

SCIENCE & TECHNOLOGY/ENGINEERING COURSE SYLLABUS

Biology

Course Title: Biology – Level 3

Department: Chelmsford High School Science/Technology Department

Primary Course Materials: Biology The Dynamics of Life; Glencoe Science; Glencoe/McGraw-Hill 2004.

Course Description: Biology is a full year course. It is designed to give students a basic understanding of the scientific processes of biology. Emphasis is geared to the successful completion of the MCAS Test in biology. The laboratory investigation is the basis for each unit. All units are based upon the required MCAS strands for science competency. All methods for student evaluation for assessment are given.

Recommended:

Successful completion of a physical science course;

Level 3 math course taken concurrently.

Essential Questions:

1. How do chemical elements form organic molecules that interact to perform the basic functions of life?
2. What are the specific structures and functions that make cells distinctive and allow them to grow, maintain homeostasis and reproduce?
3. How do genes allow for the storage and transmission of genetic information?
4. How does the structure and function of organs determine their relationships within body systems of an organism and allow the body to perform its normal functions?
5. How do changes in the genetic make-up of populations affect biodiversity through speciation and extinction?
6. How do organisms interact with each other and their environment?

Course Objectives:

1. To engage the students in a Biology course which meets the goals of the Massachusetts Frameworks for 10th Grade Biology
2. To prepare students for the MCAS Biology exam.

Common Goals:

Thinking and Communicating

- 1) Read information critically to develop understanding of concepts, topics and issues.
- 2) Write clearly, factually, persuasively and creatively in Standard English.
- 3) Speak clearly, factually, persuasively and creatively in Standard English.
- 4) Use computers and other technologies to obtain, organize and communicate information and to solve problems.
- 5) Conduct research to interpret issues or solve complex problems using a variety of data and information sources.

Gain and Apply Knowledge in and across the Disciplines

- 6) Gain and Apply Knowledge in:
 - a) Literature and Language
 - b) Mathematics
 - c) Science and Technology
 - d) Social Studies, History and Geography
 - e) Visual and Performing Arts
 - f) Health and Physical Education

Work and Contribute

- 7) Demonstrate personal responsibility for planning one's future academic and career options.
- 8) Participate in a school or community service activity.

- 9) Develop informed opinions about current economic, environmental, political and social issues affecting Massachusetts, the United States and the world and understand how citizens can participate in the political and legal system to affect improvements in these areas.

Learning Standards from the Massachusetts Curriculum Framework:

1. The Chemistry of Life

Broad Concept: Chemical elements form organic molecules that interact to perform the basic functions of life.

- 1.1 Recognize that biological organisms are composed primarily of very few elements. The six most common are C, H, N, O, P, S.
- 1.2 Describe the basic molecular structures and primary functions of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).
- 1.3 Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, which have an effect on enzymes.

2. Cell Biology

Broad Concept: Cells have specific structures and functions that make them distinctive. Processes in a cell can be classified broadly as growth, maintenance, and reproduction.

- 2.1 Relate cell parts/organelles (plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod) to their functions. Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, and active transport).
- 2.2 Compare and contrast, at the cellular level, prokaryotes and eukaryotes (general structures and degrees of complexity).
- 2.3 Use cellular evidence (such as cell structure, cell number, and cell reproduction) and modes of nutrition to describe six kingdoms (Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia).
- 2.4 Identify the reactants, products, and basic purposes of photosynthesis and cellular respiration. Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms.
- 2.5 Explain the important role that ATP serves in metabolism.
- 2.6 Describe the cell cycle and the process of mitosis. Explain the role of mitosis in the formation of new cells, and its importance in maintaining chromosome number during asexual reproduction.
- 2.7 Describe how the process of meiosis results in the formation of haploid cells. Explain the importance of this process in sexual reproduction, and how gametes form diploid zygotes in the process of fertilization.
- 2.8 Compare and contrast a virus and a cell in terms of genetic material and reproduction.

