

Washington Township Public Schools

Office of Curriculum & Instruction

Course: Honors Biology

Written By: B. J. Schuler

**Under the
Direction of:** Patricia A. Hughes

Description:

This course is intended for advanced students with an interest in Biology and who intend to continue their education beyond high school. The topics presented are cytology: cell structure & function, bioenergetics, mitosis and meiosis, and the role of DNA; biochemistry; principles of molecular and organismal genetics; the concepts of evolution; and ecology with emphasis on human activities and impact on natural systems. Computers will be used for developing spreadsheets and graphs, to access the internet for references, as well as in laboratory applications. Students will exercise their skills of note taking and composition, manipulation of lab equipment, measurement, and mathematical applications as related to graphing, data collection and interpretation. Critical analysis and problem solving will be required in both group and individual work.

Joseph A. Vandenberg: *Assistant Superintendent for Curriculum & Instruction*

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Jack McGee: *Director of Secondary Education*

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BOE Approval: AUGUST 2011

DEMONSTRABLE PROFICIENCIES

COURSE TITLE: Honors Biology

I. CLASSWORK REQUIREMENTS

- A. Notebook: neat, legible, chronological order. Reviewed by teacher on request.
- B. Lab work: approximately one activity per week.
- C. Homework and classroom assignments: vocabulary, and completing worksheets pertaining to content review, graphic organizing, critical thinking, problem solving and special projects.

II. ATTITUDE & BEHAVIOR

- A. Safety: students must utilize lab safety equipment and follow safety guidelines.
- B. Preparedness: students must have assignments completed on time and will bring pen, pencil, textbook, notebook and calculator to class as needed.
- C. Students must pay attention, follow directions and demonstrate courteous behavior.
- D. Students must display a serious attitude, self-motivation and initiative.
- E. Academic integrity demands that students display honesty, honor and truthfulness in all work.
- F. Responsibility requires that students complete assignments on time.

III. COURSE OBJECTIVES/OVERVIEW

A. COURSE CONTENT

1. Basic chemical principles with an emphasis on biochemistry.
2. Cell theory/cytology.
3. General patterns of energy acquisition: photosynthesis/respiration.
4. Cell reproduction: mitosis & meiosis.
5. Nucleic acids/protein function.
6. Principles of heredity: Mendelian genetics and beyond.
7. Biological evolution as a function of natural selection.
8. Environmental studies: natural systems & human impact.

B. SKILLS

1. Note taking
2. Manipulative skills: lab equipment, microscopes
3. Technology skills: computer data collection, graphics, calculations
4. Measurement: meters, liters, grams, Celsius
5. Essay: ability to compose and express ideas in written form
6. Ability to work as an individual and as part of a group
7. Mathematical relationships: graphing, data interpretation, and critical analysis.
8. Safety
9. Scientific process

C. APPRECIATION OF CONCEPTS

After completion of this course, it is expected that the student will:

1. Acquire a clear understanding and mastery of key biological concepts and ideas.
2. Master important science process and safety skills through laboratory and field investigation.
3. Develop an awareness of the relevance of biology as an integral part of everyday life.
4. Develop a proficiency in critical thinking skills.
5. Demonstrate the ability to formulate and conduct experiments and to draw conclusions based on their observations.
6. Foster a growing appreciation of and interest in biology and in all other sciences.

IV. ATTENDANCE

Attendance: Refer to Board of Education Policy

V. GRADING PROCEDURES

The final grade will be a composite of quizzes, tests, labs, homework and class work assessments, and projects which will reflect a student's mastery of the areas outlined below.

Marking period 1 - 4

Tests	40%
Labs	30%
Quizzes	20%
Homework	10%

Per policy, the Mid-Term and Final Examination Grades will be counted as 20% in determination of a semester grade and 10% each in determination of the final yearly average.

MAJOR UNITS OF STUDY

Course Title: Honors Biology

- I. **Chemical principles, emphasis on biochemistry:** The chemical basis of life; the molecules of cells.
- II. **The Life of the Cell:** An overview of structure of the cell; the functional cell and energy acquisition.
- III. **Cellular Reproduction:** Molecular biology of the gene; cellular basis of reproduction and inheritance.
- IV. **Genetics:** Patterns of inheritance.
- V. **Concepts of Evolution:** How populations evolve; the origin of species.
- VI. **Ecology:** Population dynamics; communities and ecosystems; conservation biology.

Unit Overview

Course Title: Honors Biology

Unit #: 1 UNIT 1 OVERVIEW **Unit Title:** Chemical principles; emphasis on biochemistry

Unit Description:

The initial portion of this unit focuses on the chemical composition and physical structure and function of cells. To develop an understanding of how the properties of life emerge from the chemical basis of the molecules of cells, biochemistry is introduced. The organization of matter into cells, systems and organisms allows life to exist.

Enduring Understandings/Generalizations

Students will understand that:

The cell is the basic unit of life. Living cells are composed of elements that form large, complex molecules.

Guiding Questions

1. How is life's diversity based on the unique properties of the carbon atom?
2. How does the structure of the molecules of life relate to their function in cellular structure and metabolism?
3. How does the polarity of the water molecule lead to hydrogen bonding that makes life possible on earth?

