

## Review Sheet NYS Regents Lab Activity Relationships and Biodiversity

### Important Terms

Biodiversity

Evolutionary relationships

Molecular Evidence

Structural Evidence

Chromatography

DNA

Extinct

Transcription

Enzymes

Gel Electrophoresis

*Genus species*

Habitat Destruction

Habitat Degradation

Human Impact

Cladograms\*

Amino Acids

Translation

\*Term is not actually used in lab, but essentially is what they are talking about. They do discuss and have a question on “branching tree diagrams.”

### Key Points

1. The diversity of life on the planet has been created through the process of evolution by means of natural selection.
2. Through natural selection, organisms have evolved to lessen competition, and therefore fill a wide array of niches. This *biodiversity* increases the stability of ecosystems.
3. Biodiversity has important benefits to mankind, including development of new food sources and medicines; as well as beneficial, free, ecosystem services. Ecosystem degradation and destruction lead to the loss of genetic biodiversity and increases the chance that an ecosystem will become less stable and collapse.

### Procedures

\*Safety precautions are moronic for this lab. Goggles in step 4 & 5 are for a vinegar and baking soda reaction and paper chromatography using food coloring, vinegar, and water.

1. Seven tests are conducted to determine the relatedness of Samples X,Y, and Z to *Botana curus*. They are as follows:
  - a. Structural Characteristics of Plants
    - Compare the characteristics of the bagged samples
  - b. Structural Characteristics of Seeds
    - Compare the characteristics of the bagged samples
  - c. Structural Characteristics of Stems (Internal Microscopic Structures)
    - Use low power on the microscope to examine cross sections of the stems. Look for a scattered arrangement of bundles or a circular arrangement of bundles.
  - d. Paper Chromatography to Separate Plant Pigments
    - Using clean, separate pipettes for each sample, transfer two drops of each plant extract to a piece of chromatography paper, two cm above the bottom. Label the top of the paper with the proper sample names.

- Place the paper into a cup of water, 1 cm deep. The water should NOT touch the spots of plant extract.
  - Keep checking the sample to make sure the water does not reach the labeled top part of the paper. When the water is done rising, check the color and relative amounts of pigments and record this in the data table.
- e. Indicator Test for Enzyme M
- Placing a scoop of the indicator powder into 4 depressions of the well tray, check the extracts for the presence of Enzyme M. A fizzing reaction indicates that Enzyme M is present in the extract.
- f. Gel Electrophoresis (simulated) to Compare DNA
- Obtain colored paper strips representing portions of DNA molecules. The sequence of bases are representative of molecules isolated from *Botana curus* and Species X, Y, and Z. An enzyme will be used to cut between C and G of the sequences to produce different sized portions of the DNA. These will be placed on a simulated gel plate to compare the relatedness of *B. curus* to X, Y, and Z.
- g. Translating the DNA Code to Make a Protein
- Using the DNA codons, create the complementary messenger RNA, remembering that the DNA base A specifies the RNA base U (\*T is replaced with U in RNA). Using the Universal Genetic Code table, translate the mRNA base sequences into the correct amino acid sequences of the protein.

### Analysis

1. This lab has 7 tests used to determine the relatedness of 4 plant samples. Remember that scientists use a variety of evidence to determine evolutionary relationships, including cell types, structural morphology, DNA, behavior, embryology, and fossils. The more criteria that are shared between organisms, the more likely they are closely related.
2. Relatedness can be shown using a “branching tree diagram”, or cladogram. Organisms that are closely related are next to each other on the same branch. More distant relations are further apart on the branch.
3. *Botana curus* shares the most characteristics with Sample Z, making this sample the most closely related. These characteristics included the presence of Enzyme M, the same pigments blue, yellow, and pink, scattered bundles, no difference in the amino acid sequences, and the same DNA banding pattern.
4. The evidence that should receive the most emphasis when determining the relatedness would be the genetic sequence, as many things can look similar structurally (convergent evolution), but would be unlikely to share the same DNA sequence if they are not truly closely related.
5. The loss of even a single species (extinction) can have major implications for mankind and natural ecosystems.
6. Scientists use gel electrophoresis to separate DNA fragments. Negatively charged DNA molecules migrate through the gel like material towards the positively charged pole. The smaller molecules migrate more rapidly through the gel than the larger ones do.