Biology SYLLABUS

Biology
QSI Virtual School

Meeting Days/Time/Location: Class platform is available 24/7 for students to learn.
https://learn.qvs.qsi.org/course/view.php?id=157#section-0

Instructor Information

Instructor: Cari Ann VanDevelde
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Online Office Hours: by appointment
Time Zone: Varies
Preferred Method of Communication: Email, Teams

Course Description

This course emphasizes cell biology, genetics with particular attention to the expanding realm of molecular biology, ecology, and human systems. The content for this course includes biological structures and functions, processes and cycles, and systems. Emphasis is placed on explanation, description, analysis, and laboratory study through computer simulations. Skills in observation, experimental design and analysis, and virtual dissections are developed throughout the course. The course is intended to provide the student with a basic knowledge of biology leading to further study at the secondary or university level. For all students the course provides a foundation for life-long learning and interaction with issues in the life science realm. The course consists of 10 units that all need to be mastered for credit to be granted. The Essential Units are: **E01**– Living Systems, **E02**– Chemistry in Living Systems, **E03**– Matter and Energy in Living Systems, **E04**- Ecosystems: Stability and Change, **E05**- Cells: Stability and Change, **E06**- Structure and Function of DNA, **E07**- Genetics and Heredity, **E08**- Evidence for Natural Selection, **E09**- Patterns of Natural Selection, and **E10**- Human Impacts on the Environment. This class is a requirement for graduation!

Course Credit Equivalency: 1 Carnegie credit
Approximate length of the course – 34 weeks

Course Prerequisites

None

Required Materials

Open Mindset
Willingness to communicate weekly
Willingness to learn independently
Graphing calculator TI84+ recommended
Computer with Word and Excel capabilities

Course is self-contained; however, if the student feels a resource textbook is needed please reach out and the following will be provided: *Biology*, HMH Science Dimensions (2018)

Technology Information and Requirements

Computer with internet access, word, and excel
Microphone
Graphing calculator, TI84+ recommended

Course Grading

QVS is a mastery learning school where students must demonstrate that they meet certain criteria ("**T**he **S**tudent **W**ill", or TSWs) before closing a unit and receiving credit for it. The assignments for each unit are designed to give students a chance to meet the TSW criteria for either B Level Mastery or A Level Mastery (see below).

Assignments may be graded as follows:

Attempted /NOT Completed **-** the student has attempted the assignment but it is not done correctly or completely to mastery standards.

***Completed* –** the assignment in question is completed to mastery standards for the TSW being evaluated.

Mastery "B" - the student has met the TSW criteria covered by the assignment for Mastery. This is sometimes also referred to as "B Level Mastery".

Above Mastery "A" - the student has exceeded the TSW criteria covered by the assignment for Mastery and meets the criteria for Above Mastery. This is sometimes referred to as "A Level Mastery" and is awarded for work that showcases a consistently sophisticated, nuanced and thorough understanding and application of the TSW criteria being evaluated.

Units may be graded as follows:

Mastery "***B"*** - the student has met all of the required criteria for B Level Mastery as described in the unit document.

Above Mastery "A"- the student has met all of the required criteria for A Level Mastery described in the unit document. Unit grade of A-Level will only be accepted in the pre-scheduled time table or if the student gets ahead of the pre-scheduled time table he/she may return to any unit that is currently has a mastery grade (B) and upgrade the unit to above mastery (A) based on the given criteria found at the beginning of the unit.

Deficient "D"- Every unit has a start date and end date per the class calendar. When a unit starts the QVS teacher enters a "P" for all student to indicate the unit is in progress. When the unit ends according to the pre-set calendar the QVS teacher enters an "A" or a "B" depending on the level of mastery. If the student did not master the unit, the QVS teacher will enter a D. Please note the

following: D – This grade communicates that the student is not meeting expectations about the amount of mastery work submitted in a given time period. "D" grades are not given without an opportunity for students to make-up the work. The D must be converted into a B before the student will be allowed access to the next unit.

On Hold "H" – for whatever reason, the student is unable to complete a unit and it is put on hold until such a time as work can resume.

Teacher feedback and revision of work:

- The instructor will endeavor to return work within 24 hours, excepting weekends and holidays.
- If a student does not receive feedback within 48 hours, the student should contact the instructor.
- The student will endeavor to revise any assignment that requires it within 48 hours.