CURRICULUM – Unit Plan

Course Title: Honors Biology
Unit Title: Chemical principles; emphasis on biochemistry
Time Allocation: 6 weeks

Core Content Standards and Cumulative Progress Indicators:

<u>5.1.12.A.1, 2</u>	<u>5.1.12.B.1, 2</u>	<u>5.1.12.C.1</u>	
<u>5.3.12.A.</u>	<u>5.3.12.B.1</u>	<u>5.3.12.C.1</u>	<u>5.3.12.D.1</u>
<u>5.5.12.A.1, 2, 3</u>			

Objectives:

- | | |
|---|---|
| <p>1. List elements that are important to life.</p> <hr/> <p>2. Use a Periodic Table to identify properties of elements that are important to life maintenance.</p> <hr/> <p>3. Name, describe, and diagram examples of ionic, covalent and hydrogen bond in compounds with biological activity.</p> <hr/> <p>4. Use pH and litmus papers and the computer probe to identify acids, bases, and neutral substances.</p> <hr/> <p>5. Observe, identify, describe, and demonstrate some of the unusual properties of water that are essential to life.</p> <hr/> | <p>6. Diagram the structure of the carbon atom and describe how its structure defines its function of making life as we know it possible.</p> <hr/> <p>7. Identify the structural and molecular formulae of the functional groups which participate in chemical reactions.</p> <hr/> <p>8. Use a diagram to describe the role of water in dehydration synthesis and hydrolysis of the four major molecules of life.</p> <hr/> <p>9. Describe properties of carbohydrates, lipids, proteins and nucleic acids and their structural and functional roles in the cell.</p> <hr/> |
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A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
<p>Chapter 2: The chemical basis of life 2.1 Twenty-five elements of life 2.2 Trace elements 2.3 Elements form compounds 2.4 Sub atomic particles 2.5 Radioactive isotopes 2.6 Electron arrangement 2.7 Ionic bonds 2.8 Covalent bonds 2.9 Water: polar molecules 2.10 Water: hydrogen bonds 2.11 Water: cohesion 2.12 Water: moderates temperature 2.13 Water: ice floats 2.14 Water: a versatile solvent 2.15 pH 2.16 Acid precipitation</p>	<p>LAB Chapter 2</p> <p>1. Controlled experiment: yeast & sugar</p> <p>2. Chemical change: effect of temperature on the dissolving rate of alka seltzer</p> <p>3. pH: comparison of techniques for collection of pH data: litmus & pH papers and computer probes; perform a neutralization reaction; observe effect of pH on biological materials; study the buffering capacity of water and other</p>	<p>LAB Chapter 2</p> <p>1. TTs, racks, sugar, yeast culture, hot plates and beakers</p> <p>2. alka seltzer, water, stop watch, graph paper</p> <p>3. litmus & pH papers, computer & pH probes, various solutions to test, buffers, biological solutions such as milk</p> <p>4. water: beakers, pennies, water droppers, cohesion plates, wax paper, string, paper clips, capillarity</p>	<p>Lab activities and lab evaluations</p> <p>Lab Reports</p> <p>Quizzes</p> <p>Tests</p> <p>HW/CW</p>

A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
<p>2.17 Chemical reactions</p> <p>Chapter 3</p> <p>3.1 Properties of Carbon</p> <p>3.2 Functional groups</p> <p>3.3 Dehydration synthesis & hydrolysis</p> <p>3.4 Monosaccharides</p> <p>3.5 Disaccharides</p> <p>3.6 Sugar = sweet</p> <p>3.7 Polysaccharides</p> <p>3.8 Fats</p> <p>3.9 Other lipids</p> <p>3.10 Anabolic steroids</p> <p>3.11 Proteins</p> <p>3.12 Peptide bonds</p> <p>3.13 Shape determines function of protein</p> <p>3.14 Four levels of protein structure</p> <p>3.15 Linus Pauling</p> <p>3.16 Nucleic acids = polymers</p>	<p>solutions</p> <p>4. Water: demonstrations & observations of its unique properties</p> <p>Text Assignments</p> <p>1. Read text sections: <u>Biology: Concepts & Connections</u>, 2009; Chapter 2.</p> <p>2. Complete student study guide worksheets relating to the assigned chapter sections.</p> <p>LAB Chapter 3</p> <p>1. Chemical testing for carbohydrates, lipids & proteins</p> <p>Text assignments</p> <p>1. Read text sections, Chapter 3.</p> <p>2. Complete student study guide worksheets relating to the assigned chapter sections.</p>	<p>Chapter worksheets</p> <p>Computer, power point presentations including diagrams & models</p> <p>Computer internet</p> <p>Class discussions/lectures</p> <p>LAB Chapter 3</p> <p>1. Chemical testing: Benedict's solution, IKI, various sugars & starches, TTs, TT rack, hot plate & beakers of water, brown paper bag and oil, biuret reagent & egg white</p> <p>Text chapter 3</p> <p>Chapter worksheets from student study guide</p> <p>Models & diagrams of monomers & polymers</p> <p>Power point presentations</p>	

Unit Overview

Course Title: Honors Biology

Unit #: 2 **UNIT 2 OVERVIEW** **Unit Title:** The Life of the Cell

Unit Description:

This unit is designed to develop an understanding of the dynamic nature of cell structures and the metabolic pathways through which cells acquire and use energy. An in depth study of the fluid mosaic model of membrane structure and the roles of membrane proteins are incorporated in the unit. The processes of respiration and photosynthesis are integral chemical processes to maintain life overall.

