Hands -On Activity:
What's the Scoop on Juice?

Topic: Measuring Acidity !

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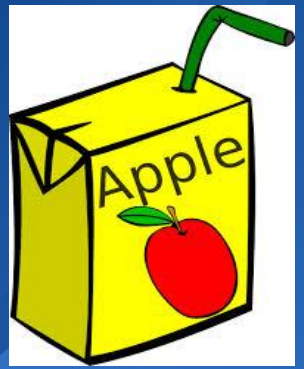


Goals:

⇨Students will conceptually understand the significance of pH levels when determining the concentration of hydronium ions in each of the 5 juices.

⇨Students will determine the pH levels and concentration of $[H_3O^{+1}]$ in the given 5 juices.

Objectives:

* Given 5 clear plastic cups, filled with different juices, and pH paper, students will determine the level of pH in each juice with 100 % accuracy.
* Given a calculator, students will calculate the $[H_3O^{+1}]$ when given the pH levels of juices with 100% accuracy.
* Given a blank data table, students will record their pH levels and $[H_3O^{+1}]$ calculations in the appropriate sections that are labeled with 100% accuracy.

Objectives Continued:

*Given blank graph paper, students will draw, label, and graph their recorded data with 100% accuracy.

* Given a corresponding extra practice worksheet, students will be able to complete the problems with their pre-determined group members with 90 % accuracy.

Materials Needed:

* A set of 5 different juice solutions: cranberry juice, pineapple juice,grape juice, orange juice, and apple juice.
* Data Recording Sheet/ Graph Paper
* 5 plastic cups for the juices.
* pH Paper
* Calculator
* Worksheet

Introduction :

* Do-Now: (**Based on lesson and material taught prior to this activity**)

-Define and Review the following basic concepts:

1) Acid
2) Base
3) Concentration
4) Independent Variable
5) Dependent Variable
6) pH

- Find the $[H_3O^{+1}]$ of a solution with a pH level of 5.56

Definition of Basic Concepts Terms:

1) Acid: a substance that donates hydrogen ions.

2) Base: a substance that accepts hydrogen ions.

3) Concentration: the relative amount of a particular substance, a solution, or mixture.

4) Independent Variable: the factor that is changed in an experiment, in order to study change in the dependent variable. (graphed on x-axis)

5) Dependent Variable: factor being measured or observed in an experiment. (graphed on y-axis)

6) pH: a measure of the acidity or alkalinity of a solution.

Find the [H_3O^{+1}] of a solution with a pH level of 5.56.

Step 1: Write equation. [H_3O^{+1}]= 10^-pH

Step 2: Plug in pH value. [H_3O^{+1}]= 10^-5.56

Step 3: Solve [H_3O^{+1}]= 2.75

Introduction :

- Explanation of hands- on activity to the students.

  * Objectives

  * Materials:

  - A set of 5 different juice solutions:
cranberry juice, pineapple juice,grape juice, orange juice, and apple juice.
  - Data Recording Sheet/ Graph Paper
  - 5 plastic cups for the juices.
  - pH Paper
  - Calculator
  - Worksheet

  *Assign groups and distribute materials.

Development :

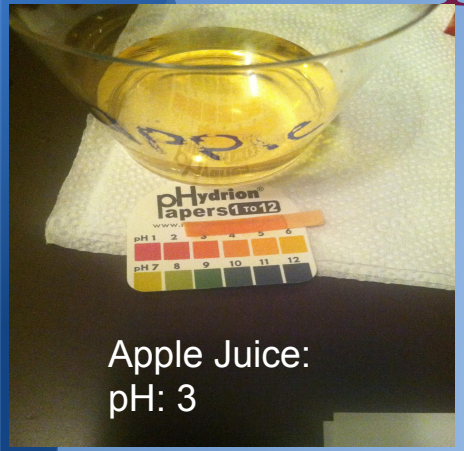
- Beginning of group work.