3. Genetics

Broad Concept: Genes allow for the storage and transmission of genetic information. They are a set of instructions encoded in the nucleotide sequence of each organism. Genes code for the specific sequences of amino acids that comprise the proteins that are characteristic of that organism.

- 3.1 Describe the basic structure (double helix, sugar/phosphate backbone, linked by complementary nucleotide pairs) of DNA, and describe its function in genetic inheritance.
- 3.2 Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic code. Explain the basic processes of transcription and translation, and how they result in the expression of genes. Distinguish among the end products of replication, transcription, and translation.
- 3.3 Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic change in an organism. Explain how mutations in gametes may result in phenotypic changes in offspring.
- 3.4 Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, incomplete dominance, codominant, sex-linked, polygenic, and multiple alleles).
- 3.5 Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance (such as dihybrid crosses).
- 3.6 Use a Punnett Square to determine the probabilities for genotype and phenotype combinations in monohybrid crosses.

4. Anatomy and Physiology

Broad Concept: There is a relationship between the organization of cells into tissues, and tissues into organs. The structure and function of organs determine their relationships within body systems of an organism. Homeostasis allows the body to perform its normal functions.

- 4.1 Explain generally how the digestive system (mouth, pharynx, esophagus, stomach, small and large intestines, rectum) converts macromolecules from food into smaller molecules that can be used by cells for energy and for repair and growth.
- 4.2 Explain how the circulatory system (heart, arteries, veins, capillaries, red blood cells) transports nutrients and oxygen to cells and removes cell wastes. Describe how the kidneys and the liver are closely associated with the circulatory system as they perform the excretory function of removing waste from the blood. Recognize that kidneys remove nitrogenous wastes, and the liver removes many toxic compounds from blood.
- 4.3 Explain how the respiratory system (nose, pharynx, larynx, trachea, lungs, alveoli) provides exchange of oxygen and carbon dioxide.
- 4.1 Explain how the nervous system (brain, spinal cord, sensory neurons, motor neurons) mediates communication between different parts of the body and the body's interactions with the environment. Identify the basic unit of the nervous system, the neuron, and explain generally how it works.
- 4.2 Explain how the muscular/skeletal system (skeletal, smooth and cardiac muscle, bones, cartilage, ligaments, tendons) works with other systems to support and allow for movement. Recognize that bones produce both red and white blood cells.
- 4.3 Recognize that the sexual reproductive system allows organisms to produce offspring that receive half of their genetic information from their mother and half from their father and that sexually produced offspring resemble, but are not identical to, either of their parents.
- 4.4 Recognize that communication between cells is required for coordination of body functions. The nerves communicate with electrochemical signals, hormones circulate through the blood, and some cells produce signals to communicate only with nearby cells.
- 4.5 Recognize that the body's systems interact to maintain homeostasis. Describe the basic function of a physiological feedback loop.

5. Evolution and Biodiversity

Broad Concept: Evolution is the result of genetic changes that occur in constantly changing environments. Over many generations, changes in the genetic make-up of populations may affect biodiversity through speciation and extinction.

- 5.1 Explain how evolution is demonstrated by evidence from the fossil record, comparative anatomy, genetics, molecular biology, and examples of natural selection.
- 5.2 Describe species as reproductively distinct groups of organisms. Recognize that species are further classified into a hierarchical taxonomic system (kingdom, phylum, class, order, family, genus, species) based on morphological, behavioral, and molecular similarities. Describe the role that geographic isolation can play in speciation.
- 5.3 Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity from a population.

6. Ecology

Broad Concept: Ecology is the interaction among organisms and between organisms and their environment.

- 6.1 Explain how birth, death, immigration, and emigration influence population size.
- 6.2 Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.
- 6.3 Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels. Describe how relationships among organisms (predation, parasitism, competition, commensalism, and mutualism) add to the complexity of biological communities.
- 6.4 Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in an ecosystem and how oxygen cycles through photosynthesis and respiration.