Progression through course units:

- Students must close a unit with at least a B before beginning the next.
- The instructor may allow students to 'upgrade' their results on an assignment or on a unit from B to A level mastery outside of the unit timeframe during a pre-approved agreed upon time between the instructor and student.
- Students may only complete two (2) units in June. That is to say that if a student has fallen behind during the school year it is not possible to close more than two units between June 1st and the last day of school (typically, mid-June).

Course Content

E01: Living Systems

Unit Statement: Biological systems have a hierarchical structure in which each component is dependent on others in order for the biosphere to support life. This unit aims to demonstrate the dynamic nature of a system, from something as small as a cell, up to an ecosystem. Structure and function of individual parts of a system play a role in the structure and function of the entire system. Homeostasis is maintained as the parts of the system function as the structure is designed. Students will use the Science Practices that are discussed in the Course Outcomes throughout the unit. The connection between Biology and the Engineering Design Process is introduced in this unit.

Essential Outcomes:

1. **T**he **S**tudent **W**ill explain the hierarchical structure of biological organization and describe how these components work together to make up one system.
2. **TSW** describe properties of systems (inputs and outputs) and system models to determine whether it is an open or closed system.
3. **TSW** analyze the characteristics of living things in terms of life as an emergent property.

4. **TSW** model the structure and functions of organ systems and the interaction between systems.
5. **TSW** relate structure and function of tissues and organs to the structure and function of the corresponding organ system.
6. **TSW** relate the structure of various cell types to their functions.
7. **TSW** relate the structure of each organelle to their respective functions.
8. **TSW** analyze mathematical representations and models to determine how plants and animals use feedback loops to maintain homeostasis.
9. **TSW** plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
10. **TSW** outline and evaluate the engineering design process as it relates to a human health problem of their choice.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 1 - Assessment List for Mastery

Week 1

1. Assignment: Skype Appointment - 1st GRADE
2. Scorm Lesson: 14/17 pts Living Systems and Models
3. Activity: Systems and System Models Activity
4. Scorm Lesson: 20/23 pts Cells, Tissues, and Organs
5. Assignment: Interaction Between Organ Systems
6. Scorm Lesson: 22/26 pts Cell Organelles
7. Quiz: Cell Organelle and Function

Week 2

8. Scorm Lesson: 11/14 pts Feedback loops and Homeostasis
9. Assignment: Mathematical Representation of Animal Feedback Loops
10. Scorm Lesson: 2/2 pts Examples of Feedback loops and Homeostasis
11. Laboratory Experiment: Feedback Loop Laboratory Investigation
12. Scorm Lesson: 3/3 pts Bioengineering and Biotechnology
13. Assignment: Bioengineering/Biotechnology Research Activity

Week 3

14. Assignment: Unit 1 Concept Map
15. Summative Assessment: E01 - Living Systems: End of Unit Short Answer Exam
16. Summative Assessment: E01- Living Systems - End of Unit Multiple Choice Exam
17. Project: E01 "A" Level Project

18. UNIT 1 GRADE

E02: Chemistry in Living Systems

Unit Statement: Living things rely on chemical reactions to fuel the biological functions needed to for organisms to survive. Carbon, Hydrogen and Oxygen combine in different ways to form the basis for most chemical structures that living things depend on. Their use and formation is based on the rearrangement of these atoms through complex chemical interactions that give them a variety of functions. These reactions require an input and output of energy that is harnessed by energy molecules that can be used instantly or stored for later use. Cells facilitate the movement of varied molecules through membrane transport into and out of the cell. Students connect all of these concepts as they discuss how food is absorbed, digested, and used in metabolism to make the molecules needed for life. Students will use the Science Practices that are discussed in the Course Outcomes throughout the unit. The connection between Biology and the Engineering Design Process is continued in this unit.

Essential Outcomes:

1. **T**he **S**tudent **W**ill model how each property of water is used in a biological system.
2. **TSW** relate acids, bases and hydrogen bonding to homeostasis.
3. **TSW** apply the law of conservation of matter to the inputs and outputs in a chemical reaction.
4. **TSW** use the concepts of activation energy, endothermic reactions and exothermic reactions to demonstrate energy input and output in a system.
5. **TSW** illustrate enzymes as catalysts by using models to compare the lock and key and induced-fit models.
6. **TSW** describe carbon as the backbone of organic molecules by contrasting the structures of monomers and polymers.
7. **TSW** compare and contrast the structure and function of carbohydrates, lipids, protein, nucleic acids as they are related to life.
8. **TSW** use modeling to explain how the structure and function of ATP supports its role as the energy currency of the cell.
9. **TSW** create a model that illustrates the properties of the cell membrane.
10. **TSW** discuss membrane transport by using their model of the cell membrane to show when passive or active transport would be used for different molecules.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 2 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 8/10 pts Properties of Water
2. Quiz: Properties of Water Assignment
3. Scorm Lesson: 20/23 pts pH Scale
4. Quiz: pH
5. Laboratory Experiment: pH Laboratory Simulation
6. Quiz: pH Laboratory Simulation Quiz
7. Scorm Lesson: 8/9 pts Chemical Reactions