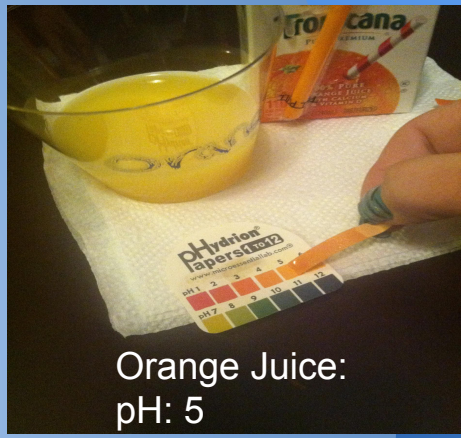
  * During this time, students should be:

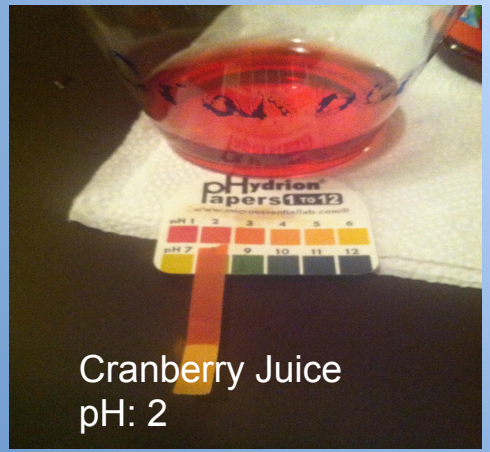
    -Collectively measuring the pH level of each juice.

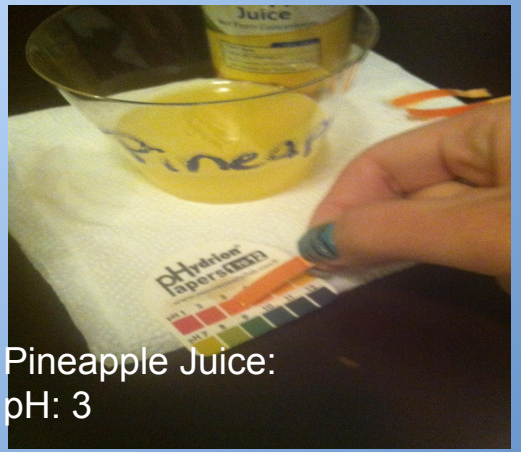
    - Individually recording their findings in the provided data tables.

Sample Measurements of pH Levels:



