**Which Juice has the Highest Concentration of Antioxidants?**

Lab Prep Instructions

***GENERAL INFORMATION***

Experiment Day/Date:

Instructions: Write any calculations in the space provided, and check with the lab instructor if you have any questions. Check off each item as you prepare it.

Quantity: Amounts indicated are for a pair of students and includes an excess. Check the pre-lab assignment sheet to determine how many groups need each solution.

***SOLUTIONS AND CHEMICALS NEEDED***

□ 0.1 M HCl (hydrochloric acid)

□ 0.1 M HNO3 (nitric acid)

□ 0.1 M acetic acid

□ 0.1 M maleic acid

□ 0.1 M hydroxylamine HCl

□ 0.1 M HPO3 (phosphoric acid)

□ 0.1 M NaOH (sodium hydroxide)

□ Black Cherry Juice

□ Blueberry Juice

□ Concord Grape Juice

□ Cranberry Juice

***SOLUTION PREPARATION***

*After preparation, leave all of the solutions except NaOH in the volumetric flask used for preparation. Discard the excess when the experiment is complete.*

□ 25 mL of 0.1 M HCl (hydrochloric acid)

- add 206 μL concentrated (12.1 M) HCl to a 25 mL volumetric flask

- fill the flask to the mark with DI water and mix

□ 25 mL of 0.1 M HNO3 (nitric acid)

- add 158 μL concentrated (15.8 M) HNO3 to a 25 mL volumetric flask

- fill the flask to the mark with DI water and mix

□ 25 mL of 0.1 M acetic acid

- add 144 μL glacial (17.4 M, 99.8%) CH3CO2H to a 25 mL volumetric flask

- fill the flask to the mark with DI water and mix

□ 25 mL of 0.1 M maleic acid

- add 0.290 g maleic acid to a 25 mL volumetric flask

- fill the flask to the mark with DI water and mix

□ 25 mL of 0.1 M hydroxylamine HCl

*\* This solution must be prepared* ***fresh*** *every year and cannot be stored from year to year*

- add 0.174 g hydroxylamine HCl to a 25 mL volumetric flask

- fill the flask to the mark with DI water and mix

□ 25 mL of 0.1 M H3PO4 (phosphoric acid)

*Note: this is enough for two groups*

- add 170 μL concentrated (14.7 M) H3PO4 to a 25 mL volumetric flask

- fill the flask to the mark with DI water and mix

□ 100 mL of 0.1 M NaOH (sodium hydroxide)

*Note: all groups will need this*

- prepare solution from the solid (FW 40.00 g/mol) and dilute in DI water and store in a **clear** glass or plastic bottle, prepare enough for 1 extra group to allow for standardization



- please round volume of 0.1 M NaOH needed up to match the nearest volumetric flask volume available (i.e. to the nearest 500 mL or 1 L). Amount of 0.1 M NaOH to prepare: \_\_\_\_\_ mL



-if multiple flasks are used to prepare the solution, combine everything prior to standardization

***Standardization of 0.1 M NaOH solution***

- add 0.5-0.6 g KHP (that has been dried in an oven overnight at 110-120 °C) to a 250 mL Erlenmeyer flask and dissolve with 10 mL of DI water (it is not necessary for all of the KHP to dissolve), be sure to record mass

- add 2 drops of 2% phenolphthalein to the flask

- titrate the KHP solution with the 0.1 M NaOH until a color change is visible (approx. 25 mL)

- repeat the process with a second sample

- calculate the molarity for each trial and record the average on the bottle to four significant figures

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Standardization of NaOH to 0.1 M with KHP** | |  | |  | |
| Trial | 1 | | 2 | |  | |
| KHP\* (g)( 4 decimal places) |  | |  | |  | |
| Initial Volume in Burette (mL) |  | |  | |  | |
| Final Volume in Burette (mL) |  | |  | |  | |
| Change in volume (mL) |  | |  | | average | |
| [NaOH] |  | |  | |  | |

\*MW 204.22 g/mol

***EQUIPMENT & GLASSWARE***

**In Lab Bins**:

□ 100 mL beaker (1)

□ 250 mL beaker (1)

□ 400 mL beaker (1)

□ 100 mL graduated cylinder (1)

□ Magnetic stir bar (1)

□ Short-stem liquid funnel (1)

**In Dana 200:**

□ Volumetric pipettes

10 mL (2) – cranberry juice, phosphoric acid

20 mL (5) – acetic acid, hydrochloric acid, hydroxylamine HCl, maleic acid, nitric acid

25 mL (3) – black cherry juice, blueberry juice, concord grape juice

□ Titration set-up – burette, burette clamp, ring stand (1/group)

□ pH meter (1/group)

□ pH 4 and pH 7 buffers in labeled vials next to each pH meter (1/group)

□ Magnetic stir plates (1/group)

□ Kim wipes

□ Plastic transfer pipettes

***WASTE DISPOSAL CONTAINERS***

€ Building: Dana

€ Room #: 200

€ Waste Accumulation Start Date: \_\_/\_\_/2010

€ Date Container Filled: leave blank

€ Date moved to MAA: leave blank

€ Physical State(s): liquid, solid

€ Chemical Waste Composition: hydrochloric acid (< 1%), nitric acid (< 1%), acetic acid (< 1%), maleic acid (< 1%), hydroxylamine HCl (< 1%), phosphoric acid (< 1%), sodium hydroxide (< 1%), black cherry juice (< 1%), blueberry juice (< 1%), concord grape juice (< 1%), cranberry juice (< 1%), water (~ 99%)

€ Hazards: toxic, corrosive, oxidizer

***SPECIAL INSTRUCTIONS***

Wear goggles, gloves and lab coat at all times when preparing chemicals and solutions.

Unless otherwise stated, all chemicals can be prepared with plenty of time before the lab and excess chemicals can be stored after the lab has finished