Week 2

8. Scorm Lesson: 8/9 pts Endothermic and Ectothermic Reactions
9. Quiz: Endothermic and Exothermic Assignment
10. Scorm Lesson: 13/15 pts Catalyst and Enzymes
11. Assignment: Catalyst and Enzymes Assignment
12. Scorm Lesson: 6/8 pts Carbon
13. Scorm Lesson: 8/10 pts Monomers and Polymers
14. Quiz: Carbon - Monomers and Polymers

Week 3

15. Scorm Lesson: 22/27 pts Macromolecules
16. Assignment: Macromolecules - monomers and polymers
17. Scorm Lesson: 5/6 pts ATP
18. Assignment: ATP - Our Cell's Cellular Currency.
19. Scorm Lesson: 10/12 pts Cell Membrane
20. Scorm Lesson: 20/23 pts Cell Transport
21. Quiz: Cell Membrane and Transport Quiz
22. Assignment: Cell Membrane and Transport

Week 4

23. Assignment: Unit 2 Concept Map
24. Summative Assessment: E02 - Chemistry in Living Systems End of Unit Short Answer/Essay Questions
25. Summative Assessment: E02 - Chemistry in Living Systems End of Unit Multiple Choice Exam
26. Project: "A" Level Project
27. Unit Grade: E02

E03: Matter and Energy in Living Systems

Unit Statement: Students look at how matter cycles and energy flows move through living systems. Models are used to illustrate how photosynthesis and cellular respiration use chemical bonds to store and release energy needed in biological functions, and how carbon is cycled through various systems. Students explore aerobic and anaerobic conditions, net transfer of energy, and use mathematical representations to support the requirement of matter and energy

in and among organisms. The connection between Biology and the Engineering Design Process is continued in this unit.

Essential Outcomes:

1. **T**he **S**tudent **W**ill use models to explain how light energy is transferred in the process of photosynthesis.
2. **TSW** compare and contrast the cycling of matter and flow of energy in photosynthesis and chemosynthesis.
3. **TSW** use a flow chart to model how matter and energy are transformed in the different stages of photosynthesis from light energy to chemical potential energy.
4. **TSW** discuss the importance of the formation and breakdown of bonds during cellular respiration to release and store energy.
5. **TSW** trace the cycling of matter and flow of energy through the stages of cellular respiration and fermentation.
6. **TSW** examine the relationship of photosynthesis and cellular respiration within and between ecosystems as processes that convert energy for life.
7. **TSW** compare matter and energy movement through food chains and trophic levels by using the law of conservation of mass.
8. **TSW** use mathematical representations to show the interaction between species as demonstrated by energy, biomass and number pyramids.
9. **TSW** illustrate the flow of matter and energy through biogeochemical cycles.
10. **TSW** analyze the impacts of human activities on cycles in ecosystems.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 3 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 18/21 pts Overview of Photosynthesis
2. Scorm Lesson: 30/38 pts Photosynthesis - Light Reactions
3. Quiz: Photosynthesis Quiz: Overview and Light Reactions
4. Scorm Lesson: 30/39 pts Photosynthesis - Calvin Cycle
5. Assignment: Modeling Light Energy and Matter in Photosynthesis
6. Scorm Lesson: 15/18 pts Photosynthesis Factors
7. Quiz: Photosynthesis Quiz: Calvin Cycle, Modifications, and Alternatives

Week 2

8. Assignment: Compare and Contrast Photosynthesis and Chemosynthesis

9. Laboratory Experiment: Photosynthesis Virtual Labs
10. Quiz: Photosynthesis Virtual Lab Quiz
11. Scorm Lesson: 18/21 pts Cellular Respiration
12. Quiz: Cellular Respiration Quiz
13. Laboratory Experiment: Video: Amoeba Sisters - Fermentation and Fermentation Laboratory Experiment