Enduring Understandings/Generalizations

Students will understand that:

The cell is the basic unit of life. The primary source of energy to sustain most life is derived from a conversion of light energy to chemical energy through the process of photosynthesis.

Guiding Questions

1. How do plants convert light energy into chemical energy?
2. How is matter cycled through food webs but why is an input of energy continually need to sustain an ecosystem?
3. How do microscopes provide the technology for scientists to study the world of the cell?
4. What are the cells' organelles that perform life activities?
5. Why are cells so small?
6. How does the plasma membrane regulate the movement of materials between the cell and its surroundings?

CURRICULUM – Unit Plan

Course Title: Honors Biology
Unit Title: The Life of the Cell
Time Allocation: 9 weeks

Core Content Standards and Cumulative Progress Indicators:

<u>5.1.12 A.3</u>	<u>5.1.12 B.1, 2</u>	<u>5.1.12 C.1</u>	<u> </u>
<u>5.2.12 B.2, 3</u>	<u> </u>	<u> </u>	<u> </u>
<u>5.3.12 A</u>	<u>5.3.12 B.1</u>	<u> </u>	<u> </u>
<u>5.4.12 A.1</u>	<u> </u>	<u> </u>	<u> </u>
<u>5.5.12 A.2, 3</u>	<u> </u>	<u> </u>	<u> </u>

Objectives:

1. Compare and contrast prokaryotic and eukaryotic cells.

2. Use diagrams to identify the structures of plant and animal cells.

3. Microscopic observation and identification of visible plant and animal cell structures.

4. Distinguish the similarities and differences in plant and animal cells.

5. Group cell organelles into the following functional categories: manufacturing, breakdown, energy processing, and support, movement and communication between cells.

6. Explore how the processes of respiration and photosynthesis are complementary energy producing processes which cycle O₂ & CO₂ gasses.

7. Distinguish and explain the difference between an endothermic (endergonic) and exothermic (exergonic) reactions.

8. Draw the structure of ATP and list its components.

9. Evaluate how the structure of ATP enables it to shuttle energy for the cell.

10. Explain how enzymes function in the cell.

11. Discuss the structure and function of the fluid mosaic model of the cell membrane including passive and active transport of molecules across the membrane.

12. Compare and contrast diffusion and osmosis with emphasis on osmoregulation.

A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
<p>Chapter 4</p> <p>4.1 Microscopes 4.2 microscopic cell size 4.3 Prokaryotic cells 4.4 Eukaryotic cells 4.5 Nucleus 4.6 Endomembrane system 4.7 Smooth endoplasmic reticulum 4.8 Rough endoplasmic reticulum 4.9 Golgi apparatus 4.10 Lysosomes 4.11 Abnormal lysosomes 4.12 Vacuoles 4.13 Review of endomembranes 4.14 Chloroplasts 4.15 Mitochondria 4.16 Cytoskeleton 4.17 Cilia & flagella 4.18 Cell surfaces 4.19 Four functional categories</p>	<p>LAB Chapter 4</p> <p>1. Introduction to the microscope 2. Plant and animal cell observations 3. Diffusion and cells size 4. Respiration and photosynthesis</p> <p>Text Assignments</p> <p>1. Read text sections, Chapter 4. 2. Complete student study guide worksheets relating to the assigned chapter sections</p>	<p>LAB Chapter 4</p> <p>1. microscope, slides, cover slips, letter “e”, threads, potato starch grains and IKI, scale slide with mm/microns, cork cells 2. microscope, slides & stain, cover slips, cheek, onion, & elodea cells; optional: lettuce epidermis, banana, & tomato cells 3. phenolphthalein agar, vinegar, cup, cm ruler, calculator, plastic knife and spoon, gloves 4. CO₂ and/or O₂ computer probes, lap tops, seed sprouts</p> <p>Text chapter 4</p> <p>Chapter worksheets from student study guide.</p> <p>Models & diagrams & video of cell parts & structure</p> <p>Power point presentations</p> <p>4. Discuss the structure and function of the fluid mosaic model of the cell membrane including passive and active transport of molecules across the membrane.</p>	<p>Lab activities & lab evaluations</p> <p>Quizzes</p> <p>Tests</p> <p>HW/CW</p>

