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| **Teacher:**  http://fc08.deviantart.net/fs71/i/2009/344/a/c/Biology_by_MaddRaVen.jpg  **“Pride Inside”** | Willy L. Herrera | | | | |
| **Date:** | November 19, 2013 | | | | |
| **Content:** | **Biology and Environmental Science** | | | | |
| **Unit:** | Cells and Environmental Issues | | | | |
| **Topics:** | DNA and Wildlife Forensic | | | | |
| **Core Learning Goal(s)**  **or VSC Standard(s)** | | **MSDE Standards:**  ***Skills and Processes:***  **1.2.5** The students will select appropriate instruments and materials to conduct an investigation.  **1.3.1** The student will develop and demonstrate skills in using lab and field equipment to perform investigative techniques.  **1.5.6** The student will read a technical selection and interpret it appropriately.  **1.6.4** The student will manipulate quantities and/or numerical values in algebraic  **Common Core State Standards:**  **RST.9-10.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 9-10 texts and topics.  **WHST.9-10.2.b** Develop a topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information or examples appropriate to the audience’s knowledge of the topic.  ***Biology Content:***  **3.2.1** The student will demonstrate an understanding that all organisms are composed of cells which can function independently or as part of multicellular organisms.  3.5.1 The student will analyze the relationships between biotic diversity and abiotic factors in environments and the resulting influence on ecosystems  3.4.2 The student will estimate degree of relatedness among organisms or species. | | | |
| **Objective:** | | At the end of the lesson students will be able to understand how the principle wildlife forensic can be used in solving environmental issue by performing gel electrophoresis. | | | |
| ***Assessment Focus:***  ***(Key Idea)*** | | **Main Ideas**  **DNA extraction** is the process of removing DNA from the nucleus of a cell. This is the first step researchers must perform in order to examine the genetic makeup of an organism. In this case, DNA is extracted from the cells that make up shark fin tissue. This extracted DNA will be used as the template DNA during the PCR testing for species identification. Note that students do not perform this step in the lab, but you may discuss how this process works so they know where the DNA came from.  **Gel electrophoresis is** a technique that allows separation of molecules based on net charge and size by the use of an electric field through a porous matrix (gel made from agarose). Students will be performing gel electrophoresis in this lab. DNA, a negatively charged molecule, migrates toward the positive pole when placed in an electric field. The rate of movement depends on the length of the DNA fragment; small pieces migrate faster than larger pieces. The positive electrode is colored red and electrophoresis of DNA is always “Running towards Red”. The sizes of the DNA fragments can be determined by comparing them to a DNA standard. The size of a DNA fragment is denoted by the number of base pairs or “bp”.DNA standards can be a DNA “ladder”which has standard DNA fragments of known size and when run on a gel appear as a ladder with many rungs. By comparing the resulting pattern of the DNAfragments on the gel (looking at both the number of bands and the corresponding sizes) the different DNA molecules may be differentiated. You can also run DNA without a ladder and compare to a control sample, as we are doing in this lab. In the WildlifeForensics Lab, the DNA standard is a sample of DNA  from a great white shark.  **The polymerase chain reaction** (commonly referred to as PCR) is a technique that was developed in 1983 by Kary Mullis, an American chemist/molecular biologist. This technique revolutionized the field of genetic research by giving scientists the ability to study specific regions of an organism's genetic code. PCR targets a very specific region of the genome using a short sequence of DNA (primers) and makes millions of copies (amplifies) of that region using an enzyme (polymerase) that facilitates the copying of DNA. PCR is like photocopying a single page of a book millions of times. Millions of copies of a piece of DNA are needed in order to visualize a specific region of DNA using a technique called gel electrophoresis. Therefore, without the use of PCR, there would not be enough DNA copies of the region of interest (i.e. a gene) for scientists to study or to test. PCR is a technique with wide ranging applications in all kinds of scientific research, medical testing, forensics, paternity/pedigree testing, etc. | | | |
| **Materials Needed:** | | Students:   1. Writing instruments 2. Binder | Teacher:   1. Hand Outs 2. E | | |
| **Essential Question:** | | 1. How does gel electrophoresis work? | | | |
| **Accommodations and Modifications:** | | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **STUDENT INITIAL** | **ACCOMODATIONS/MODIFICATIONS** | | | | | | **Presentation Accommodations** | **Response Accommodations** | **Timing and Scheduling Accommodations** | **Setting Accommodations** | **Supplementary Aids** | | 1. R.W(P2) | **(1-G)**Human Reader for verbatim reading of selected sections of the test. | **(2-J)** Calculation Devices | **(3-A)** Extended time | **(4-A)** Reduce distractions to the students | **(1C) allow use of organizational aid**  **(2A) Altered/modified assignment**  **(1B) Allow use of manipulative** | | 1. A.W (P2) |  | **(2-J)** Calculation Devices (2-L) visual organizer |  | **(4-A)** Reduce distractions to the students | **91H) Monitor independent work** | | 1. J.B (P2) |  | **(2-J)** Calculation Devices | **(3-A)** Extended time  **(3-B)** Multiple or frequent breaks | **(4-A)** Reduce distractions to the students | (5C) Classroom instructional consult  (1D) Check for understanding  (4H) Preferential seating  (3F) Encourage student to ask for assistance when needed | | | | |
| **Warm-Up**  **(10 minutes)** | | **Biology:**  **PART 1:** Students will be asked to develop a paragraph about what they have learned in yesterday’s lesson. Students are expected to include the following in their response:   * The treat great white sharks are facing. * Techniques used to identify shark fins.   **PART 2:** Based from your activity yesterday, which shark fin DNA sample do you think come from the great white shark? Use data to support your conclusion.  The result of yesterday’s simulation will be discussed. | | Level(s) of Bloom’s taxonomy: | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **Engagement**  **(10 minutes)** | | * Students will be given a practice time for loading the DNA samples. This will be done in a form of Micropipette Challenge. * Students will complete the micropipette challenge sheet. | |  | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **Exploration**   1. **minutes)** | | * Students will run the gel using the Shark’s DNA samples. | | Level(s) of Bloom’s taxonomy: | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **Explanation**  **(10minutes)** | | * Students will analyze the result of DNA electrophoresis by completing the DNA analysis report. | | Level(s) of Bloom’s taxonomy: | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **Extension**  **(10 minutes)** | | **EXTENDING THE CONCEPT ONE STEP FURTHER:**   * Students will develop an argument by completing the argumentation template. Students will use information from the text, and data from the gel electrophoresis to complete this assignment. | | Level(s) of Bloom’s taxonomy: | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **Evaluation**  **(10 minutes)** | | **CHECKING FOR UNDERSTANDING:**   * Students will be asked to write a report to the Custom’s officials who confiscated the shark fins. This report should explain the two molecular techniques used to generate these results and the results of the genetic analysis performed by the class: How many samples were from the great white sharks and how many samples were not from great white sharks. | | Level(s) of Bloom’s taxonomy: | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **Homework** | | 1. Research about the characteristics, the habitat, the range, and the danger the white sharks are facing. Include a picture of this shark species. | | Level(s) of Bloom’s taxonomy: | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **Summary**  **(10minutes)** | | * Selected students will be asked to describe the structure and function of one cell organelle.   **EXIT TICKET:**  Students will be asked to write a question that they still want to know about the lesson. | | Level(s) of Bloom’s taxonomy: | I Knowledge  II Comprehension  III Application  IV Analysis  V Synthesis  VI Evaluation |
| **References/Credits:** | | <http://www.towson.edu/cse/beop/mdll/Lab_Activities/wildlife_forensics_mdll_teacher_manual.pdf> | | | |
| **Reflections:** | | * What went well and why? * What didn’t go well and why? | | | |
| ***Areas for Improvement:*** | |  | | | |
| ***NOTES:*** | |  | | | |