Week 3

14. Assignment: Relationship of Photosynthesis and Cellular Respiration within a Biome
15. Assignment: Human Impact on an Ecosystem
16. Scorm Lesson: 16/19 pts Food Chains/Webs and Trophic Levels
17. Scorm Lesson: 16/20 pts Math Problems as It Relates to Pyramids
18. Scorm Lesson: 13/16 pts Biogeochemical Cycles
19. Quiz: Biogeochemical Cycles Quiz

Week 4

20. Assignment: Unit 3 Concept Map
21. Summative Assessment: E03 Matter and Energy in Living Systems Short Answer Questions
22. Summative Assessment: E03: Matter and Energy in Living Systems End of Unit Multiple Choice Exam
23. Project: "A" Level Project
24. Unit Grade: E03

E04: Ecosystems: Stability and Change

Unit Statement: Components of an ecosystem help it to be resilient and resistant to change. Students will use mathematical representations to support an explanation of factors that affect carrying capacity, biodiversity, and populations in ecosystems of different scales. Claims will be evaluated, using evidence and reasoning, that show complex interactions in ecosystems maintaining relatively consistent numbers and types of organism is stable conditions, but show that changing conditions may result in a new ecosystem. The connection between Biology and the Engineering Design Process is continued in this unit.

Essential Outcomes:

1) The **S**tudent **W**ill calculate population densities using a variety of methods and discuss limits to species population size.

2) **TSW** analyze different measures of population growth in terms of population size, survivorship curves, and types of growth.

3) **TSW** analyze the effect of density dependent and density independent limiting factors on the carrying capacity of a population in an ecosystem.

4) **TSW** conduct an experiment that investigates how limiting factors affect population size and density and calculate carrying capacity.

5) **TSW** illustrate how species are adapted to their niche and habitat.

6) **TSW** compare and contrast predation, competition, mutualism, commensalism and parasitism in an ecosystem.

7) **TSW** use evidence to support the claim that biodiversity and ecosystem stability are directly related.

8) **TSW** use a model to compare resilience with resistance in an ecosystem and explain how ecosystems change and how they remain stable.

9) **TSW** analyze how primary and secondary succession affect change and stability in an ecosystem.

10 **TSW** research and present how a current ecosystem's stability is being affected by change.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 4 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 4/6 Unit Introduction
2. Scorm Lesson: 5/7 Population Density
3. Scorm Lesson: 12/15 Changes in Population Size
4. Scorm Lesson: 11/14 Population Growth and Limitations
5. Laboratory Experiment: Dry Lab: Bison Population Carrying Capacity
6. Quiz: Unit 4 Week 1
7. Laboratory Experiment: Lab Simulation: Avril Gulf Tuna Population Simulation

Week 2

8. Scorm Lesson: 21/26 Ecology Organization/Habitat vs. Niche
9. Scorm Lesson: 5/7 Species Interaction
10. Quiz: Unit 4 Week 2
11. Scorm Lesson: 8/10 pts Biodiversity
12. Scorm Lesson: 8/10 pts Ecosystem Stability and Resilience vs. Resistance
13. Assignment: How Biodiversity Affects Ecosystems when Disturbances Occur
14. Assignment: Ecosystem's Stability and Change

Week 3

1. Scorm Lesson: 9/11 pts Ecological Succession
2. Assignment: Unit 4 Concept Map
3. Summative Assessment: E04: Ecosystems - Stability and Change End of Unit Multiple Choice Exam
4. Project: "A" Level Project
5. Unit Grade: E04

E05: Cells: Stability and Change

Unit Statement: Students will use models to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. They will explore explanations of how mitosis and differentiation in cells contributes to the maintenance and reproduction of multicellular organisms.

Essential Outcomes:

1) The **S**tudent **W**ill develop a model to illustrate the cell cycle and the interactions within organisms on both molecular and cellular scales.

2) **TSW** describe the relationship between surface area and volume in different sized cells.

3) **TSW** predict the result on a cell if growth and development are not regulated properly.

4) **TSW** conduct an investigation that relates cell size and optimal functioning.

5) **TSW** use the history of the cell theory to assess the three major principles which outline how complex organisms are composed of cells.

6) **TSW** illustrate changes in chromosome structure during mitosis.

7) **TSW** describe the process of cell division as it relates to organisms' growth and asexual reproduction.

8) **TSW** create explanations based on investigate interphase, mitosis and cytokinesis using a microscope or computer images.