A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
<p>Chapter 5 5.3 2 Kinds of chemical reactions 5.4 ATP 5.5 – 5.9 Enzymes 5.10 – 5.13 Plasma membrane structure 5.14 Passive transport 5.15 Transport proteins 5.16 Osmosis 5.17 Osmoregulation 5.18 Active transport 5.19 Exo and exocytosis 5.20 Faulty membranes 5.21 Role of chloroplasts & mitochondria in production of energy for the cell</p> <p>Reference Chapters 6 & 7 as needed to support discussion of energy production & utilization by cells</p> <p>Chapter 6 How cells Harvest Chemical Energy</p> <p>Chapter 7 Photosynthesis</p>	<p>LAB Chapter 5</p> <ol style="list-style-type: none"> Enzymes: catalase and liver Cells and osmosis: osmoregulation ATP structure & function <p>Text Assignments</p> <ol style="list-style-type: none"> Read text: Chapter 5 Complete student study guide worksheets relating to the assigned text sections. 	<p>LAB Chapter 5</p> <ol style="list-style-type: none"> Enzymes: Calf liver (or catalase solution), H₂O₂, TTs, TT rack, HCl, NaOH, pH paper, enzyme inhibitor, wooden splints for flame test, O₂ computer probes artificial cell: starch bag; egg & vinegar; potatoes, raisins or cucumbers; elodea & red onion cells & salt solution, microscope, slides & cover slips; droppers, beakers, IKI, starch solution worksheets of ATP models, scissors, tape <p>Chapter worksheets</p> <p>Computer, power point presentations including diagrams & models</p> <p>Class discussion/ lectures</p> <p>Internet references</p> <p>Cell models & diagrams</p> <p>Video</p>	<p>Lab activities & lab evaluations</p> <p>Quizzes</p> <p>Tests</p> <p>HW/CW</p>

Unit Overview

Course Title: Honors Biology

Unit #: 3 **UNIT 3 OVERVIEW** **Unit Title:** Cellular Reproduction

Unit Description:

The unit encompasses the structure and function of the nucleic acids DNA and RNA and their role in heredity and protein synthesis. An understanding of the structure and function of nucleic acids and the processes of mitosis and meiosis will occur through a study of the molecular biology genes. Cell reproduction as related to inheritance is presented.

Enduring Understandings/Generalizations

Students will understand that:

During cell reproduction, DNA replicates to ensure that each new cell formed through mitosis has a copy of the blueprint that controls all cellular activity. Through transcription and translation, DNA and RNA direct the synthesis of proteins, biomolecules which are the molecular basis of an organism's physical characteristics. Meiosis is necessary to produce gametes, reproductive cells with half the number of chromosomes as the original cell.

Guiding Questions

1. What is the structure of the DNA molecule?
2. How and why does DNA replicate prior to cell division?
3. How do DNA and RNA direct protein synthesis in a cell?
4. How do mutations occur and how do they change the meaning of genes?
5. What are the events of the cell cycle and how long does a cell spend in each event?
6. What are the events of mitosis and how do the chromosomes change during the process?
7. How are gametes formed through the process of meiosis?
8. How does meiosis produce variations in offspring?
9. What mutations occur during meiosis and how do they affect chromosome number and phenotypes?

CURRICULUM – Unit Plan

Course Title: Honors Biology
Unit Title: Cellular Reproduction
Time Allocation: 6 weeks

Core Content Standards and Cumulative Progress Indicators:

5.1.12 A.3	5.1.12 B.1, 2	5.1.12 C.1	
5.2.12 A.1	5.2.12 B.1, 2, 3		
5.3.12 A			
5.4.12 A.1			
5.5.12 C.1, 2, 3			

Objectives:

1. Diagram DNA and RNA molecules and explain how the molecular structure allows the mechanism for chromosome replication and gene expression.

2. Explain the way in which genetic information is encoded in DNA, and replicated.

3. Trace the steps of protein synthesis, emphasizing the locations of the process.

4. Outline the mechanisms of mutations and explain how this alters an organism’s phenotype.

5. Identify the important events in the cell cycle and list what occurs in each event.

6. Using the microscope and onion root tip cells, identify the phases of mitosis and determine the relative amount of time the cells spend in each phase.

7. Outline the important events of meiosis.

8. Explain how chance plays a role in “shuffling” genes during meiosis which leads to genetic variation in sexually reproducing organisms.

