Milton Area School District

Biology Syllabus

Course Description: BIOLOGY

Grades 9th Credit: 1.00

Prerequisites: Algebra I

This course is designed for all students. The following areas are covered: basic biological principals, chemical basis for life, ecology, bioenergetics, homeostasis and transport, cellular growth and reproduction, genetics, and the theory of evolution. In each area the students are made aware of the interrelationships that exist within the living world and life's dependence on the nonliving one. The course will meet daily for one semester.

There is also a required Keystone exam at the end of the course.

The **PA Common Core Standards** for **Biological Content** and **Biological Practices** will direct instruction. The **Biology Standards** define what students should understand and be able to do. **Biological Practice Standards** describe the habits of mind required to reach a level of **Biological** proficiency.

Course Goals

Designed and aligned with the PACCS or substitute the standards currently driving your course content.

1.Basic Biological Principles: Scientific Method and Inquiry, Prokaryotic and Eukaryotic, Levels of Organization

2. Chemical Basis for Life: Properties of Water, Macromolecules Structure and Function, Carbon, Enzyme, pH

3. Ecology: Ecological Organization, Interactions of Biotic and Abiotic components of Ecosystems, Energy Interactions, Cycles of Matter, Population Dynamics, Change in Ecosystems

4. Bioenergetics: Organelles, Photosynthesis, Cellular Respiration, ATP, Energy Transformations

5. Homeostasis and Transport: Structure of Cell Membrane, Transport Mechanisms of Cell Membrane and Organelles, Thermoregulation

6. Cellular Growth and Reproduction: Cell Cycle, DNA Replication and Conservation, Interactions of Genetic Material

7. Genetics: Predicting patterns of Inheritance and their outcomes, Genetic Mutations, Central Dogma, Biotechnology

8. Theory of Evolution: Natural Selection, Population Genetics, Allele Frequencies and how they occur, Genotypic and Phenotypic variations, Interpreting Evidence of Evolution,

Student Literacy Objectives

Students will independently use their learning to:

- **Effective *Biology 1A* readers use appropriate strategies to construct meaning.**

- **Critical thinkers actively and skillfully interpret, analyze, evaluate, and synthesize information.**
- **Active listeners make meaning from what they hear by questioning, reflecting, responding, and evaluating.**
- **Effective speakers prepare and communicate messages to address the audience and purpose**
- **Effective research requires the use of varied resources to gain or expand knowledge.**
- **Audience and purpose influence a *biology 1A* writer's choice of organizational pattern, language, and *biological* concepts using appropriate literacy techniques.**
- **Language conventions support clarity of communications between writers/speakers and *{your course}* readers/listeners.**
- **An expanded vocabulary enhances one's ability to express *biological* ideas and information**

Additional Content Area Student Objectives

- Proficiency in the language of biology.
- Application of critical thinking skills to:
    - Describe, analyze, apply, represent, explain, translate, classify, construct, and extend biological conceptual understanding and skills in Biology.
- Participate equally in all labs and projects.

INSTRUCTOR COURSE POLICIES

All sections below are developed by the instructor

Text/Related Resources: Biology (Pearson Realize.com) , Biology Coloring Workbook

Teacher and Student Technology Integration and Resources: Internet, Lab equipment, Science in Motion, Insight 360, Smartboard, Vernier peripherals.

Course Requirements: Notebook, textbook (online) and a writing instrument are required daily. Final exam.

Attendance Policy: Unexcused absences will result in a zero. Required work is due within 5 class periods.

Grading Policy: Follows MHS handbook.

Overall Course Essential Questions:

- How does the field of Biology impact you and the abiotic and biotic factors around you?