9) **TSW** outline the processes of differentiation and development from the division of a single fertilized cell to differentiation in a complex organism.

10) **TSW** outlines the process that stem cells go through as the mechanism for cell differentiation.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 5 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 18/23 pts Binary Fission and Mitosis
2. Laboratory Experiment: Dry Lab: Onion Root Tip - Cell Cycle Identification of Phases
3. Quiz: DNA forms, Cell Cycle, and Mitosis Quiz
4. Scorm Lesson: 8/10 pts Cells: Surface Area-to-Volume
5. Laboratory Experiment: Lab: Cell Surface Area to Volume

Week 2

6. Scorm Lesson: 15/18 pts Rates of Cell Division
7. Scorm Lesson: 8/10 pts Cell History
8. Scorm Lesson: 12/15 pts Cell Differentiation
9. Assignment: The Role of Stem Cells in Society

Week 3

10. Assignment: Unit 5 Concept Map
11. Summative Assessment: E05: Cells - Stability and Change End of Unit Short Answer Exam
12. Summative Assessment: E05: Cells - Stability and Change End of Unit Multiple Choice Exam
13. Project: "A" Level Project
14. Unit Grade: E05

E06: Structure and Function of DNA

Unit Statement: DNA is the molecule responsible for heritable information being passed from generation to generation. Students will use evidence to explain how the structure of DNA determines the structure of proteins. Explorations will be conducted which demonstrate how proteins carry out the essential functions of life through systems of specialized cells.

Essential Outcomes:

1. **T**he **S**tudent **W**ill use the history of early scientific discoveries that led to an understanding of the structure and function of DNA as a molecule of inheritance.

2. **TSW** compare the bonding between phosphate groups and sugar molecules in the backbone to the bonding between nitrogenous bases.

3. **TSW** illustrate how DNA replication occurs using models and simulations to examine the function of various enzymes that are involved in replication.

4. **TSW** compare and contrast DNA and RNA's structure and function.

5. **TSW** model the process of transcription.

6. **TSW** model the process of translation.

7. **TSW** predict the effect of point and frameshift mutations on the structure and function of a protein.

8. **TSW** construct an explanation that relates the structure of DNA in a prokaryotic cell to its expression and regulation.

9. **TSW** describe the process of gene expression in eukaryotes, including introns, exons and transcription factors.

10. **TSW** explain how internal and external factors influence gene expression.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 6 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 16/19 pts DNA Overview and Scientist
2. Scorm Lesson: 20/25 pts What is DNA?
3. Scorm Lesson: 14/17 pts DNA Replication
4. Quiz: DNA and DNA Replication Quiz
5. Assignment: Modeling DNA Replication Lab

Week 2

6. Scorm Lesson: 21/26 pts DNA vs. RNA
7. Scorm Lesson: 51/63 pts Transcription and Translation
8. Scorm Lesson: 2/2 pts Mutations
9. Assignment: Modeling Transcription and Translation
10. Quiz: Transcription, Translation, and Mutation Quiz

Week 3

11. Scorm Lesson: 8/10 pts Gene Expression
12. Scorm Lesson: 8/10 pts Lac Operon - Gene Regulation in Prokaryotes
13. Assignment: Modeling Gene Expression in Prokaryotes

14. Scorm Lesson: 8/10 pts Gene Regulation in Eukaryotes
15. Scorm Lesson: 4/5 pts Factors That Affect Gene Expression
16. Quiz: Gene Expression and Regulation Quiz

Week 4

17. Assignment: Unit 6 Concept Map
18. Summative Assessment: E06 Structure and Function of DNA Short Answer Exam
19. Summative Assessment: E06 Structure and Function of DNA End of Unit Multiple Choice Exam
20. Project: "A" Level Project
21. Unit Grade: E06

E07: Genetics and Heredity

Unit Statement: Traits are passed from parents to offspring, creating diversity across generations. The role of DNA will be explored in coding the instructions for heritable traits. Students will analyze claims based on evidence that genetic variations result from new combinations through meiosis and viable errors that occur during replication or that are caused by environmental factors. Statistics and probability will be used to explain the distribution of expressed traits in a population. Students will also evaluate real-world uses for genetic engineering.

Essential Outcomes:

1) **T**he **S**tudent **W**ill illustrate the structure of chromosomes (autosomal and sex) in both stages of meiosis for both egg and sperm cell production.