I. Scientific Inquiry Skills Standards		
<input checked="" type="checkbox"/>	1.	Make observations, raise questions, and formulate hypotheses.
<input checked="" type="checkbox"/>	1A	Observe the world from a scientific perspective
<input checked="" type="checkbox"/>	1B	Post questions and form hypotheses based on personal observations, scientific articles, experiments, and knowledge.
<input checked="" type="checkbox"/>	1C	Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories.
<input checked="" type="checkbox"/>	2	Design and conduct scientific investigations.
<input checked="" type="checkbox"/>	2A	Articulate and explain the major concepts being investigated and the purpose of an investigation.
<input type="checkbox"/>	2C	Identify independent and dependent variables.
<input type="checkbox"/>	2D	Write procedures that are clear and replicable.
<input checked="" type="checkbox"/>	2E	Employ appropriate methods for accurately and consistently
<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> making observations
<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> making and recording measurements at appropriate levels of precision
<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> collecting data or evidence in an organized way
<input checked="" type="checkbox"/>	2F	Properly use instruments, equipment, and materials (e.g., scales, probe ware, meter sticks, microscopes, computers) including set-up, calibration (if required), technique, maintenance, and storage.
<input checked="" type="checkbox"/>	2G	Follow safety guidelines.
<input checked="" type="checkbox"/>	3	Analyze and interpret results of scientific investigations.
<input type="checkbox"/>	3A	Present relationships between and among variables in appropriate forms.
<input type="checkbox"/>		<ul style="list-style-type: none"> represent data and relationships between and among variables in charts and graphs.
<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> use appropriate technology (e.g., graphing software) and other tools.
<input checked="" type="checkbox"/>	3B	Use mathematical operations to analyze and interpret data results.
<input checked="" type="checkbox"/>	3C	Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.
<input checked="" type="checkbox"/>	3D	Use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis.
<input checked="" type="checkbox"/>	3E	State questions raised by an experiment that may require further investigation.
<input checked="" type="checkbox"/>	4	Communicate and apply the results of scientific investigations.
<input type="checkbox"/>	4A	Develop descriptions of and explanations for scientific concepts that were a focus of one or more investigations.
<input checked="" type="checkbox"/>	4B	Review information, explain statistical analysis, and summarize data collected and analyzed as the result of an investigation.
<input checked="" type="checkbox"/>	4C	Explain diagrams and charts that represent relationships of variables.
<input checked="" type="checkbox"/>	4D	Construct a reasoned argument and respond appropriately to critical comments and questions.
<input checked="" type="checkbox"/>	4E	Use language and vocabulary appropriately, speak clearly and logically, and use appropriate technology (e.g., presentation software) and other tools to present findings.
<input checked="" type="checkbox"/>	4F	Use and refine scientific models that stimulate physical processes or phenomena.
<input checked="" type="checkbox"/>		II. Mathematical Skills
<input type="checkbox"/>		Students are expected to know the content of the <i>Massachusetts Mathematics Curriculum Framework</i> , through grade 8. Below are some specific skills from the <i>Mathematics Framework</i> that students in this course should have the opportunity to apply:
<input checked="" type="checkbox"/>		Construct and use tables and graphs to interpret data sets.
<input type="checkbox"/>		Solve simple algebraic expressions.
<input checked="" type="checkbox"/>		Perform basic statistical procedures to analyze the center and spread of data.
<input checked="" type="checkbox"/>		Measure with accuracy and precision (e.g., length, volume, mass, temperature, time)
<input checked="" type="checkbox"/>		Convert within a unit (e.g., centimeters to meters).
<input checked="" type="checkbox"/>		Use common prefixes such as <i>mill-i</i> , <i>cent-i</i> , and <i>kilo-</i> .
<input type="checkbox"/>		Use scientific notation, where appropriate.
<input type="checkbox"/>		Use ratio and proportion to solve problems.
<input type="checkbox"/>		The following skills are not detailed in the <i>Mathematics Framework</i> , but are necessary for a solid understanding in this course:

<input type="checkbox"/>		Determine the correct number of significant figures.
<input type="checkbox"/>		Determine percent error from experimental and accepted values.
<input checked="" type="checkbox"/>		Use appropriate metric/standard international (SI) units of measurement for mass (g); length (cm); and time (s).
<input checked="" type="checkbox"/>		Use the Celsius and Kelvin scales.