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**WARM UP:**

DIRECTIONS: 5-10 sentences to answer each of the following questions:

**PART 1:** Develop a paragraph to demonstrate your understanding of yesterday’s reading. Include the following in your response:

* The threat great white sharks are facing.
* Techniques used to identify shark fins.

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**PART 2:** Based from your simulation activity yesterday, which DNA sample (SF) do you think belongs to the great white shark? Use data to support your conclusion.

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**HOMEWORK:**

DIRECTIONS: Conduct a research about the great white sharks. Include the following in your report:

* Physical characteristics (includes the size, color, fin features)
* Habitat and range (include places where they live, migrate, and reproduce)
* Reproductive behavior (how do they reproduce? Do they lay eggs or do they give birth?
* Life span
* Diet (What do they feed on? Are they omnivorous, carnivorous or herbivorous? Explain why?)
* The dangers the white sharks are facing and the different ways people do to protect their population
* Colored picture of the great white shark (could be an illustration or a picture from the internet)
* Cite your source by providing the websites you’ve used to gather your information.

**NOTE:** This could be type written or hand written. You can turn this assignment electronically to [willylherrera75@yahoo.com](mailto:willylherrera75@yahoo.com).

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| CRITERIA | POSSIBLE POINTS |
| 1. Physical Characteristics | 20 |
| 1. Habitat and Range | 10 |
| 1. Life Span | 10 |
| 1. Diet | 10 |
| 1. Threat and protection management | 20 |
| 1. Colored picture | 15 |
| 1. References | 15 |
| TOTAL | 100 POINTS |