2) **TSW** explain crossing over, independent assortment, and gene duplication as modes for genetic variation.

3) **TSW** explain how Mendel's experiments were used to discover the function of traits, genes and alleles.

4) **TSW** compare patterns of inheritance.

5) **TSW** calculate the probability of genotypes and phenotypes in a variety of crosses.

6) **TSW** use models, such as Punnett square and pedigree charts, to explain the inheritance of sex- linked traits.

7) **TSW** demonstrate the cause and effect of point mutations, frameshift mutations and chromosomal mutations.

8) **TSW** make a claim based on evidence for the impact that both genetic and environmental factors have on offspring phenotypes and genetic diversity.

9) **TSW** evaluate the methods of genetic engineering, including their constraints, benefits and ethical dilemmas.

10) **TSW** discuss the impact that genetic engineering has on conservation efforts and the prevention and cure of disease.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 7 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 5/6 pts Inheritance and Chromosomes
2. Scorm Lesson: 14/17 pts Meiosis
3. Scorm Lesson: 21/26 pts Comparisons
4. Scorm Lesson: 12/14 pts Genetic Variation
5. Quiz: Inheritance, Meiosis, and Genetic Variation Quiz

Week 2

6. Scorm Lesson: 13/16 pts Mendel's Genetics
7. Scorm Lesson: 16/19 pts Punnett Squares
8. Scorm Lesson: 16/19 pts Non-Mendelian I
9. Scorm Lesson: 10/12 pts Non-Mendelian II
10. Quiz: Punnett Squares Quiz

Week 3

11. Scorm Lesson: 8/10 pts Pedigree
12. Scorm Lesson: 8/10 pts Gene vs. Chromosomal Mutations
13. Scorm Lesson: 12/14 pts Genetic Engineering
14. Assignment: Genetic Engineering - Beneficial or Not?
15. Quiz: Pedigrees, Mutations, and Genetic Engineering Quiz

Week 4

16. Assignment: Unit 7 Concept Map
17. Summative Assessment: E07 Genetics and Heredity Short Answer Exam
18. Summative Assessment: E07 Genetics and Heredity End of Unit Multiple Choice Exam
19. Project: "A" Level Project
20. Unit Grade: E07

E08: Evidence for Natural Selection

Unit Statement: Evolution is a process of biological change by which descendants come to differ from their ancestors through changes in a species over time. Multiple lines of empirical evidence have led scientists to the theory of evolution by natural selection. Students will analyze the four primary factors of evolution: 1) the potential for a species to increase in number, 2) the heritable genetic variation in a species is due to mutation and sexual reproduction, 3) competition for limited resources, 4) the proliferation of those organisms that are better able to survive and reproduce in the environment. Statistics and probability will be used to support the claim that organisms with advantageous heritable trains tend to increase in proportion to organisms lacking those traits.

Essential Outcomes:

1) **T**he **S**tudent **W**ill define theory as a body of facts that have been repeatedly confirmed through observation and experiment.

2) **TSW** compare DNA sequences of similar organisms within a clade and draw conclusions of about common descent.

3) **TSW** construct explanations based on anatomical and embryological evidence about natural laws operating today as they did in the past.

4) **TSW** describes geological and fossil evidence to the ongoing branching that produces multiple lines of descent from a common ancestor.

5) **TSW** use radioactive dating as evidence for order and consistency in natural systems.

6) **TSW** gather evidence from a simulation to construct an explanation for how beneficial adaptations increase an individual's fitness.

7) **TSW** debate Darwin's ideas as he developed the theory of evolution by natural selection.

8) **TSW** use a model to illustrate that artificial selection led to a change in species traits over multiple generations.

9) **TSW** discuss how genetic variation, overproduction, competition and adaptation are involved in natural selection.

10) **TSW** analyzes the cause-and-effect relationship of how a change in environment could change selected traits in a population.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 8 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 7/8 pts Lineage of Evolution
2. Scorm Lesson: 8/9 pts Evolutionary Evidence
3. Scorm Lesson: 8/10 pts Fossils and Dating
4. Laboratory Experiment: DNA Comparison Simulation Lab
5. Quiz: Evolution

Week 2

6. Scorm Lesson: 5/6 pts Developing the Theory of Natural Selection
7. Scorm Lesson: 1/2 pts Artificial Selection
8. Scorm Lesson: 10/12 pts Principles of Natural Selection
9. Laboratory Experiment: Peppered Moth Simulation of Natural Selection and Evolution
10. Quiz: Natural Selection and Evolution Quiz

Week 3

11. Unit 8 Concept Map
12. E08 Evidence for Evolution Short Answer Exam
13. E08 Evidence for Natural Selection Multiple Choice Exam
14. "A" Level Project
15. Unit Grade: E08

E09: Patterns of Natural Selection

Unit Statement: Natural selection leads to a population's traits changing over time. Change in environmental conditions may result in increases in the number of individuals of some species, the emergence of new species over time, and the extinction of other species. Students will apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population and to support explanations that organisms with advantageous heritable traits tend to increase in proportion to organisms lacking this trait. These changes can have an impact on individual and species' chances to survive.