CONTENT OUTLINE

Biology Level 3 - Full Year Pacing Guide First Draft: 2009

Text: Glencoe Science Biology The Dynamics of Life

Website: bdol.glencoe.com

Login:

Password:

Tools of Biologists

Chapters 1, 17

Biology Standards

- 2.3 Use cellular evidence (e.g., cell structure, cell number, cell reproduction) and modes of nutrition to describe the six kingdoms (Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia).
- 4.8 Recognize that the body's systems interact to maintain homeostasis.
- 5.2 Describe species as reproductively distinct groups of organisms. Recognize that species are further classified into a hierarchical taxonomic system (kingdom, phylum, class, order, family, genus, species) based on morphological, behavioral, and molecular similarities.

Day	In Class	Homework
1	Class introduction Lab safety scavenger hunt	1) School shopping 2) Cover book (10 points) Parent/Guardians sign: A) Letter (10 points) B) Lab safety contract (no lab participation until this is done)
2	Collect signed letters & safety contracts Check for book covers 7 Traits of life worksheet and activity	1-1: vocab definitions
3	Microscopes start microscope lab	1-1: section review questions #1-4 (see bottom of page 10)
4	Finish microscope lab Review homework	17.1: vocab definitions Microscope lab questions due day 6
5	Assign groups for six kingdoms posters Computer lab for research on six kingdoms posters Introduction to taxonomy (classification) and scientific names	17.1 review questions 1-2 Finish six kingdoms research
6	Group time to assemble six kingdom posters	1-2: vocab definitions
7	6 kingdom poster presentations (100 points)	1-2: Review questions 1-4
8	Fill in six kingdoms table discuss/review scientific method Catch up time, review games	Study for Exam (see Test Objectives List!)
9	Exam (100 points)	Ch 6 vocabulary worksheet due day 2 of next unit

Chemistry of Life

Chapter 6

Biology Standards

- 1.1 Recognize that biological organisms are composed primarily of very few elements. The six most common are C, H, N, O, P, and S.
- 1.2 Describe the basic molecular structures and primary functions of the four major categories of organic molecules (carbohydrates, lipids, proteins, nucleic acids).
- 1.3 Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, that have an effect on enzymes.

Day	In Class	Homework
1	Review: Atomic structure, 3 types of bonds Lab (Building Simple Inorganic Molecules)	Ch 6 vocabulary worksheet due 6-1: review questions 1-4
2	Ch 2 vocabulary worksheet collected Notes: Carbohydrates Lab (Building Carbohydrates) Dress for lab tomorrow!	Dress for lab tomorrow – no other homework tonight
3	Notes: Lipids Lab (Building Lipids) Start Lab (Testing for the Presence of Molecules) Dress for lab tomorrow!	6-3: vocab definitions
4	Finish Lab (Testing for the Presence of Molecules) Notes: Proteins	6-3: review questions 1-5
5	Lab (Building Proteins) Discuss water as life's solvent	6-2: review questions 1-4
6	Introduction to enzymes Activity (Bio-Penny Wars) Prep. for lab tomorrow Dress for lab tomorrow!	Pre-Lab: Catalase Lab
7	Catalase Lab (Observing the Effect of Concentration on Enzyme Activity)	
8	Lab Analysis: Catalase Lab	Lab Report (100 points) due on _____
9	Review Worksheet: Carbon Compounds Review Game	Study for exam (see Test Objectives)
10	Exam (100 points)	

Cell Structure & Function

Chapter 7, 18

Biology Standards

- 2.1 Relate cell parts/organelles (plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod) to their functions. Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, active transport).
- 2.2 Compare and contrast, at the cellular level, the general structures and degrees of complexity of prokaryotes and eukaryotes.
- 2.3 Use cellular evidence (e.g., cell structure, cell number, cell reproduction) and modes of nutrition to describe the six kingdoms (Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia).
- 2.8 Compare and contrast a virus and a cell in terms of genetic material and reproduction.