Course Schedule

Week	Unit Essential Question(s): Key Understandings	Focus of the Units: Key knowledge	Standards Addressed:	Assignment/Artifact	Method of Evaluation
1-2	How do we use the scientific method to study the characteristics of life?	Scientific Method Characteristics of Life Prokaryote vs. Eukaryote <u>Vocabulary:</u> Biology Observation Hypothesis Experiment Theory Homeostasis	**3.1.B.A1**	Bell Ringer Vocabulary Highlight key examples Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt notes. Using the rules of Scientific Method generate the correct procedures in Method Lab Construct a graph using set of data in the Graphing Exercise Group Project: student generated experiment of their choice in ConsumerClaims Project Using objects in the classroom working in pairs complete Metric Work and Conversions	• Graphic Organizer • Vocabulary Quiz • Metric Quiz • Test • Completion of Assignment Grades • Using Project Rubric Experiment Consumer Claims
3-4	How do atoms and molecules build and sustain life?	Biochemistry Macromolecules Properties of Water <u>Vocabulary:</u> Atom Compound Molecule Cohesion Adhesion Acid Base Organic Molecule Carbohydrate Protein Amino Acid	**3.1.B.A2** **3.1.B.A7** **3.1.B.A8**	Bell Ringer Vocabulary Highlight key examples Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt notes. Evaluate the reason for the grouping on the Periodic Table Using an element of the students choice research the uses of the element in the Element Project	• Graphic Organizer • Vocabulary Quiz • Test • Completion of all Assignment Grades • Using rubric for Element Poster • Analysis of Labs • Macromolecule Project

		Nucleic Acid Enzyme Activation Energy		Trace the reactants and products in the Bonding Review and Balancing Equations Exercise Students generate a group of 18 items to test and make an Acid/Base Lab Identify and test the four groups of Macromolecule Webquest/Lab	
5-6	How do organisms interact with their environment?	Population Dynamics Relationships between organisms Biogeochemical Cycles <u>Vocabulary:</u> Community Ecosystem Biodiversity Succession Biome Producer Consumer Trophic Level Carbon Cycle Nitrogen Cycle Population Carrying Capacity Symbiosis Niche Keystone Species Global Warming Deforestation	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.3	Bell Ringer Vocabulary Highlight key examples Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt notes. Evaluate the effects of introduction of a non native species in the Population Density Activity Working in Pairs students will identify which areas of a habitat are most Bio diverse Group Project: Food Web showing trophic levels Student Choice Comparison of Biomes using venn diagram and ppt presentation Students will read a scenario on ecological problems in completion of the Ecology Webquest	• Graphic Organizer • Vocabulary Quiz • Test • Assignment Grades • Project Rubric to be followed for Food Web • Presentation and Class Discussion of Biome • Completion of Webquest
7-8	How does the structure of a cell relate to its function	Cell Theory Cell Structure Homeostasis	BIO.A.3.1 BIO.A.3.2 BIO.A.4.1 BIO.B.1.1	Bell Ringer Vocabulary Highlight key examples	• Graphic Organizer • Vocabulary Quiz • Test

	and how does the cell membrane help to maintain homeostasis?	<u>Vocabulary:</u> Cell theory Prokaryote Eukaryote Organelles Cell Membrane Phospholipid Diffusion Osmosis Passive Transport Active Transport	BIO.B.2.2	Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt. notes. Visual Representation Project : Students will color and lable cell of prokaryote and eukaryote and construct a representative model Using the internet as a guide discussion of the similarities and differences in all cells in the Cells Alive Webquest Cell Membrane Color/Label Construct a table representing the three different types of transport systems of the cell membrane Cell Lab	• Completion of Assignment Grades • Using the knowledge of tonicity set up the Egg Lab • Student based rubric for the chart on membrane transport
9-10	What are the initial reactants, final products, and general purposes of photosynthesis and respiration?	Photosynthesis and Cellular respiration <u>Vocabulary:</u> Photosynthesis Cell Respiration ATP Electron Transport Chain Thylakoid Chlorophyll Calvin Cycle Glycolysis Anaerobic Aerobic Krebs cycle Fermentation	BIO.A.3.1 BIO.A.3.2 BIO.A.4.1 BIO.B.1.1 BIO.B.2.2	Bell Ringer Vocabulary Highlight key examples Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt notes. Independent Study: Using the ebook students will compare the similarities and differences of Photosynthesis/Respiration Group Work Students will evaluate what will happen to respiration rates of crickets when temperature changes Respiration Lab	• Graphic Organizer • Vocabulary Quiz • Test • Completion of Assignment Grades • Etech book instructions of Photosynthesis and Respiration Assessment and Constructed Responses

