**Unit 1 – Introduction to Biology**

**MCAS Standards:** This unit addresses the following MA State Frameworks in Biology:

**5.3** Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity from a population.

**2.8** Compare and contrast a virus and a cell in terms of genetic material and reproduction.

**SIS 1.** Make observations, raise questions, and formulate hypotheses.

**SIS 2**. Design and conduct scientific investigations.

**SIS 3**. Analyze and interpret results of scientific investigations.

**SIS 4.** Communicate and apply the results of scientific investigations.

**Big Ideas:**

1. Biology is based on observational and experimental science.
2. In science, definition is based on human decisions and some concepts, such as life are difficult to define.
3. Natural selection provides the best scientific explanation for the evolution of life on earth.

**Essential Questions:**

1. How do the methods of biology, as a science, help us understand the world?
2. How do scientists use common characteristics to devise definitions such as one for ‘life’?
3. How does natural selection help us make sense of the unity and diversity of life?

**Unit 1 – Introduction to Biology**

**Reading:** Text Chapter 1, 15, pages 478-483

**Objectives:** Upon completion of this unit, you should know and be able to:

***Topic 1: The methods of science (Chapter 1)***

1. Describe the stages common to scientific investigation.
2. Define and compare the terms prediction, hypothesis, and theory.
3. Define dependent variable, independent variable, and control.
4. Design and conduct a controlled experiment. (In Class)
5. Write scientific predictions in the form of if…then statements. (In Class)
6. Demonstrate safety measures in the biology laboratory. (In Class)
7. Use a common measurement system. (In Class)
8. Define pseudoscience and differentiate pseudoscience from science.

***Topic 2: What is life? (Chapter 1)***

1. Describe eight characteristics of living things.
2. Relate the definition of life to viruses, fire, computer viruses, the earth and other “things”.

***Topic 3: Viruses (Pages 478-483)***

1. List the basic characteristics of a virus.
2. Explain the lytic cycle of virus replication.
3. Explain the lysogenic cycle of virus replication.
4. Explain how viruses differ from cells

***Topic 4: Natural Selection (Chapter 15)***

1. Define evolution and natural selection.
2. Describe the events on Darwin’s trip on the *HMS Beagle* that influenced his idea of evolution by natural selection.
3. Explain the ideas of *Hutton, Lyell,* and, *Malthus* and how they influenced Darwin.
4. Explain and evaluate Lamarck’s theory of evolution.
5. Describe the factors/events that led Darwin to publish *On the Origin of Species*.
6. Explain how artificial selection can be used as an analogy to natural selection.
7. Explain how natural selection is related to an individual’s fitness.
8. Explain what is meant by the phrases: *struggle for existence, survival of the fittest, and descent with modification*.
9. List and explain the steps of evolution by natural selection (OCVSRS). (In Class)

**Key Terms/Concepts**

|  |  |  |
| --- | --- | --- |
| Biology | Cell | Fossil |
| Observation | Unicellular | Use and disuse |
| Data | Multicellular | Inheritance of acquired traits |
| Inference | Sexual reproduction | Overpopulation |
| Hypothesis | Asexual reproduction | Competition |
| Prediction | Metabolism | Natural variation |
| Theory | Homeostasis | Artificial selection |
| Experiment | Gene | Natural selection |
| Control group | Heredity | Struggle for existence |
| Independent variable | Mutation | Fitness |
| Dependent variable | Evolution | Adaptation |
| Pseudoscience | Species | Population |
| Metric system | Stimulus | Survival of the fittest |
|  | Growth and development | Descent with modification |
| Virus | Responsiveness | Speciation |
| Capsid |  |  |
| Bacteriophage |  |  |
| Lytic cycle |  |  |
| Lysogenic cycle |  |  |

**Assessment Evidence**

Project/Lab: Case Study

Product: Case study questions

Assessment: Unit quiz

Assessment: Unit test

Observation: Teacher observation and feedback

**Learning Plan**

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| --- | --- | --- |
| Day | In Class Activity | Homework |
| 1 | Intro to course, handouts and course expectations, books & How to do objectives | Books covered  Read ALL handouts – parents sign |
| 2 | Learning styles | Objectives 1, 2, 8, 9 |
| 3 | Lab safety & contract  What is science? pseudoscience? Review the scientific method | Obj 9, 11, 12 |
| 4 | Autism case study | Case study questions |
| 5 | Characteristics of Life | Obj 13-14 |
| 6 | Viruses | Obj 15-17 |
| 7 | Metrics Lab (obj 6-7) | Metric system review |
| 8 | Jelly Bean & Sunflower Seed Nat. Selection Mini Lab | Obj 18-20 |
| 9 | Artificial Selection (dog breeding) Examples of Natural Selection (Obj 21)  Darwin and Evolution’s Historical Influences | Obj 20-21 |
| 10 | Examples of Natural Selection (Obj 21)  Natural Selection & El Nino (Peter & Mary Grant)  Galapagos Islands Video | Study |
| 11 | Review | Study |
| 12 | Unit test | Unit 2 Obj TBA |