification

Unit 9: Living in the Modern World

This Unit provides a look at the hazards, both human generated and natural, that challenge people in today's society. We are exposed to some hazards because of the actions of others. Some potential hazards are completely in our own personal control.
Upon completion of this Unit, students will:

- understand the role that the United States Environmental Protection Agency played in the crisis at Love Canal.
- explain the nuclear disaster at the Chernobyl Nuclear Facility.
- describe the causes and effects of air pollution in Mexico City.
- understand the dangers and symptoms of drug addiction.
- identify the chemicals in tobacco.
- understand various aspects of alcohol abuse and its impact on the human body.
- compare and contrast other types of drugs.
- describe some of the advances in farming and agriculture.
- explain how biotechnology has been applied to agriculture.
- compare and contrast organically and conventionally grown foods.
- describe the different types of aquaculture.

1. Research essay about the Love Canal
2. Read: Chernobyl
3. "The Animals of Chernobyl / New York Times" video notes and discussion
4. Class Discussion - Air Pollution Crisis in Mexico City
5. Quiz 1: Environmental Hazards
6. Chapter Preview - 25 vocabulary words
7. Class notes - the cost of smoking
8. "Turning Cigarette Butts Into Park Benches / National Geographic" video notes and class discussion
9. Class notes - alcohol use and abuse, other drugs
10. Quiz 2: Hazardous Choices
11. "This is what happens to your brain on Opioids / Short Film Showcase" video notes and class discussion
12. Class notes - advances in farming, biotechnology in agriculture, issues surrounding genetically modified foods, organic foods, aquaculture
13. "A Plan to Feed the World / Future of Food" video notes and class discussion
14. "From Farm to Table / Nat Geo Live" video notes and class discussion
15. "Evolutionary Development: Chicken Teeth" video notes and class discussion
16. Quiz 3: Feeding the World
17. Final Quiz: Unit 9

PROJECT: Model of the Chernobyl Incident and the effects on the region

RESEARCH PROJECT: Find and create a group presentation regarding the marketing of alcohol and cigarettes

RESEARCH ESSAY: Genetically Modified Foods

Unit 10: Case Studies and Research

This unit delves into specific case studies to further explore concepts researched and taught in prior units. Using the in class textbook, students will learn how to critically think to develop ideas about the controversial topics of conservation and environmental science. Students will be called to research specific case studies and create research and lab projects to solidify their views supported by cited sources and specific research.

1. Case study - Field experiences test value of Biodiversity
2. "Three New Marine Parks Protect Stunning Biodiversity / National Geographic" video notes and class discussion
3. Case study - Why Trees need Salmon
4. "The Salmon's Life Mission / Destination WILD" video notes and class discussion covering the river and forest biomes
5. Case study - Darwin's Voyage of Discovery
6. "Darwin in the Galapagos / Nat Geo Wild" video notes and class discussion
    1. How does evolution produce species diversity?
    2. How do species interaction shape biological communities?
    3. How do community properties affect species and populations?
    4. Why are communities dynamic and how do they change over time?
7. Cast study - How many fish in the sea?
8. "7 Billion, National Geographic Magazine / National Geographic" video notes and class discussion
9. Case Study: Becoming a Locavore in the Dining Hall
10. Essay - Why do you think it would be important to be a Locavore?
11. Case study: Farming the Cerrado
12. Essay - What are the differences between conventional and sustainable practices in farming?
13. Case Study: Job Destroyer or Forest Protector?
14. "Killing One Owl to Save Another Owl? / National Geographic" video notes and class discussion
    1. Although extinction is a natural process, what are ways that people accelerate the process?
    2. Should we be trying to save animals that are becoming extinct, or is this a choice of natural selection?
15. Case study - Restoring Louisiana's Coastal Defenses
16. Research and respond to "Reviewing Learning Outcomes" from the textbook
17. Quiz on Case Studies
18. Case study - Leaching Gold

19. "How Gold is Made Documentary Gold Mining National Geographic Documentary" video notes and class discussion
20. Case study - When Wedges do More Than Silver Bullets
21. Quiz on case study
22. Case study - Controlling Mercury Pollution
23. Class discussion and essays - a) what is the air like around us? b) What are natural pollutants for air pollution? c) How do humans cause air pollution? d) How does climate topography and atmospheric processes affect air quality? e) What are the effects of air pollution? f) How do people work on controlling air pollution?
24. Case study - Sharing the Klamath, 3 paragraph essay
25. Class Discussion - a)What is water pollution? b)Describe types of water pollution and the effects it has on the environment. c) How can people be a part of water pollution control.
26. Case Study - A natural system for wastewater treatment
27. "Chasing Rivers, Part 1: The Colorado / Nat Geo Live" video notes and class discussion
28. 5 paragraph essay on Water Legislation

PROJECT - Research the way that humans affect biodiversity. Create an advertisement poster and a 30 second multi media commercial to present views of human affects of biodiversity.

PROJECT - Create a diorama of the correlation between the river biome and forest biome. Talk about the relationship and the importance of the two working together.

GROUP PROJECT - How does human population affect natural resources? Each group will study a natural resource, the group will provide a creative way to describe how humans affect the natural resource. Describe ways that the human race hurts natural resources. Describe ways that people have worked for the conservation and renewable resources.

POINT / COUNTERPOINT PROJECT - Discuss the pros and cons of conventional and sustainable farming

PROJECT - Using an animal that is on the endangered species list, create a newspaper page page about the endangered animal. There must be at least one photo of the animal. There must be at least two "news articles" pertaining to the endangered animal. The page must include: a) why the animal is on the endangered list. b) Information about the species and how it contributes to the planet. c) What group(s) are aiding in the conservation efforts of this animal. d) Any laws or legislation that is working to help the preservation of the species. e) Photos and/or drawings of the species.

GROUP PROJECT - Make a kids' television show segment on "Air Pollution." Define what Air Pollution is. Give ways that air pollution happens. Talk about ways that people can help air pollution.

Honors Final Exam Details

FINAL EXAM: Honors students will take part in a comprehensive 2 hour final including all elements of the entire course. This final will include multiple choice and essay answers as well as a diagnostic lab.

FINAL PROJECT: Students are required to complete a multimedia presentation that will be presented to the class. Topic - Must be based on conservation or ecology. The topic must be approved by the teacher at the beginning of semester 2. The topic must cover: a) a person that is important to the research or development of conservation. b) a conservation effort. c) a persuasive project to help people understand the importance of a specific conservation effort. d) an ecology area that is specifically interesting in light of the topic (like Chernobyl).

The final project includes a 10 page written report including: a) maps and/or diagrams of affected areas (1 page). b) at least 3 compelling photos of the affected region (1 page) Use captions and explain. c) Cite references (at least 10) with specific bibliography of references (1 page), d) case study / biography of a person that is working on the conservation efforts (2 pages), e) Overall information about the topic (3 pages) - How many people does this affect / What other populations does this affect / What has been done to get to this point / What can be done to improve this topic / According to scientists, what doe the future hold regarding this topic / Summarize a specific case study about the topic / Offer compelling information regarding topic. f) Persuasive essay (2 pages) Create a compelling essay about how you feel about the topic. Give people ideas on how they can help with the topic and a specific place they can contact to get involved.

Multi Media Presentation - Using information from research, create a multimedia presentation for the purposes of telling an audience about the topic that has been chosen and give a call to action regarding the project. a) the project should be 6 - 10 minutes. b) the presentation must use technology. c) the presentation should include a handout (trifold, flyer, etc.) d) the presentation must include a live speech of some kind that is at least 1 minute long.