Cabbage Juice Lab

Name: Ms. Smith Subject: Biology I Length: 48 minutes Date:

Objectives:

TSW investigate the use of an indicator in identifying acids and bases (DOK 3, 2.c) Instead on board: TSW complete a lab using cabbage juice (DOK 3, 2.c)

Materials:

-Lab handout (1 per student)

-For demo: 1 clear container of red cabbage juice, unlabeled containers of lemon juice and diluted laundry detergent solutions

-<u>For lab:</u> container of red cabbage juice (1 per group), dropper (1 per group), popsicle-making containers as "test tube racks" (1 per group). Each container should have one well each of lemon juice, baking soda solution, dilute dish soap, dilute laundry detergent, vinegar, soda water, salt water, and rubbing alcohol.

Bell Ringer:

For each question, write: if the pH is below 7/above 7/at 7 AND label neutral/acidic/basic. (answers in italics)

pH 6 below 7, acidic
pH 14 above 7, basic
pH 10 above 7, basic
pH 7 at 7, neutral
pH 2 below 7, acidic
pH 7.5 above 7, basic
min. NET 3]

Set:

Please play close attention to this demonstration. Record your observations on your lab sheet as the demonstration continues.

- I will show two clear containers of cabbage juice to the students. What color is this cabbage juice? [purple]. Please record your observations.
- I will add a "mystery liquid #1" (vinegar or another acid) to one container of cabbage juice. What happened? What color is the cabbage juice now? [red/pink]. Please record your observations.
- I will a second "mystery liquid #2" (baking soda solution or another base) to another container of cabbage juice. What happened? What color is the cabbage juice now? [blue/green]. <u>Please record your observations.</u>
- In today's class, you will be doing an experiment to explain what happened in this demonstration. You will be adding cabbage juice to different liquids and determining what causes the cabbage juice to change color and why. [3 min. NET 6]

Procedures:

A. TSW decide on the problem posed by the demonstration as a class and write it on their lab sheets. Acceptable problems include: "What made the cabbage juice change color?" or "What does the color of the cabbage juice indicate?"

[2 min. NET 8]

B. Working individually, TSW write a hypothesis to explain what happened in the demonstration. To avoid "giving away" the answer, TSW **not** share their hypotheses as a class. Any well-explained hypothesis is acceptable. For example: "The cabbage juice tells us whether a substance is an acid or a base." "The cabbage juice tells us the temperature of a substance." "The color of the cabbage juice depends on how much liquid you add." [2 min. NET 10]

C. TTW explain the procedures for the lab. Each group will be given two sets of containers, one with the liquids they are to test, and the other containing cabbage juice. They are to add drops of cabbage juice to each liquid and record the color. They will then answer the questions at the end. TTW also note that students should not complete the challenge experiment until their answers have been checked. [2 min. NET 12]

D. TTW give the procedures for group work and the consequences of not following these procedures. [2 min. NET 14]

E. TSW practice the procedure for silence [1 min. NET 15]

F. TTW give the groups and TSW get into their groups. [1 min. NET 16]

G. Working in groups of two or three, TSW complete the cabbage juice experiment. TTW walk around aiding students. Specifically, TSW:

-add drops of cabbage juice to a variety of household liquids

-record the color change of each liquid

-answer questions which will guide them through the thought process to determine what causes the cabbage juice to change color

-write a conclusion explaining the color change of the cabbage juice

Students who finish early will complete a "challenge experiment" in which they perform a neutralization reaction and explain the color changes that occur. The directions for the challenge experiment will be projected on the board. [19 min. NET 35]

H. During the last five minutes of the lab, TTW individually ask groups to clean up their materials as they complete the lab. [simultaneous with F]

I. TSW review their results of the experiment as a class using their whiteboards. Specifically they will answer questions asking:

-which liquids turned the cabbage juice red, blue/green, or did not change its color

-what the liquids that turned the cabbage juice red have in common [*they are acids*]

-what the liquids that turned the cabbage juice blue or green have in common [*they are bases*]

-what the liquids that did not change the color of the cabbage juice have in common [they are neutral]

[3 min. NET 38]

J. As a class, TSW conclude what the cabbage juice measured and why. [3 min. NET 41]

K. TTW give the closure [3 min. NET 44].

L. TTW collect the lab sheets and dismiss the class. [1 min. NET 45]

Closure

Today, you completed an experiment in which you determined what the color of the cabbage juice measures. Now that you have solved the mystery, let's return to the demonstration from the beginning of class.

[I will hold up one container at a time from the demo at the beginning of class]. Why do you think this one turned red? What might I have added to it? [*it turned red because an acid was added to it*]

What about the container where the liquid turned green? [a base was added to it]

If there is time, TTW ask students to predict the effect different liquids will have on the color of the cabbage juice, then add these liquids to demonstrate whether students are correct. If there is a lot of extra time, TTW demonstrate a neutralization reaction by first adding an acid to the cabbage juice (turning it red or pink), then adding a base (turning it purple, then blue or green). TTW ask students to explain what happened.

[first the base neutralized the acid, causing the purple color, then there was extra base, causing the blue or green color].

Great job solving the mystery of the cabbage juice today! In the next class, you will begin learning about the different types of macromolecules. [3 min. NET 44]

Please pass your lab reports to your right and put your binders under your desks. Then wait silently to be dismissed. [1 min. NET 45]

Assessment/Evaluation:

Objective: TSW investigate the use of an indicator in identifying acids and bases (DOK 3, 2.c)

Informal: TTW observe student whiteboards (M) for the correct data about each liquid's color in cabbage juice and an explanation of the reason for each color (C).

Formal: TTW collect the lab answer sheets (M) and grade them based on whether the students successfully explained the function of the cabbage juice (C). The grade will be recorded in the grade book (D).