Day	In Class	Homework
1	Prokaryote vs eukaryote cells Important scientists: Robert Hooke, Anton van Leeuwenhoek, Matthias Schleiden, Theodor Schwann, Rudolf Virchow Poster diagrams of animal vs plant cells (pg 186) Virus discussion (lytic/lysogenic cycles) Virus on the head of a pin activity	Define the following vocab: cell, prokaryote, eukaryote, organelle, cell theory, nucleus, plasma membrane
2	Cell structure and organelles discussion Work on cell diagram posters	7-3: vocab definitions
3	Lab (Microscope/Plant versus Animal Cells) Work on cell diagram posters	7-3: review questions 1-5 due day 5 Complete cell diagram posters if necessary
4	Lab (Six Kingdoms of Cells) Quick check quiz on plant and animal cell anatomy	
5	Wrap up 6 Kingdoms of Cells Review/Games	Study for exam (see Test Objectives)
6	Exam (100 points)	

Cell Membrane Structure & Function

Chapters 7, 8

Biology Standards

- 2.1 Relate cell parts/organelles (plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod) to their functions. Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, active transport).

Day	In Class	Homework
1	Cell Membrane Structure Phospholipid/plasma membrane activity with pompoms and pipe cleaners	pre-lab questions for iodine baggy due day 2 7-2: vocab definitions due day 4 Dress for lab tomorrow
2	passive diffusion Lab Activity: Cell Membrane Properties (bubble lab)	Dress for lab tomorrow
3	osmosis, diffusion, active transport Set-up Naked Eggs Lab Set-up: iodine baggy lab Quick check quiz on fluid mosaic/plasma membrane	8-1: vocab definitions due day 4 Dress for lab tomorrow
4	Collect data: naked egg, iodine baggy labs Analysis questions	
5	Review	Study for exam (see Test Objectives)
6	Exam (100 points)	

Energy (Chloroplast & Mitochondria)

Chapter 9

Biology Standards

- 2.4 Identify the reactants, products, and basic purposes of photosynthesis and cellular respiration. Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms.
- 2.5 Explain the important role that ATP serves in metabolism.

Day	In Class	Homework
1	Introduction to ATP structure and the equations (reactants and products) for photosynthesis and cellular respiration	9-1 and 9-2 vocab definitions Dress for lab tomorrow
2	Lab (chromatography of plant pigments) Photosynthesis and cell respiration How oxygen cycles through How photosynthesis and cell respiration are related	Questions for article on global warming due day 4 Dress for lab tomorrow
3	Review article questions Lab (microscopic layers of a leaf)	9-3 vocab definitions article on mitochondrial disease due day 5
4	Review equations (worksheets) Discuss fermentation Lab/Demonstration (yeast fermentation)	article on mitochondrial disease due day 6
5	Review article questions Computer lab Video: Six Degrees	Study for exam (see Test Objectives)
6	Video: Six Degrees	Study for exam (see Test Objectives)
7	Exam (100 points)	

Cell Division

Chapter 8, 10

Biology Standards

- 2.6 Describe the cell cycle and the process of mitosis. Explain the role of mitosis in the formation of new cells, and its importance in maintaining chromosome number during asexual reproduction.
- 2.7 Describe how the process of meiosis results in the formation of haploid cells. Explain the importance of this process in sexual reproduction, and how gametes form diploid zygotes in the process of fertilization.