				Cause and Effect: Students will compare photosynthesis in plants left in dark and plants left in light Evaluate the path of photosynthesis vs. respiration by using the webquest provided. Show how the two rely on each other	
11-12	How is cell reproduction essential for the growth, development, and reproduction of all living things (Including how DNA and RNA serve as a blueprint for proteins)	Cell Cycle Structure of Hereditary molecules Meiosis <u>Vocabulary:</u> Cell cycle Mitosis Meiosis Haploid Diploid Homologous Crossing over Replication Nucleotide Transcription Translation	BIO.A.3.1 BIO.A.3.2 BIO.A.4.1 BIO.B.1.1 BIO.B.2.2	Bell Ringer Vocabulary Highlight key examples Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt notes. Visual Representation: Students will construct foldables on Mitosis and Meiosis to evaluate similarities and differences Students will read how the effects of cancer will affect the cell cycle timing in the Onion Root Lab Students will create a Compare and Contract chart of the Division Cycles Evaluation: Cancer Research including an online quiz of the risk of cancer. Research a cancer of student choice Modeling: Create DNA using the K'nex kits and have group decide if the model is correct. Group Pair Share: Using models, have students present the process of Transcription and Translation	• Graphic Organizer • Vocabulary Quiz • Test • Completion of Assignment Grades • Foldable Of Mitosis and Meiosis • Models using K'nex Lab • Using guided questions Research on Cancer

				Evaluate these processes and explain what can happen to cause the mutations	
13	How does forensic science use DNA evidence to solve crimes?	Fingerprinting Hair Analysis Blood Typing DNA electrophoresis	**3.1.B.B5**	Guided Readings: CSI Webquest answering different forensic questions Group work: Labs on Hair Analysis, blood typing, fingerprinting, electrophoresis to be done with Science in Motion	Completion of Webquest Creation of Lab Analysis charts to determine evidence leading up to a suspect in a crime
14-15	How do different patterns of inheritance influence traits?	Mendellian Genetics Probability and Inheritance Human Genetics <u>Vocabulary:</u> Trait Gene Allele Dominant Recessive Genotype Phenotype Homozygous Heterozygous Probability Punnett Square Mutation Codominance	**3.1.10.B1.1** **3.1.10.B3.1** **3.1.10.B5.2** **3.1.12.B1.1** **3.1.12.B2.1** **3.1.12.C2.1** **3.1.B.B1.1** **3.1.B.B2.3** **3.1.B.B5.1** **3.1.B.B5.2** **3.1.B.B5.4**	Bell Ringer Vocabulary Highlight key examples Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt notes. Debate the idea of using Stem Cell/Cloning in research and designer babies Prepare a Chromosomal Karyotype of a unknown mutation and discuss what the particular mutation is and how it became a mutation Visual Representation using Punnett Squares of all crosses in genetics Creative Group Projects: Using representation of chromosomes from both parents construct an offspring with correct genetic traits Construct a Visual pedigree of the Royal Family (Students can choose to create a	• Graphic Organizer • Vocabulary Quiz • Test • Completion of Assignment Grades • Persuasive speech of Cloning or Stem Cell Debate • Construction of the following: Karyotyping Lab Create a ____lab Punnett Squares Pedigree • Genetics Brochure

				pedigree of their own families)	
16-17	What factors contribute to changes in a population over time?	Natural Selection Evidence for Evolution <u>Vocabulary:</u> Evolution Natural Selection Adaptation Homologous Structure Speciation Population density Genetic equilibrium Taxonomy Genus Species Domain Phylogeny	**BIO.A.1.1.1** **BIO.A.4.1.1** **BIO.B.2.1.2** **BIO.B.2.3.1** **BIO.B.3.1.1** **BIO.B.3.1.2** **BIO.B.3.1.3** **BIO.B.3.2.1** **BIO.B.3.3.1** **BIO.B.4.1.1** **BIO.B.4.2.5**	Bell Ringer Vocabulary Highlight key examples Using reading strategies to understand concepts in Reading Guide Record classroom examples in notes using ppt notes. Describe the events of the creation of the earth by using a timeline for the theories surrounding evolution Prepare a lab of student choice on Natural Selection and Classification Presentation of findings Create a chart showing the 6 Kingdoms including similarities and differences Research One Kingdom of Student's Choice: Be prepared to include what makes the kingdom unique as well as the classification of organisms within the kingdom. Be prepared to come up with a way to present to class	• Graphic Organizer • Vocabulary Quiz • Test • Completion of Assignment Grades • Timeline of Theory of Evolution • Classification of Organism in Kingdom • Report out to group on Kingdom research
18	Keystone/Final Exam Prep	9 Essential Units		Study Guides on Each topic as well as work on study island and keystone prep websites	Keystone Exam

***Specific assignments/artifacts and assessments are subject to change or be eliminated due to time constraints or lack of equipment, materials, and/or supplies.**

Reflection: Instructor Developed Assessment Methods

Definition and Purpose of Assessments: Purposeful assessments are performance/demonstration for a real audience, addresses a useful purpose, meaning for the learner, production of information, development of product or service. Assessment is integral to students during learning and challenging meaningful activities. Student self-assessment and reflection is vital to their learning. Define the types of quizzes, tests, rubrics, demonstrations, etc. to reflect or support your answers to the questions to the right of each type of assessment.

