

DNA Sequencing Activity – Tracey Clark

Curriculum:

Subject Matter: College Prep Biology
Content: Genetics & Biotechnology.
Materials: Adding Machine Tape, Scissors, Graph Paper, Metric Ruler

Instructional Strategies:

This is a simplified, hands-on model that allows students a macroscopic view of what actually happens during a restriction enzyme digest, and gel electrophoresis.

Objectives: 1. Students use model to demonstrate how restriction enzymes work.
2. Students use model to demonstrate how gel electrophoresis works.
3. Students use DNA sequencing to identify their model DNA.

Activities:

During this activity students will mimic the action of restriction enzymes by identifying patterns in the DNA sequence, and using scissors to cut the DNA into smaller segments. Students will also model the process of DNA moving through an agarose gel using a paper simulation of a gel electrophoresis box and their hands to serve as electrical current, separating the DNA segments by size. Students will then model the process of photographing their gel by transferring their results to graph paper – thus creating banding patterns. Finally students will compare their banding patterns to known banding patterns in order to determine if their sample is from beneficial or harmful yeast.

Assessment:

Teacher will be able to assess student understanding of the concepts at various stages in the activity. At the end, student will have produced a graph of their DNA banding pattern which will have been identified. This can be used to determine their understanding of the entire process. There is also a series of analysis questions that require the student to explain the process. Finally students will write a summary of the process used to generate and identify their DNA fingerprint.

Products:

Students will generate a diagram showing a DNA banding pattern, identify their DNA banding pattern and provide answers to analysis questions. Students will also summarize the process they used to generate and identify their DNA.

Lesson Plan

Mr. Herrick

Oakdale High School

Objective:

1. To enhance the students' ability to solve a problem.
2. To enhance the students' ability to work together as a functional team.
3. To improve the students' ability to communicate effectively their observations and interpretation of a problem and their solution of the problem.

Bell Ringer:

Bell Activity: None.

Procedure:

Review/Follow up: None today

The students will have had one day to review the general requirements of this lab. They will complete the lab assignment and the objectives of today by doing the following expectations:

Objective 1: "To enhance the students' ability to solve a problem."

The students will be given an open-ended experiment. During this lab time, they must interpret the problem, design an experiment based upon their knowledge of chemical behaviors, and conduct the experiment that they design.

Objective 2: "To enhance the students' ability to work together as a functional team."

The students will be placed into lab teams. Within the structure of the team, they must work together to design the lab, write a procedure for accomplishing the lab and the actual conduction of the experiment

Objective 3: "To improve the students' ability to communicate effectively their observations and interpretation of a problem and their solution of the problem"

As a team, the students shall write a lab report. In the report, they will need to communicate the reason of the lab, the procedures that they did, the equipment they used, and their conclusions as to how effective their procedures were in accomplishing the purpose of the lab..

Total time of lab: 50 minutes.

Closure:

Announcements: "Homework for tomorrow is as follows:

- 1) Complete the lab by answering the questions listed on the hand out.

Acid/Base: Design Your Own Lab Procedure

Purpose:

1. Students design their own procedure to answer questions of scientific interest regarding acids and bases.
2. Students base conclusions on observation made in lab.

Materials:

12-well test plate	0.1M acetic acid, $\text{HC}_2\text{H}_3\text{O}_2$ (weak acid)
toothpicks	0.1M ammonium hydroxide NH_4OH (weak base)
conductivity tester	0.1M hydrochloric acid (strong acid)
deionized water	0.1M sodium hydroxide (strong base)
Mg or Zn metal	
pipettes	<u>pH indicators</u>
lab apron	bromothymol blue
safety goggles	methyl green
	litmus
	phenolphthalein
	universal indicator

Lesson Plan

Intern: Derek Madden

School: Modesto Junior College

Intern site: Memorial Medical Center

Intern site supervisor: Carla Mensonides, RN, and Shirley Rodrigues

Curriculum/Instructional strategies.

Background: Air quality has long-term implications for the overall health of humans. This is of special concern in California's Central Valley where a combination of local sources of air pollution, air pollution imported on prevailing winds from heavily industrialized Bay Area sources, and chronic summertime high pressure systems collectively work to create unhealthy near surface atmospheric conditions. Add to these atmospheric situations a personal addiction to smoking tobacco, and we have conditions that will lead to a number of different respiratory illnesses. The attached Respiration Lab describes methods for a teacher to lead students through an analysis of ventilation assessment.

Objectives.

1. Students will be able to recognize lung tissue.
2. Students will be able to assess tidal volume.
3. Students will understand how emphysema might influence normal physical activity.

Activities, Assessment, and Products

Students will conduct experiments, and produce a written report, as portrayed in the attachment.