Essential Outcomes:

1) The **S**tudent **W**ill explain genetic variation in a population as a key component of natural selection.

2) **TSW** analyze and interpret data on changes to populations to determine the type of selection that is occurring.

3) **TSW** explain how the bottleneck effect, founder effect and sexual selection can cause variations in the genetic information found in a population.

4) **TSW** discuss the modes of speciation by comparing how changes in an organisms' physical environment can contribute to the emergence of new species as populations diverge.

5) **TSW** interprets the cause and effect of climate change on the expansion of species ranges.

6) **TSW** evaluate evidence for currently accepted explanations for the extinction of certain species.

7) **TSW** construct explanations based on evidence that describes how group behavior has evolved to increase the chances of survival for individuals.

8) **TSW** determine the costs and benefits of social interaction behaviors by evaluating how group behavior has evolved.

9) **TSW** make a claim supported by evidence that group behavior can be learned and can increase an individual's chances to survive and reproduce.

10) **TSW** conduct a simulation that demonstrates the factors involved in Hardy-Weinberg Equilibrium.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark and ii) receive an average score of 7 pts or above on the retention exam.

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, ii) receive an average score of 8.8 pts or above on the multiple-choice retention exam and iii) do the "A Level" Project according to the criteria set within the assignment.

Unit 9 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 13/16 pts Genetic Variation
2. Laboratory Experiment: Laboratory Simulation of Population Evolution involving Hardy-Weinberg Equation
3. Scorm Lesson: 10/12 pts Selection on Population
4. Scorm Lesson: 6/7 pts Effects of Gene Flow
5. Quiz: Population Genetics and Evolution

Week 2

6. Scorm Lesson: 10/12 pts Mechanisms of Speciation
7. Scorm Lesson: 8/9 pts Expansion and Extinction of Species
8. Assignment: Research Assignment of Extinct or Endangered Species
9. Scorm Lesson: 6/7 pts Social Interactions
10. Scorm Lesson: 10/12 pts Behaviors
11. Quiz: Speciation and Behaviors QZ

Week 3

12. Assignment: Unit 9 Concept Map
13. Summative Assessment: E0 Patterns of Natural Selection Short Answer Exam
14. Summative Assessment: E09 Patterns of Natural Selection End of Unit Multiple Exam
15. Project: "A" Level Project
16. Unit Grade: E09

E10: Human Impacts on the Environment

Unit Statement: There are a variety of factors that affect biodiversity and populations in ecosystems of different scales. Students will design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity. Major global challenges will be analyzed to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. Problems will be broken down into manageable pieces that can be solved through engineering.

Essential Outcomes:

1) **T**he **S**tudent **W**ill describe the human growth curve and discuss the role of carrying capacity.

2) **TSW** compare renewable and nonrenewable resources.

3) **TSW** construct explanations that relate air pollution and climate change to ecosystem functioning and resilience.

4) **TSW** evaluate the impacts that humans have on the function of water and land in ecosystems.

5) **TSW** use a model to evaluate how human activity can lead to habitat destruction and habitat loss.

6) **TSW** compare introduced and invasive species and discuss ways to manage them.

7) **TSW** examine the effects of overharvesting on biodiversity.

8) **TSW** evaluate waste recycling and solar energy as sustainable ways of energy conversion.

9) **TSW** design a solution to prevent energy and matter waste in urbanization.

10) **TSW** analyze the problem of water pollution by evaluating a system of reusing water.

To receive a "B" for the unit you must get i) mastery or above mastery on all assignments in this unit that needs a check mark

To receive an "A" in this unit you must i) get mastery or above mastery on all assignments in this unit that needs a check mark, and ii) do the "A Level" Project according to the criteria set within the assignment.