Day	In Class	Homework
1	Introduction to chromosomes Lab (karyotyping) **Thanksgiving Break**	8.2 vocab definitions  <i>Have a wonderful Thanksgiving!</i>
2	cell cycle and where mitosis fits in..... Computer lab (Online Onion Root)	8-1: Vocab and SR 1-4, 6,8
3	Mitosis poster Introduction to meiosis	8-2: Vocab and SR 1-5
4	Meiosis Activity (flip book)	8-3: Vocab and SR 1-6
5	Meiosis activity day 2 (if needed) Asexual reproduction Fertilization and zygote formation	Study for exam (see Test Objectives)
6	Review/Games	Study for exam (see Test Objectives)
7	Exam (100 points)	

Genetics

Chapter 10, 12

Biology Standards

- 3.4 Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles).
- 3.5 Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance (e.g., dihybrid crosses).
- 3.6 Use a Punnett Square to determine the probabilities for genotype and phenotype combinations in monohybrid crosses.

Day	In Class	Homework
1	Introduction to basic vocab Discuss importance of Gregor Mendel & his laws of segregation and independent assortment Probability coin toss game Begin Mendel homework questions in class.	10-1 vocab definitions PLUS 1) Describe or draw a diagram to show how Mendel was able to control how his pea plants were pollinated(prevent self-pollination) 2) Describe in words the steps in Mendel's experiments on true breeding garden peas (see figure 9-3 for a visual aid – you can also copy it in your notes if you want) DUE DAY 5
2	Monohybrid Punnett Squares Basic practice problems Sponge Bob Punnett practice worksheets	Assigned portion of Sponge Bob a worksheet
3	Sponge Bob Punnett practice worksheets	Punnett practice problems worksheet
4	Introduction to Dihybrid Punnett Squares Activity (Genetics and Human Traits)	
5	Quick quiz on Punnett squares Catch up time/more dihybrid practice	12-1 and 12-2 vocab definitions Read 12-3 for blood typing and sex-linked traits
6	Introduction to other inheritance forms and blood type Optional Activity (mixing blood types or sickled cells matching of inheritance forms, etc)	Worksheet/Punnett Practice
7	sex linked inheritance Optional Activity (pipe cleaner babies, Punnett web sites, etc)	Explain the role of chromosomes in sex determination
8	Interpreting pedigrees Activity (Human Traits pedigrees)	Describe how an X or a Y linked gene affects the inheritance of a trait
9	Review/Games	Study for exam (see Test Objectives)
10	Exam (100 points)	

The following should be accomplished prior to midterm exams

Childhood Disease Vaccination Project computer lab	Work on your project Due _____
Work on Project – computer lab	
Review for midterm exams	Midterms – No HW
Midterm (10 % of term grade)	Midterms – No HW

Options for midterm days: Show Lorenzo's Oil (3 days) or other genetic disease videos

DNA Structure, Function & Mutations

Chapter 11

Biology Standards

- 3.1 Describe the basic structure (double helix, sugar/phosphate backbone, linked by complementary nucleotide pairs) of DNA, and describe its function in genetic inheritance.
- 3.2 Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic code. Explain the basic processes of transcription and translation, and how they result in the expression of genes. Distinguish among the end products of replication, transcription, and translation.
- 3.3 Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic change in an organism. Explain how mutations in gametes may result in phenotypic changes in offspring.