9. Compare and contrast the events of mitosis and meiosis.

10. Demonstrate how chromosome mutations lead to changes in phenotypes.

A. CONTENT/SKILLS

B. LEARNING ACTIVITIES

C. SUGGESTED MATERIALS

D. STUDENT EVALUATION

<p>Chapter 10</p> <p>10.1 DNA is the genetic material 10.2 nucleotides = monomers of nucleic acids 10.3 DNA = double helix 10.4 complementary base pairs 10.5 DNA replication 10.6 & 7 DNA → RNA → proteins 10.8 Genetic code 10.9 Transcription 10.10 mRNA 10.11 tRNA 10.12 rRNA</p>	<p>LAB Chapter 10</p> <p>1. DNA structure & function 2. Transcription & translation 3. Extraction of DNA from cells</p> <p>Text Assignments</p> <p>1. Read text sections: Chapter 10</p>	<p>LAB Chapter 10</p> <p>1 & 2: DNA & RNA models, tape & scissors & worksheets 3. wheat germ, warm water, TTs, wooden stirrer, detergent, cold alcohol, TT rack</p> <p>Text</p> <p>Power point presentation</p>	<p>Lab activities & lab evaluations</p> <p>Quizzes</p> <p>Tests</p> <p>HW/CW</p>
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A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
<p>10.13 - .15 Transcription 10.16 Mutations 10.17 - .23 Microbial genetics (optional)</p> <p>Chapter 8 8.1- 2 Cell division 8.3 Binary fission 8.4 Chromosome structure 8.5 Cell Cycle 8.6 Mitosis stages 8.7 Cytokinesis 8.8 Factors affecting cell division 8.9 Cell cycle control system 8.10 Cancer cells 8.11 Mitosis review 8.12 Homologous pairs 8.13 Gametes 8.14 Meiosis stages 8.15 Compare mitosis & meiosis 8.16 Independent orientation 8.17 Alleles 8.18 Crossing over 8.19 Karyotype 8.20 Down syndrome 8.21 Mutations 8.22 Turner & Klinefelter syndrome 8.23 Chromosome mutations</p>	<p>2. Complete student study guides relating to the assigned chapter sections.</p> <p>LAB Chapter 8</p> <p>1. Karyotype: normal & abnormal 2. Time for Mitosis 3. Meiosis</p> <p>Text Assignments</p> <p>Read Chapter 8</p> <p>Complete student study guide worksheets relating to assigned sections</p> <p>On-line research for models & videos of mitosis & meiosis</p>	<p>DNA model & diagrams</p> <p>Video: Dark Lady of DNA: Rosalind Franklin</p> <p>LAB Chapter 8</p> <p>1. Karyotype: paper pictures of chromosomes, scissors, tape 2. microscope & prepared slides of plant cell mitosis and online resources which review mitosis phases, mitosis models 3. microscope & prepared slides of meiosis</p> <p>Text</p> <p>Power point presentations</p> <p>worksheets from student study guide</p> <p>Video clips demonstrating mitosis & meiosis</p> <p>Models & diagrams of mitosis & meiosis</p> <p>Computer internet</p>	<p>Lab Activities & lab evaluations</p> <p>Quizzes</p> <p>Tests</p> <p>HW/CW</p>

Unit Overview

Course Title: Honors Biology

Unit #4: UNIT 4 OVERVIEW **Unit Title:** Genetics

Unit Description:

This unit includes the study of genetics. Students will study basic Mendelian heredity patterns, as well as patterns of heredity not following Mendel's principles. Students will also investigate current DNA technology trends and applications, as well as the ethics associated with the use of biotechnology.

Enduring Understandings/Generalizations

Students will understand that:

Characteristics are inherited as a result of genes which are passed from parent to offspring following Mendel's Laws and many other patterns of inheritance. Modern DNA technology, which has led to techniques applied to the fields of medicine, agriculture, forensics, and pharmaceuticals, involves risks and raises inherent ethical questions.

Guiding Questions

1. What are the basic principles of Genetics as proposed by Gregor Mendel?
2. How do the principles of heredity relate to laws of probability?
3. How can genetic testing detect inherited disorders in humans?
4. How can patterns of human inheritance that don't follow Mendel's Laws be explained?

CURRICULUM – Unit Plan

Course Title: Honors Biology
Unit Title: Genetics
Time Allocation: 4 weeks

Core Content Standards and Cumulative Progress Indicators:

<u>5.1.12A.1, 2, 3, 4</u>	<u>5.1.12 B.1, 2</u>	<u>5.1.12 C.1</u>	
<u>5.2.12 A.1</u>	<u>5.2.12 B.1, 2, 3</u>		
<u>5.3.12 A</u>		<u>5.3.12 C.1</u>	<u>5.3.12 D.1</u>
<u>5.4.12 A 1</u>	<u>5.3.12 B.1</u>	<u>5.4.12 C.1</u>	
<u>5.5.12 A .4</u>	<u>5.4.12 B.1</u>	<u>5.5.12 C.1, 2, 3</u>	

Objectives:

1. Name and describe Mendel’s 3 Principles of heredity.
2. Use Punnett Squares to predict the offspring of mono and dihybrid crosses and the proportions in which they should occur.
3. Use test crosses to determine unknown genotypes.
4. Demonstrate how the rules of probability relate to the study of genetics.
5. Compare & contrast examples of inheritance patterns which are variations on Mendel’s Laws such as incomplete dominance, multiple alleles, codominance, pleiotrophy, sex-linkage, and polygenic inheritance.

6. Demonstrate Mendelian patterns of heredity by performing crosses between fruit flies with contrasting traits.
7. Compose conclusions that are supported by the data collected from the breeding experiment with fruit flies.

A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
Chapter 9 1 & 2 Gregor Mendel & his experiments 9.3 Mendel’s Lab of Segregation 9.4 Homologous chromosomes 9.5 Law of independent assortment 9.6 Testcross 9.7 Rules of probability 9.8 Pedigrees 9.9 Single gene disorders 9.10 Fetal screening 9.11 “Beyond Mendel” 9.12 Incomplete dominance	LAB Chapter 9 1. Fruit fly genetics project 2. Worksheet practice with monohybrid and dihybrid crosses, test crosses, multiple allele & genes (blood type) 3. Debate: Nature vs. Nurture issue		Lab Activities and lab evaluations Quizzes Tests HW/CW

A. CONTENT/SKILLS**B. LEARNING ACTIVITIES****C. SUGGESTED MATERIALS****D. STUDENT EVALUATION**

<p>9.13 Multiple alleles 9.14 Pleiotropy 9.15 Polygenic inheritance 9.16 Nature vs. nurture 9.17 Genetic testing 9.18 Chromosomal theory of inheritance 9.19 Linked genes 9.20 Crossing over 9.21 Mapping genes 9.22 – 24 Sex-linked genes</p>	<p>Text Assignments</p> <p>Read assigned sections in Chapter 9</p> <p>Complete student study guide Worksheets relation to assigned chapter sections</p> <p>Search online for information related to unit topics</p>		
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Unit Overview

Course Title: Honors Biology

Unit #5: UNIT 5 OVERVIEW **Unit Title:** Concepts of Evolution

Unit Description:

The unit encompasses Evolutionary Theory. Students will study Darwin's theory of natural selection as a mechanism of evolution and consider scientific evidence to support the theory. The unit emphasizes how the Earth's present species developed from earlier distinctly different species.