Lesson Plan – Particulate Matter Lab

Background Information:

Students should go to the following website and read about Particulate Matter Pollutant Monitoring.

<http://www.arb.ca.gov/aaqm/partic.htm>

Airborne particulates are among the unhealthiest components of air pollution to humans. Very small particulates can lodge deep inside the lung tissue where they can stay throughout the life span of a person. Airborne dust, pollen, soil, or particles from the smoke and exhaust of automobiles, factories and power plants all contribute particulate matter pollution. All members of the class will collect particulate matter for a period of a week and compare data to uncover trends in the distribution patterns of particulates in the community.

Materials:

Microscope Slides

Graph paper

Petroleum Jelly

Map of local community

Stereoscope/dissecting scopes

Procedure:

1. Prepare a particulate collector by smearing petroleum jelly in a ½ inch square on a microscope slide.
2. Using the stereoscope. Examine and sketch the particulate collector.
3. Take the particulate collector home and place outside 6 feet above the ground.
4. One week later – bring the particulate collector back to class – being careful not to dislodge the material on the slide.
5. Examine and sketch the particulate collector.
6. You will probably notice many different types of PM on the slide.
7. Dark particulate usually is from combustion of fuel and the lighter particulate is usually pollen like materials.
8. Assess whether you think your collector has more dark or light particulate.
9. On the map of the local community – place the location of your house – use an X for dark particulate or an O for lighter particulate.

Data Analysis:

1. As a class – discuss the findings for the local community. For example, do homes near the highway contain more light or dark particulate matter.
2. Draw conclusions about your data, as well as the distribution of airborne particulates in the community.
3. Write a discussion paragraph about your findings.

Lesson Plan SPIE 2009

Hydroponics Club Experiment

Objectives:

1. Students will be able to devise a plant growing experiment which includes a thesis, equipment, the process, and criteria for proving or disproving the thesis.
2. Students will be able to write an abstract and/or outline of their experiment.
3. Students will be able to observe and record data

Instructional Strategies:

Direct Instruction/Lecture, 5-10%
Directed Hands on, 30-40%
Student led, self directed, 50-60%

Activities:

Activities will include building and experimenting with different types of equipment and different ways of propagating plants: seed, cloning, starts. There will be record keeping and data entry, as well as writing.

Students will be self directing through most of the experiment, from developing what equipment to use, to what they want to accomplish.

Assessment:

Before experiment is conducted, students will write a thesis, including predictions on percentages of plant survival and/or growth rate. At the conclusion of the experiment, students will compare collected data to the original thesis and decide if the experiment proved or disproved the thesis.

Products:

Students will produce an outline of their experiment, including thesis and steps to take.
Students will produce a recorded log of growth data.
Students will produce plants that can be grown indoors, or planted in an outside garden.

Lesson Plan: Acid/Base Titration

Curriculum

Subject:

College Prep Chemistry, grade 10

Content:

Acids & Bases

Materials:

Beakers, Buret clamps, Burets, ring stands, eye protection, gloves, aprons, HCl solution 1 M (part diluted to create an unknown solution), NaOH solution 1 M, phenolphthalein (in dispensers, per group)

Instructional Strategies:

This lab allows students to practice lab safety, to read instruments & make measurements, to perform simple calculations, and to practice using titration to find an unknown quantity.

Objectives:

- Students learn about accuracy/precision by performing the same test multiple times
- Students learn how titrations can be used to find unknown concentrations
- Students practice relevant calculations, in this case $M_1V_1 = M_2V_2$
- Students practice the proper use of basic lab equipment

Activities:

Equipment Orientation

Show students the proper lab set-up (buret clamp attached to ring stand). Demonstrate the proper way to use the stopcock on a buret and how to swirl gently without losing any liquid. Have students practice using the buret with colored water until they get comfortable using them.

Procedure

Discuss the procedure of titrations as a class. Then hand out and discuss the Acid-Base Titration lab procedure. Explain to students how the equality $M_1V_1 = M_2V_2$ (where M = concentration and V = volume) can be used to calculate the concentration of a substance if the volumes are known.

Divide students into groups and ask them to perform the titration activity and to record their data as they go along.

Discussion

Discuss how this procedure can be used in industrial settings, like wineries, to determine the end point of neutralization reactions, to standardize the strength of cleaning products or antacids, etc.

Assessment:

Some of the assessment will be informal. The teacher should monitor how well the students use their equipment, that they are practicing the proper safety procedures, etc. By the end of the activity, it should be obvious whether students performed the correct calculations: given data from three or more titrations, students should be able to accurately identify the strongest concentration of unknown.

Product:

Ask the students to submit their data and calculations in the form of a lab report.