General types of assessments or evaluation (define based on pg. 3)	Performance or demonstration for a real audience? (yes or no)	Does this measure proficiency of basic skills?	Is the student producing information or developing a product/service?	Are students contributing to the evaluation process: developing assessments and self-reflection?	Are varied student learning styles accounted for?
Open Note Guided Reading or Powerpoint notes: Measures content and comprehension, reflection and note taking skills		yes		yes	
Vocabulary Graphic Organizers: definitions of terms and representation/examples		yes		yes	yes
Rubrics					
• Lab Experiment write ups	yes	yes	yes		
• Comparison Charts in form of Charts or Venn Diagrams		yes	yes		yes
• Time Lines: Scientists and Experiments		yes			yes
• Graphic Organizers/Concept Maps		yes		Yes if students are making their own	yes

• Research Projects: research and presentation	yes	yes	yes	yes	yes
• Group Projects: Including individual and group evaluation	Yes if shared with other classes	yes	yes	yes if includes self evaluation and group	yes
• Visual Representation Projects (students can choose what kind of model used to present for comprehension)	Yes if showed outside of class		yes		yes
Keystone Preparation Guides : Focused questions and writing constructed responses in preparation for state testing		yes			yes

Appendix A

Representative roles with a defined focus on literacy

Student Role

Students will:

1. **Work independently in their learning to:**

- Comprehend and evaluate complex situations, be a critical consumer of ***Biology*** text, produce; research and gather evidence, communicate effectively, listen actively to engage in a range of conversations, to analyze and synthesize idea and positions, and to evaluate accuracy in order to learn, reflect, and respond.

2. **Construct content-meaning for self-efficacy and the efficacy all learners:**

- Build personal engagement in ***Biology*** literacy (RWSL), take and share power for learning, self-assess, monitor and reflect on. Set goals for extending math skills, use text-based evidence to establish clear relationships among claims, explore ***Biological*** concepts beyond the classroom and search to discover global perspectives

3. **Develop a Classroom Learning Community of respectful collaborative, collective dynamics:**

- Contribute and collaborate in a community of ***Biology*** learners, provide multiple perspectives to solve problems toward shared understanding, value, represent, and respect diverse opinions and perspectives.
- Tasks or assignments are completed on time in support of a shared responsibility
- Self-monitoring for preparation and understanding is encouraged to promote contribution and respect for equity of time

4. **Participate in the assessment process:**

- Set goals and self-monitoring their progress with an expectation for fulfilling assessment requirements
- Produce and complete tasks and assignments according to the parameters and expectations of the learning process and the instructor's timeline.
- Seek help in understanding and clarifying confusions is an expectation to foster student independence and confidence as a life-long learner.

5. **Use of technology to support their learning:**

- Explore creative and innovative uses of technology to enhance and express their learning.
- Participate as a 21st Century student to make connections to the global learning environment
- Use and evaluate research available resources for validity and reliability

Instructor Role

Instructor will:

1. **Conduct the learning environment that promotes a student-centered community of learners.**

- Conceptualizes instruction to include students as part of the learning community; students formally collaborate on important learning tasks
- Share learning experience to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming
- Set up the learning environment and experiences for valuing diversity, multiple perspectives, and strengths of the student.
- Foster and encourage development of new ideas and understanding in conversations and work with others
- Arrange groups to support collaboration and inquiry; students work independently, in pairs, in small groups and as a class dependent on the task.

2. **Represent themselves as a facilitator, a guide for learning, a co-learner, or as an investigator.**

- Engage in negotiation, stimulates and monitors discussion and project work but does not control
- Help students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options
- Considers themselves as self- learner; willing to take risks to explore areas outside his or her expertise; collaborates with other experts and practicing professionals

3. **Design the instructional model and learning context driven by standards and researched-based best practices.**

- Identify the specific PACCS standards addressed in all lessons and units**.**
- Provide students with an understanding of PACCS standard guiding the instruction and the relationship to the student learning goals.

4. **Develop authentic tasks to engage all learners with relevance to transfer knowledge to outside world situations**.