Enduring Understandings/Generalizations

Students will understand that:

The theory of evolution by means of natural selection accounts for the origin of species, the development of the Earth's present species, and extinctions of species.

Guiding Questions

1. How did Charles Darwin's sea voyage help to frame his theory of evolution?
2. What observations led Darwin to propose that natural selection was the mechanism of evolution?
3. How does modern synthesis blend Darwin's natural selection with Mendel's ideas to reveal how populations change genetically over time?
4. How is a species defined and what are some mechanisms of speciation?

CURRICULUM – Unit Plan

Course Title: Honors Biology

Unit Title: Concepts of Evolution

Time Allocation: 3 weeks

Core Content Standards and Cumulative Progress Indicators:

5.1.12 A.1, 2, 3, 4			
5.2.12 B.1, 3			
5.5.12 B.1, 2			

Objectives:

1. Summarize the observations which Darwin made that enabled him to propose natural selection as a mechanism of evolution.

2. Compare Mendel's concept of natural selection with Mendel's principles of genetics and modern synthesis blends the two ideas.

3. Explain how the theory of natural selection accounts for extinction as well as an increase in the proportion of individuals with advantageous characteristics within a species.

4. Explain that through evolution the Earth's present species developed from earlier distinctly different forms of life.

5. Explain mechanisms of speciation.

A. CONTENT/SKILLS

B. LEARNING ACTIVITIES

C. SUGGESTED MATERIALS

D. STUDENT EVALUATION

Chapter 13 Darwin's sea voyage Natural selection Fossil evidence More evidence of evolution Natural selection in action Population genetics Hardy-Weinberg equilibrium 13.9 Genetic drift and gene flow 13.11 Polymorphism 13.12 Mutation & sexual recombination generate variation 13.16 Distribution of phenotypes 13.17 Sexual selection Chapter 14	LAB Chapter 13 & 14 1. Biochemical evidence of evolution: comparing amino acid sequence in proteins of various animals 2. Hardy-Weinberg equation 3. Debate: Evolution vs. Creationism	LAB Chapter 13 & 14 1. Worksheets including amino acid sequences to compare. 2. Hardy-Weinberg equation: gather data and use the equation to demonstrate that the gene pool of an idealized population remains constant over generations. 3. Debate: IMC resources for research	Lab activity and lab evaluations Quizzes Tests HW/CW Lab activity and lab evaluations
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A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
14.1 Biological diversity 14.2 What is a species 14.3 Reproductive barriers 14.4 Geographic isolation 14.8 Adaptive radiation 14.10 Tempo of speciation 14.13 Evolutionary trends	Text assignments Read selections in the text Complete student study guide worksheets Observe videos about Darwin and evolution	Text Worksheets from student study guide Videos from library	Quizzes Tests HW/CW

Unit Overview

Course Title: Honors Biology

Unit #6: UNIT 6 OVERVIEW **Unit Title:** Ecology

Unit Description:

The unit focuses on the study of the interactions between organisms and their environment. Students will study population trends, the interdependent components of communities and ecosystems, and human impact on the environment.

Enduring Understandings/Generalizations

Students will understand that:

The growth of a population is dependent upon their interactions with density dependent and density independent factors in the environment. Communities and ecosystems are composed of interactions between the biotic and abiotic factors in the environment. Human activities may impact the cycling of matter and the flow of energy through an ecosystem.

Guiding Questions

1. How and why do populations change over time?
2. How do idealized models help us understand population growth?
3. What are some factors that limit population growth?
4. What is the human population growth trend and how does it affect our ecosystems?
5. What are the structural features of a community?
6. What are the structural features of an ecosystem?
7. How do chemicals cycle between organic matter and abiotic reservoirs?
8. How does ecosystem alteration upset chemical cycling?

CURRICULUM – Unit Plan

Course Title: Honors Biology
Unit Title: Ecology
Time Allocation: 8 weeks

Core Content Standards and Cumulative Progress Indicators:

5.1.12 A.1, 2, 3	5.1.12 B.1, 2	5.1.12 C.1	
5.2.12 A.1	5.2.12 B.3		
5.3.12 A	5.3.12 B.1	5.3.12 C.15.3.12 D.1	
	5.4.12 B.1		
5.10.12 A.1	5.10.12 B.1, 2		

Objectives:

1. Define ecology.
2. Explain that the levels of the biosphere are organized into a hierarchy: species, population, community, and ecosystem.
3. Demonstrate how population structures are studied by determining their density and dispersion patterns.
4. Compare and contrast population growth models that help us understand growth trends.
5. Compare the human population growth curve with idealized models and predict future trends of the human population growth.