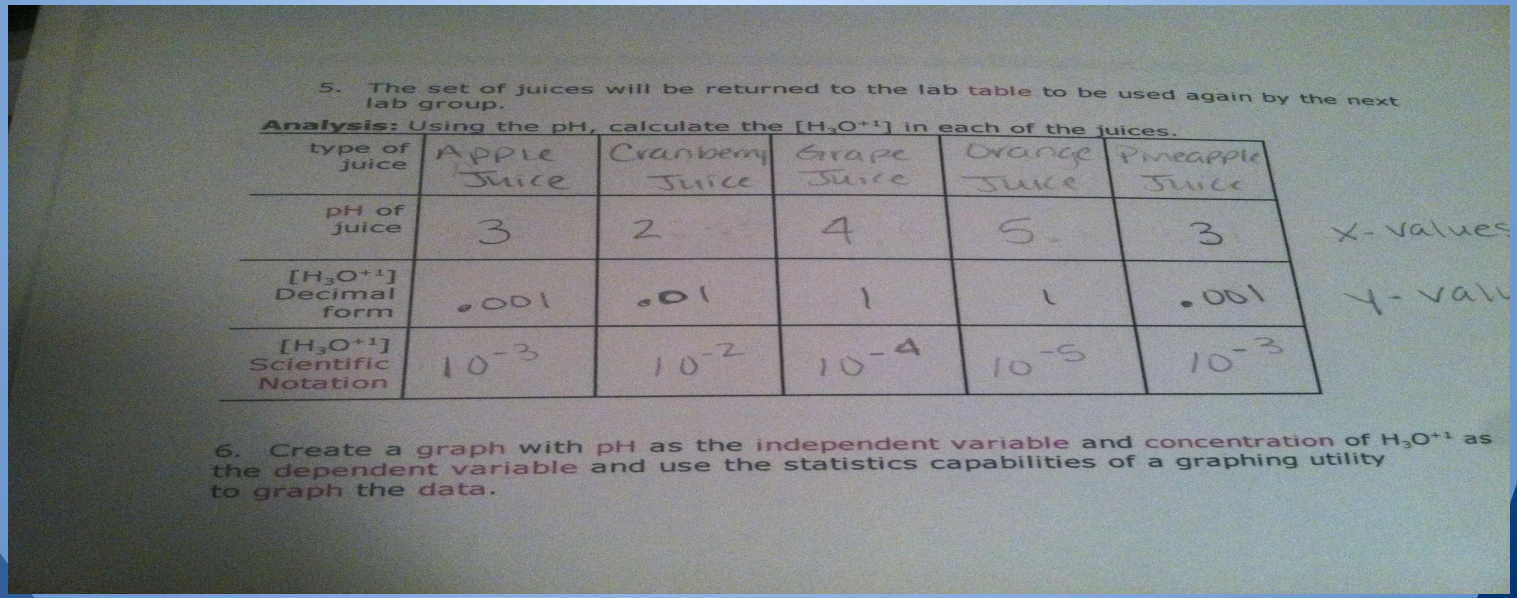






Development :

- Collectively review data table on handout.
  * Example of appropriately filled- out data table:



5. The set of juices will be returned to the lab table to be used again by the next lab group.

Analysis: Using the pH, calculate the $[H_3O^{+1}]$ in each of the juices.

type of juice	Apple Juice	Cranberry Juice	Grape Juice	Orange Juice	Pineapple Juice
pH of juice	3	2	4	5	3
$[H_3O^{+1}]$ Decimal form	.001	.01	1	1	.001
$[H_3O^{+1}]$ Scientific Notation	10^{-3}	10^{-2}	10^{-4}	10^{-5}	10^{-3}

x- values

y- valu

6. Create a graph with pH as the independent variable and concentration of H_3O^{+1} as the dependent variable and use the statistics capabilities of a graphing utility to graph the data.

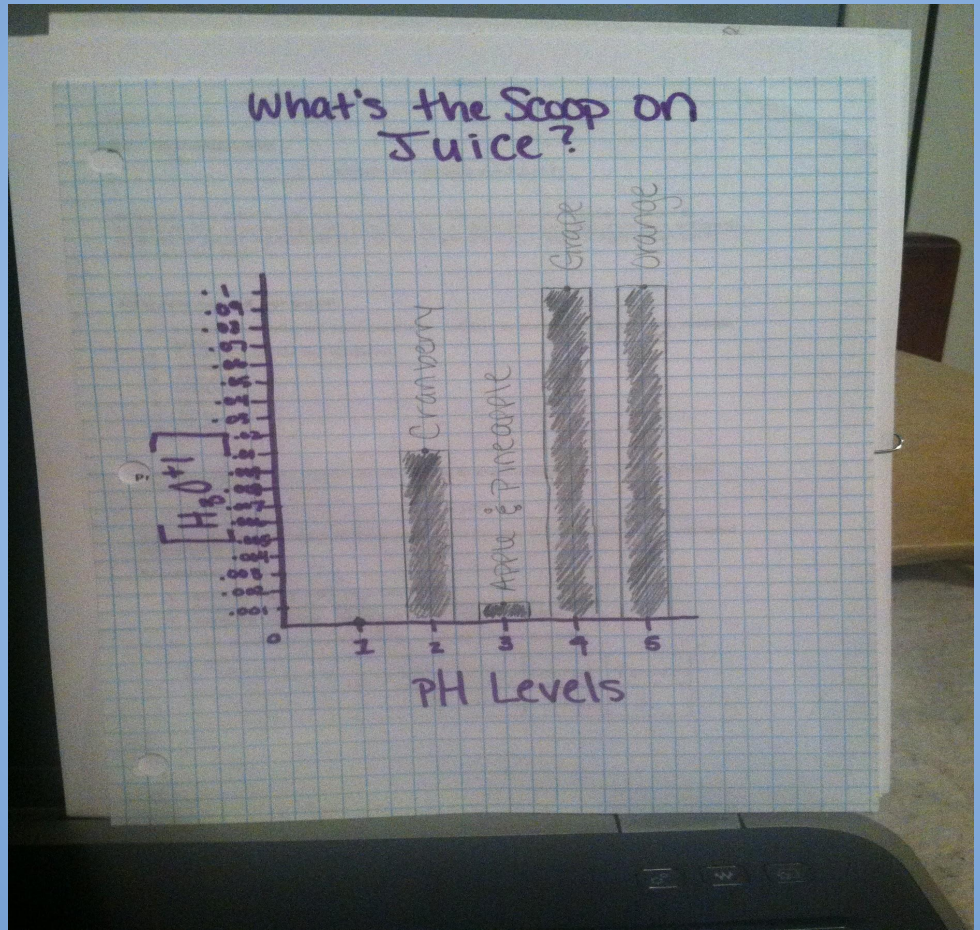
Development :