- Pertains to real world, meaningful intellectual work; may be addressed to personal interest
- Challenge and engage students with tasks with different levels of difficulty, enough to be interesting but not totally frustrating, and sustainable.
- Involves integrating disciplines to solve problems and address issues in context
- Engage students with rigorous course content to prepare them for College and Career readiness.
- Construct processes that engage students through cognitive application as an intentional principle of instruction.

5. Motivate and intentionally organize classroom instructional structure.

- Direct students to set goals, self-assess their progress to produce quality products and determine next steps
- Integrate the Literacy skills of Reading, Writing, Speaking and Listening that is discipline specific
- Activate and develop students' repertoire of thinking/learning strategies for changeable and complex knowledge building**.**
- Promote intrinsic learning with a passion for exploring and solving problems.
- Use data-driven instruction to plan for individual and group learning situations.

6. Assess students with a multitude and variety of formative, performance-based, generative, and summative assessments to address the needs and levels of all learners.

- Create assessments with meaning for the learner to produce product, performance, or service
- Make assessments transparent and integral to instruction; students learn during/through challenging meaningful activities
- Evaluate students fairly and equitably based upon student individual needs and achievement level.
- Use the most appropriate and effective technology available to enhance tasks and the evidence on learning

7. Utilized discipline-specific digital literacy and processes to engage and connect students in furthering 21st century teaching and learning.

- Use the most appropriate and effective technology available to allow for interaction by communicating and collaborating in diverse ways
- Use the most appropriate and effective technology available to access simulations, goals-based learning and real-world productivity tools.
- Use the most appropriate and effective technology available to complete and access task, locate data, and learning opportunities that stimulate thought and inquiry.
- Build awareness of and where possible, access media technologies to keep pace with the ever-changing technological devices to further educational possibilities.

Appendix B

Engaged Learning Framework for Course Syllabus Reflection and Review

	Indicators of Engaged Learning	Indicator Definition
Evaluation		
Tasks	• Authentic • Challenging • Multidisciplinary	• Pertains to real world, meaningful intellectual work; may be addressed to personal interest • Difficult enough to be interesting but not totally frustrating, usually sustained • Involves integrating disciplines to solve problems and address issues in context
Assessment	• Performance-based • Generative • Seamless and ongoing • Equitable	• Involving a performance or demonstration, usually for a 'real' audience and addressing a useful purpose • Assessments having meaning for learner; may produce information, product, service • Assessment is transparent and integral; students learn during/through challenging and meaningful activities • Assessment is culture fair
Process		
Instructional Model	• Interactive • Generative	• Instruction actively engages learners through meaningful context and construction of knowledge; encourages, supports and responds to student contributions, needs, requests for clarification, etc. • Instruction oriented to constructing meaning; providing meaningful activities/experiences
Learning Context	• Collaborative • Knowledge-building • Empathetic	• Instruction conceptualizes students as part of learning community; students formally collaborate on important learning tasks • Learning experiences set up to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming • Learning environment and experiences set up for valuing diversity, multiple perspectives, strengths
Grouping	• Heterogeneous • Equitable • Flexible/agile	• Small groups with persons with different skill sets, backgrounds, interests • Groups sized and organized so that over time all students have challenging learning tasks/experiences • Different groups organized for different instructional purposes; supports collaboration across multiple contributors
Roles		
Instructor Role	• Facilitator • Guide • Co-learner/co-investigator	• Engages in negotiation, stimulates and monitors discussion and project work but does not control • Helps students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options • Instructor considers self as learner; willing to take risks to explore areas outside his or her expertise; collaborates with other experts and practicing professionals

Student Role	• Explorer • Cognitive Apprentice • Teacher • Producer	• Students have opportunities to explore new ideas/tools; push the envelope in ideas and research • Learning is situated in relationship with mentor who coaches students to develop ideas and skills that simulate the role of practicing professionals (i.e., engage in real research) • Students encouraged to teach others in formal and informal contexts • Students develop products of real use to themselves and others; demonstrated learning
Resources		
Technology	• Interconnectivity • Access to challenging tasks • Enables learning by doing • Media Use	• Technology allows interaction by communicating and collaborating in diverse ways • Technology offers or allows access to tasks, data, and learning opportunities that stimulate thought and inquiry • Technology offers access to simulations, goals-based learning, and real-world problems and productivity tools • Technology provides opportunities to use media technologies