6. Describe the interactions among organisms which help to structure a community.
7. Explain how energy flows and chemicals are cycled between organic matter and abiotic reservoirs in an ecosystem.
8. Using data, evaluate how ecosystem alteration by human activity can upset chemical cycling and the natural flow of energy through an ecosystem.

A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
Chapter 36 36.1 Population ecology 36.2 Population density & dispersion patterns 36.4 Idealized population growth models 36.5 Population limiting factors 36.6 “Boom and Bust” cycles 36.9 & 10 Human population growth trends	LAB: Chapter 36 1. What’s an Ecosystem? 2. Population Density 3. Yeast Population Growth	LAB Chapter 36 1. worksheets & text 2. worksheets, text, plot of grasses & weeds, meter sticks, string, wooden dowels 3. worksheets, calculator, IMC video about population growth	Lab activities & lab evaluations Quizzes Tests Project HW/CW

A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
<p>Chapter 37 37.1 Community definition 37.2 Competition 37.3 Predator and prey 37.4 Predation maintains community structure 37.5 Coevolution 37.6 Symbiosis 37.8 Disturbance 37.8 Role of fire in an ecosystem 37.9 Trophic structure 37.10 Food chains and webs 37.11 Energy flow and chemical cycling 37.12 Primary production sets the energy budget for an ecosystem 37.13 Limits to food chain lengths 37.14 Meat as a luxury commodity 37.15 – 19 Chemical cycles 37.20 Ecosystem alteration</p>	<p>Read text sections</p> <p>Complete student study guide worksheets</p> <p>Videos: communities, ecosystems</p> <p>Power point presentation & discussion of readings</p> <p>LAB: Chapter 37</p> <ol style="list-style-type: none"> 1. Biomes 2. Food web: Owl Pellets 3. Project: Field study of a Community: design a food web <p>Text Assignments</p> <p>Read text sections</p> <p>Complete student study guide worksheets</p> <p>Power point presentations & discussion of readings</p>	<p>Textbook</p> <p>Student study guide worksheets</p> <p>IMC videos</p> <p>Power point, computer & projector</p> <p>LAB Chapter 37</p> <ol style="list-style-type: none"> 1. worksheets, world map, graphs & climate data 2. Owl pellets, dissecting equipment, gloves, bone diagrams, magnifying lenses 3. Field study: pond, collection nets & containers, ID manuals <p>Text</p> <p>Study guide worksheets</p> <p>Power point presentations & discussion of readings</p>	<p>Lab activities & lab evaluations</p> <p>Quizzes</p> <p>Tests</p> <p>Project</p> <p>HW/CW</p>

A. CONTENT/SKILLS	B. LEARNING ACTIVITIES	C. SUGGESTED MATERIALS	D. STUDENT EVALUATION
<p>Chapter 38 38.1 Human activity affects Earth's biodiversity 38.2 Biodiversity is vital to human welfare 38.3 – 14 Human impact on the environment</p>	<p>LAB: Chapter 38</p> <ol style="list-style-type: none"> 1. Water Pollution 2. To Dam or Not to Dam? D Students role play townspeople involved in a debate about whether or not to build a dam 3. Project: IMC research of environmental issues: global warming, air & water pollution, agriculture, trash & other ideas <p>Text Assignments</p> <p>Read text sections</p> <p>Complete student study guides</p> <p>Student power point presentations of IMC research</p>	<p>LAB Chapter 38</p> <ol style="list-style-type: none"> 1. milk, yeast, methylene blue, TTs, TT rack, graduated cylinders, hot plates and beakers 2. Town meeting role play: worksheets 3. IMC computer research, preparation of a power point presentation and worksheet to teach the class about he environmental issue <p>Text</p> <p>Student study guide worksheets</p> <p>IMC & home computer research & power point presentation</p>	

Cross-Content Standards Analysis

Course Title: _____ Honors Biology _____ **Grade:** 9 -10

Unit Title:	Visual and Performing Arts	Comp. Health & Physical Ed.	English Language Arts (See Pg. 26)	Mathematics (See Pg. 27)	Science	Social Studies	World Languages	Tech Literacy	21 st Century Life & Careers
Chemical Principles					5.1.12A.1,2,3,4 5.1.12B.1,2 5.1.12C.1 5.2.12A.1 5.2.12B.1,2,3 5.3.12A 5.3.12B.1 5.3.12C.1 5.3.12D.1 5.4.12A.1 5.4.12B.1 5.4.12C.1 5.5.12A.1 5.6.12A.1,2,3,4,5,6,8 5.6.12B.1,2			8.1.12A.3,9 8.1.12B.2,3,5,7,8	
Life of a Cell					5.2.12B.1,2,3 5.3.12A.1 5.3.12B.1 5.3.12C.1 5.5.12A.1,2,3 5.7.12B.1,2,3				
Cellular Reproduction					5.1.12C.1 5.2.12B.1,3 5.3.12A.1 5.5.12A.1 5.5.12C.1,2				
Genetics					5.3.12A.1 5.3.12B.1 5.3.12C.1 5.5.12A.1 5.5.12C.1,2,3				
Evolution					5.1.12A.1,2,3 5.1.12B.2 5.1.12C.1 5.2.12A.1 5.2.12B.1,2,3				