* **Brief discussion of data table.**
  - Pattern/ relationship between pH level and $[H_3O^{+1}]$.

* At this time, students will:

  -Form coordinate points from the data table.
  - Graph and label their coordinates on the blank plane.

* Example of acceptable form of graph:



Guided Practice :

* At this time, students will:

  - Complete the Extra Practice worksheet, and answer comprehension activity questions upon completion of worksheet.

Find the missing information from the data given below. (Modeled steps from do- now.)

1) Milk:

pH Level: 7.8

$[H_3O^{+1}]$: ?

Step 1: Write equation. $[H_3O^{+1}] = 10^{-pH}$

Step 2: Plug in pH value. $[H_3O^{+1}] = 10^{-7.8}$

Step 3: Solve $[H_3O^{+1}] = 1.58$

Acid or Base? : Base

* Because neutral pH level is 7 and milk's pH level is above 7.

Independent Practice :

* Homework Assignment: *Show all of your work, including formulas/ equations used.

- Find the Acidity/ pH level and [H_3O^{+1}] of lemon juice.
- Find the Acidity/ pH level and [H_3O^{+1}] of lime juice.
- Make a table and record your data.
- Label and graph your data on graph paper.

Bloom's Taxonomy:

- Level 1:Knowledge
  - *Do-Now:
    - -Define and Review basic concepts
    - -Recall the formula for solving [H_3O^{+1}]
- Level 2: Comprehension
  - *Do-Now/Guided Practice:
    - -Translate given information into known formulas to solve appropriately.
- Level 3:Application
  - *Hands- On Activity:
    - -Construct a graph based on collected data of pH levels and [H_3O^{+1}].
    - - Discover significance or patterns between the pH levels and [H_3O^{+1}].

Bloom's Taxonomy:

- Level 4:Analysis
  *Hands-On Activity/ Guided Practice:
  -Identify patterns and relations between pH levels and $[H_3O^{+1}]$.
  -Examine the formulas and concepts used for finding missing information.

- Level 5: Synthesis
  *Hands-On Activity/ Guided Practice:
  -Generate deeper understanding of Acidity with pH levels and the relation it has to $[H_3O^{+1}]$.
  - Completing the Comprehension review questions to generate conceptual understanding of the concepts taught.

- Level 6:Evaluation
  *Hands- On Activity:
  -Support one's conclusions through collected data, graphs, and questions.

Sources :

- http://www.algebralab.org/activities/activity.aspx?file=Science_Juice.xml
- Google images