Unit 10 - Assessment List for Mastery

Week 1

1. Scorm Lesson: 6/7 pts Natural Resources
2. Scorm Lesson: 5/6 pts Human Population
3. Scorm Lesson: 10/12 pts Air and Water Pollution vs. Climate Change
4. Scorm Lesson: 9/11 pts Human Impacts on Land
5. Quiz: E10 Bio Week 1 Short Answer Quiz

Week 2

6. Scorm Lesson: 5/6 pts Invasive Species
7. Scorm Lesson: 2/2 pts Overharvesting
8. Scorm Lesson: 7/8 pts Converting Waste into Energy
9. Quiz: E10 Bio Week 2 Short Answer Quiz

Week 3

10. Scorm Lesson: 6/7 pts Engineering to Reduce Human Impact
11. Scorm Lesson: 4/5 pts Decreasing Water Pollution and Water Shortage
12. Assignment: Unit 10 Concept Map
13. Assignment: End of Year Course Survey
14. Project: "A" Level Project
15. Unit Grade: E10

Tentative Course Schedule

Unit 1 – Living Systems: 3 weeks
Unit 2 – Chemistry in Living Systems: 4 weeks
Unit 3 – Matter and Energy in Living Systems: 4 weeks
Unit 4 – Ecosystems: Stability and Change: 3 weeks
Unit 5 – Cells: Stability and Change: 3 weeks
Unit 6 – Structure and Function of DNA: 4 weeks
Unit 7 – Genetics and Heredity: 4 weeks
Unit 8 – Evidence for Natural Selection: 3 weeks
Unit 9 – Patterns of Natural Selection: 3 weeks

Unit 10 – Human Impacts on the Environment: 3 weeks

Attendance Policy

Five periods per week, (equivalent of 225 minutes per week) plus time for homework as necessary. Together should be no more than 6 hours per week.

Students are expected to submit work daily, when assignments are submitted in bulk feedback time increases (1 assignment graded per day).

Classroom Behavior expectations

For synchronous (video) communication:

- School appropriate attire and location
- Camera on at all times
- Microphone muted on login

For asynchronous (email, texting, discussion boards, etc.) communication:

- Be polite and respectful in responses to forum posts of other students. Bullying and inappropriate language will not be tolerated.
- Upload only appropriate material.
- Write formally in email communication with instructor. Informal writing can be used in texting platforms such as skype and teams

Submit work on time and inform the instructor if you need an extension. Extensions will only be granted on occasion for exceptional circumstances.

Academic honesty

Students' are required to be academically honest at all times. Plagiarism can be defined as submitting someone else's ideas, words, images, or data without the proper acknowledgement of the source. Plagiarism is synonymous to stealing and fraud and is not tolerated at QVS.

Here are some common examples of plagiarism if the sources are not clearly cited:

- using words, phrases, or ideas that are not your own.
- paraphrasing the work of another person, even though you may have changed the wording or syntax.
- using facts or data not considered common knowledge.
- submitting a paper from an essay service or agency, even though you may have paid for it.
- submitting any work done by another person, even though he or she may have given you permission to use it.

You should also note that beyond written work, plagiarism may encompass computer data, research, musical scores, video programs, and visual arts.

Plagiarism and academic dishonesty are a serious offense, especially in an academic environment. QVS teachers must be able to rely on the students' integrity to maintain a climate for successful learning.

If you plagiarize or are dishonest even once, it will put into question all your previous work, so the consequences may go beyond redoing one assignment, and you may need to revisit your previously submitted work to prove mastery of your learning outcomes.

You should diligently avoid any deliberate or inadvertent plagiarism. When you are unsure if the acknowledgement of sources is needed, ask your teacher.

Regardless of whether a student has intentionally or unintentionally borrowed someone else's work without acknowledging it correctly, plagiarism and academic dishonesty will be dealt with as follows:

First offense: The student must redo the assignment(s) in question. The instructor will make sure the student understands how the plagiarism came about and will give strategies to avoid it going forward. If it appears the plagiarism was intentional, parents and the director will be informed.

Second offense: The QVS director and the parent/guardian will be informed. A "D" will be assigned until the student has redone the assignment(s) in question.

Third offense: The instructor will refer the matter to the QVS director for further action.

Other Information

QVS Statement of Purpose

QSI Virtual School is a diverse international, multicultural, online learning community, offering meaningful standards-based education through mastery learning.
We prepare and develop students to have confidence to pursue their dreams and to positively impact the world.
We challenge. We question. We care.