					5.5.12B.1,2				
Ecology					5.2.12A.1 5.2.12B.1 5.3.12A.1 5.3.12C.1,2 5.10.12A.1 5.10.12B.1				

***All core content areas may not be applicable in a particular course.**

Cross-Content Standards Analysis

Course Title: Honors Biology **Grade:** 9 -10

COMMON CORE ENGLISH LANGUAGE ARTS ALIGNMENT

Unit Title:	ENGLISH LANGUAGE ARTS						
	Science & Technology	Science & Technology	ELA	ELA	ELA	ELA	
Chemical Principles	RST 9-10. 1-7, 10 RST 11-12. 1-7	WHST 9-10. 1,2,4-10 WHST 11-12. 1,2,4-10	RI 9-10. 1,4,5,8 RI 11-12. 1,4,5,8	RL 9-10. 1,2,4 RL 11-12. 1,2,4	W 9-10. 1-10 W 11-12. 1-10	SL 9-10. 1-6 SL 11-12. 1-6	
Life of a Cell	RST 9-10. 1-7, 10 RST 11-12. 1-7	WHST 9-10. 1,2,4-10 WHST 11-12. 1,2,4-10	RI 9-10. 1,4,5,8 RI 11-12. 1,4,5,8	RL 9-10. 1,2,4 RL 11-12. 1,2,4	W 9-10. 1-10 W 11-12. 1-10	SL 9-10. 1-6 SL 11-12. 1-6	
Cellular Reproduction	RST 9-10. 1-7, 10 RST 11-12. 1-7	WHST 9-10. 1,2,4-10 WHST 11-12. 1,2,4-10	RI 9-10. 1,4,5,8 RI 11-12. 1,4,5,8	RL 9-10. 1,2,4 RL 11-12. 1,2,4	W 9-10. 1-10 W 11-12. 1-10	SL 9-10. 1-6 SL 11-12. 1-6	
Genetics	RST 9-10. 1-7, 10 RST 11-12. 1-7	WHST 9-10. 1,2,4-10 WHST 11-12. 1,2,4-10	RI 9-10. 1,4,5,8 RI 11-12. 1,4,5,8	RL 9-10. 1,2,4 RL 11-12. 1,2,4	W 9-10. 1-10 W 11-12. 1-10	SL 9-10. 1-6 SL 11-12. 1-6	
Evolution	RST 9-10. 1-7, 10 RST 11-12. 1-7	WHST 9-10. 1,2,4-10 WHST 11-12. 1,2,4-10	RI 9-10. 1,4,5,8 RI 11-12. 1,4,5,8	RL 9-10. 1,2,4 RL 11-12. 1,2,4	W 9-10. 1-10 W 11-12. 1-10	SL 9-10. 1-6 SL 11-12. 1-6	
Ecology	RST 9-10. 1-7, 10 RST 11-12. 1-7	WHST 9-10. 1,2,4-10 WHST 11-12. 1,2,4-10	RI 9-10. 1,4,5,8 RI 11-12. 1,4,5,8	RL 9-10. 1,2,4 RL 11-12. 1,2,4	W 9-10. 1-10 W 11-12. 1-10	SL 9-10. 1-6 SL 11-12. 1-6	

*All core content areas may not be applicable in a particular course.

Cross-Content Standards Analysis

Course Title: _____ Honors Biology _____ **Grade:** 9 -10

COMMON CORE MATH ALIGNMENT

Unit Title:	MATHEMATICS							
	Numbers & Quantity	Algebra	Functions	Geometry	Statistics & Probability			
Chemical Principles	N-Q 1-3	A-SSE 1A	F-IF 1,2,6		S-ID 1,2,4			
Life of a Cell	NQ 3	A-REI 1,2,3,6	F-IF 1,2	G-MG-2	S-ID 2			
Cellular Reproduction	NQ 3	A-REI 1,2,3,6	F-IF 1,2,4					
Genetics	NQ 3	A-REI 1,2,3,6	F-IF 1,2		S-IC 1,2,3,4			
Evolution	NQ 3	A-REI 6	F-IF 1,2,6 F-BF 1B F-LE 1C		S-IC 1,2,3,4			
Ecology	NQ 3	A-REI 1,2,3,6,10	F-IF 4,6 F-LE 1A		S-ID 2 S-IC 1,2,3,4			

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Washington Township Public Schools

Department of Student Personnel Services

CURRICULUM MODIFICATION

The regular curriculum is modified for Special Education students enrolled in both self-contained and resource center classes.

Modifications address individual learning rates, styles, needs and the varying abilities of all special populations served in the programs available in the district.

The intent is three-fold:

- To provide alternative materials, techniques and evaluation criteria to address the range of students' needs;
- To parallel the regular curriculum in skill, content sequence and coverage to prepare students for mainstreaming;
- To maximize students' potential for movement to less restrictive environments.

In the event there is a conflict between the prescribed curriculum and the IEP for an individual student, the IEP will take precedence and will constitute the individually prescribed proficiencies for the student.