Lab 8

DIRECTIONS:

The minimum daily requirement for vitamin C is 30mg and the recommended daily allowance is 60-70 mg. You can find the vitamin C content on the labels of most commercially available juices. How close is their reported number to the actual amount of the vitamin in the juice? You will test that in this lab by titrating the juice with an iodine solution using starch as an indicator. The formula for ascorbic acid is C6H8O6 and the structures for the reduced form and for the oxidized form (dehydroascorbic acid) are shown, which illustrates the first half of redox titration with a standardized solution of iodine. In this procedure, the iodine is reduced by the ascorbic acid to form iodide as show in the other half of this redox equation:

I2 + 2e🡪2I- The titration end point is reached when a slight excess of iodine is added to the ascorbic acid solution. To highlight when the excess iodine, thyodene indicator is added to the titrant. Thyodene is a starch that reacts with the excess iodine to form a bright blue complex. Thyodene does not form this complex with iodide. Before doing a titration on a solution of unknown concentration, you must first prepare a standardized iodine solution. A standardized iodine solution is one whose concentration is known exactly from its preparation and is then verified by a controlled titration.

The iodine solution on the chemicals shelf has been prepared according to a calculation that gives a concentration of 0.015M. Your task in Procedure 1 is to confirm this exact concentration of the iodine solution. In Procedure 2, you will use the standardized iodine solution to determine the concentration of vitamin C in samples of orange juice. As in any titration we use the formula: C1\*V1 = C2\*V to calculate the unknown concentration where C is the concentration in mol/L and V is the Volume of the solution. When standardizing the iodine, C1 and V1 for the absorbic acid solution are known, as the volume of iodine delivered from the burette and so you can solve for the concentration of the iodine solution.

ASSIGNMENT PROCEDURE 1:

The prepared iodine solution on the chemicals shelf with a stated concentration of 0.0015M is standardized (confirming the concentration) by performing the following titration:

1. Take a clean volumetric flask and put on workbench
2. Add 0.1g ascorbic acid to the volumetric flask
3. Fill the flask with water (making an appx 100ml solution) Record the amount of ascorbic acid used and the total volume prepared
4. Take a 150 Erlenmeyer flask and put on workbench
5. Pour 20ml of the absorbic acid solution( from volumetric flask)
6. Add 1ml Starch Indicator to Erlenmeyer flask
7. Burette fill with 50ml iodine solution with an approximately known concentration of 0.015M
8. Titrate the absorbic acid in Erlenmeyer flask at 1ml increments

QUESTIONS:

1. Calculate the molarity of the ascorbic acid solution:
2. Mass of ascorbic acid used
3. Moles of ascorbic acid (MW = 176.1 g/mol)
4. Volume of solution (mL)
5. Ascorbic Acid Concentration (mol/L)
6. For each titration record and calculate the following:
7. Volume of iodine solution added (mL)
8. Concentration of the iodine solution
9. Calculate the average iodine concentration using the formula M1\*V1 = M2\*V2

PROCEDURE 2: Scenario:

1. Determine the ascorbic acid concentration in commercial orange juice, from a freshly opened container and from a container that was opened one week ago.
2. Prepare a sample of orange from the NEW container by adding 40ml of the juice to a clean Erlenmeyer flask. Add 1ml Starch Indicator
3. Titrate the orange juice with the standardized iodine solution.
4. Repeat steps 2 and 3 to the WEEK OLD orange juice.

QUESTIONS:

1. For each titration of the NEW orange juice, record and calculate the following:
2. Volume of iodine solution added (mL)
3. Concentration of the ascorbic acid in the juice
4. Calculate the average ascorbic acid concentration for the NEW orange juice, using the formula M1\*V1 = M2\*V2
5. For each titration of the WEEK OLD orange juice record and calculate the following:
6. Volume of iodine solution added (mL)
7. Concentration of the ascorbic acid in the juice
8. Calculate the average ascorbic acid concentration for the WEEK OLD orange juice using the formula M1\*V1=M2\*V2
9. Report the average amount of ascorbic acid in the 2 samples of commercial orange juice in units of “mg per mL” of juice. The molecular weight of ascorbic acid is 176.12
10. The minimum daily requirements for vitamin C is 60mg per day. What percentage of this requirement is in one cup (200ml) of NEW and WEEK OLD orange juice?
11. What happens to the ascorbic acid in orange juice over time? (hint: oxygen makes up 20% of our air)

LAB FINDINGS PROCEDURE 1:

Clean volumetric flask add 0.1g ascorbic acid

Fill remainder with water (makes 100ml solution)

Clean 150ml Erlenmeyer flask

Pour 20ml ascorbic acid into flask from volumetric flask (above)

Add 1ml Starch Indicator

Burette, fill 50ml Iodine

Titrate with 1ml increments from burette until it turns dark blue

49.00ml – 1ml

48.00ml – 1ml

47.00ml- 1ml

46.00ml – 1ml

45.00ml -1ml

44.00ml – 1ml

43.00ml-1ml

42.00ml – 1ml TURNED DARK BLUE

LAB FINDINGS PROCEDURE 2:

Add 40 ml or juice to Erlenmeyer flask NEW orange juice

Add 1ml Starch Indicator to flask

Burette 50ml Iodine, Titrate in 1ml increments

Repeat steps 2 and 3 for ONE WEEK OLD orange juice

NEW JUICE:

40ml NEW juice

1ml Starch Indicator

Burette 50ml Iodine 1ml increments

49.00ml – 1ml

48.00ml – 1ml

47.00ml – 1ml

46.00ml – 1ml

45.00ml – 1ml

46.00ml - 1ml

45.00ml – 1ml

44.00ml – 1ml TURNED ORANGE

WEEK OLD JUICE:

40ml WEEK OLD juice

1ml Starch Indicator

Burette 50ml Iodine 1ml increments

49.00ml -1ml

48.00ml -1ml TURNED ORANGE