Day	In Class	Homework
1	Introduce the structure of DNA (worksheet) (use pages 286-287 as a guide) Activity: DNA Structure Puzzle (Coloring)	Midterms – No HW
2	Video – something related to bioethics New Vaccines (pg 356)	Midterms – No HW
3	Group project: Bioethics (computer lab)	Midterms – No HW
4	Presentations/Discussion: Bioethics	Midterms – No HW
5	discovery of DNA, the basic DNA structure, and DNA replication Lab (molecular model of DNA and its replication)	Day 1 vocab from handout Dress for lab tomorrow
6	Lab: Berry Full of DNA Finish Molecular Model of DNA lab	Read section 11-1, answer questions 1-4
7	transcription	Day 2 vocab from handout List steps of transcription, list steps of translation due day 9
8	translation Snork activity	Day 3 vocab from handout Read section 11-2
9	using the codon chart codon worksheets (activity)	Read section 11-3, answer questions 1-4
10	mutations mutations worksheets (activity)	Day 4 vocab from handout
11	Video: Human Genome	Study vocabulary
12	Intro to DNA fingerprints Activity (DNA-Who-Done-It?)	Study vocabulary
13	Finish DNA Who Done It	Study vocabulary
14	Computer lab “what don’t you get.....?”	
15	Review/Games	Study for exam (see Test Objectives)
16	Exam (100 points)	

Evolution

Chapter 15

Biology Standards

- 5.1 Explain how evolution is demonstrated by evidence from the fossil record, comparative anatomy, genetics, molecular biology, and examples of natural selection.
- 5.2 Describe species as reproductively distinct groups of organisms. Recognize that species are further classified into a hierarchical taxonomic system (kingdom, phylum, class, order, family, genus, species) based on morphological, behavioral, and molecular similarities. Describe the role that geographic isolation can play in speciation.
- 5.3 Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population.

Day	In Class	Homework
1	Discuss the discoveries of each scientist: Cuvier, Lyell, Lamarck, Wallace, Darwin Natural selection Galapagos Video Part 1	15-1 vocab definitions
2	Galapagos Video Part 2	Read section 15.1 answer questions 1-4
3	Evidence for natural selection Fossil worksheet Horse coloring activity Comparative anatomy Comparative anatomy worksheet (activity)	The following vocab from section 15-2: gene pool allelic frequency, genetic drift, gene flow, stabilizing selection, directional selection, disruptive selection, speciation, geographic isolation, reproductive isolation, adaptive radiation, divergent evolution, convergent evolution
4	Population genetics and evolution Evolution of species Speciation Patterns of evolution	Read section 15-2 answer questions 1-4
5	Computer lab – peppered moth	Research for project
6	Computer lab - group project presentations (poster) on evidence for evolution	Research for project (if necessary)
7	Assemble posters	
8	Poster presentations	
9	Notes/Discussion: 5 Factors that alter genetic equilibrium (microevolution) Cladograms and phylogenetic trees	
10	Review games	Study for exam (see Test Objectives)
11	Exam (100 points)	

The Human Body

Chapters 34, 35, 36, 37

Biology Standards

- 4.1 Explain generally how the digestive system (mouth, pharynx, esophagus, stomach, small and large intestines, rectum) converts macromolecules from food into smaller molecules that can be used by cells for energy and for repair and growth.
- 4.2 Explain how the circulatory system (heart, arteries, veins, capillaries, red blood cells) transports nutrients and oxygen to cells and removes cell wastes. Describe how the kidneys and the liver are closely associated with the circulatory system as they perform the excretory function of removing waste from the blood. Recognize that kidneys remove nitrogenous wastes, and the liver removes many toxic compounds from blood.
- 4.3 Explain how the respiratory system (nose, pharynx, larynx, trachea, lungs, alveoli) provides exchange of oxygen and carbon dioxide.
- 4.4 Explain how the nervous system (brain, spinal cord, sensory neurons, motor neurons) mediates communication between different parts of the body and the body's interactions with the environment. Identify the basic unit of the nervous system, the neuron, and explain generally how it works.
- 4.5 Explain how the muscular/skeletal system (skeletal, smooth and cardiac muscle, bones, cartilage, ligaments, tendons) works with other systems to support and allow for movement. Recognize that bones produce both red and white blood cells.
- 4.6 Recognize that the sexual reproductive system allows organisms to produce offspring that receive half of their genetic information from their mother and half from their father and that sexually produced offspring resemble, but are not identical to, either of their parents.
- 4.7 Recognize that communication between cells is required for coordination of body functions. The nerves communicate with electrochemical signals, hormones circulate through the blood, and some cells produce signals to communicate only with nearby cells.
- 4.8 Recognize that the body's systems interact to maintain homeostasis. Describe the basic function of a physiological feedback loop.

Day	In Class	Homework
1	Homeostasis, feedback loops, and body systems Video: Ultimate Human Body (45 minutes)	34-2 (bones) vocab definitions
2	Activity (Bones & Joints)	34-3 (muscles) vocab definitions Dress for lab tomorrow
3	Lab (Chicken Wing Dissection)	37-2 (circulatory) vocab definitions
4	Finish questions on Chicken Wing Lab Start Introduction to Cardiovascular System	
5	Finish notes cardiovascular system Activity (Sensing Circulation)	37-1 (respiratory) vocab definitions PLUS questions 1-4
6	Video: Heart Attack (25 mins) respiratory system	Dress for lab tomorrow
7	Gas Exchange in the Lungs lab Video: Breathing (25 minutes)	35-1 (digestive) vocab definitions
8	Digestive system Coloring: Digestive System (optional: how long is the digestive system?) Digestion lab	
9	Finish discussion digestion & where it happens Observations & analysis questions for Modeling Human Digestion & Modeling Function of Bile	37-3 (urinary) vocab definitions

	Iron in cereal activity	
10	Video-Digestion or Computer simulations Introduction to urinary system & urinalysis lab	Dress for lab tomorrow
11	Lab (simulating urinalysis) Or computer lab for online activity	36-1 (nervous) vocab definitions
12	nervous system, neurons, and reflexes Activity options: Nervous Twitch or Which Brain Side is Dominant or various senses/reflexes options	Study for exam (see Test Objectives)
13	Wrap up/catch up Review/games	Study for exam (see Test Objectives)
14	Exam (100 points)	

Unit 11: Ecology

Chapter 2, 3, 4

Biology Standards

- 6.1 Explain how birth, death, immigration, and emigration influence population size.
- 6.2 Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.
- 6.3 Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels. Describe how relationships among organisms (predation, parasitism, competition, commensalism, and mutualism) add to the complexity of biological communities.
- 6.4 Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in an ecosystem and how oxygen cycles through photosynthesis and respiration.

Day	In Class	Homework
1	Environment levels: individual, population, community, ecosystem, biosphere	2-1 vocab definitions
2	food chains, webs, and pyramids (trophic levels) (flow of energy) (biotic vs abiotic) Activity – food web assembly, pyramid assembly Nature walk/ecology scavenger hunt	Read section 2-1 answer questions 1-4
3	Complete questions for ecology scavenger hunt Activity (How Energy Flows Through Ecosystems)	2-2 vocab definitions
4	Optional: Run, Rabbit, Run or How Can You Determine the Size of a Population	Read section 2-1 answer questions 1,2,4
5	Group brainstorming time: Develop skits on the 4 biogeochemical cycles (PROPS and DIAGRAMS)	Prepare materials for your skit
6	Video clip: mass extinctions (population sampling plus introduces idea of invasive species) Work on skits	3-1 vocab definitions
7	Groups perform cycles skits Draw cycles	Practice drawing the 4 cycles at home, quiz tomorrow
8	Quiz: Drawing the 4 cycles Predator/prey game	4-1 AND 4-2 vocab definitions
9	Complete predator/prey analysis Human impacts on environment Computer activity (Alien invaders are here)	
10	symbiotic relationships Activity (A Drop of Science Pond Water...)	3-2 vocab definitions PLUS biodiversity, extinction, conservation biology
11	Video: Coral reef adventure (50 minutes)	
12	Biome Lab	Study for exam
13	Wrap up/catch up Review/games	Study for exam
14	Exam (100 points)	Study for MCAS