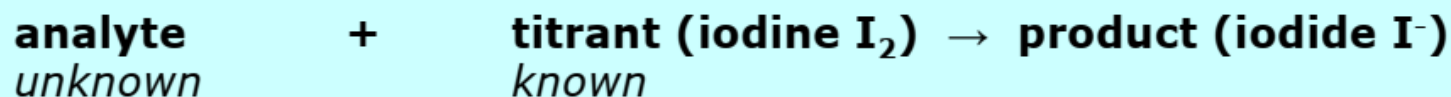# Titrimetric determination of l-Ascorbic acid (Vitamin C)
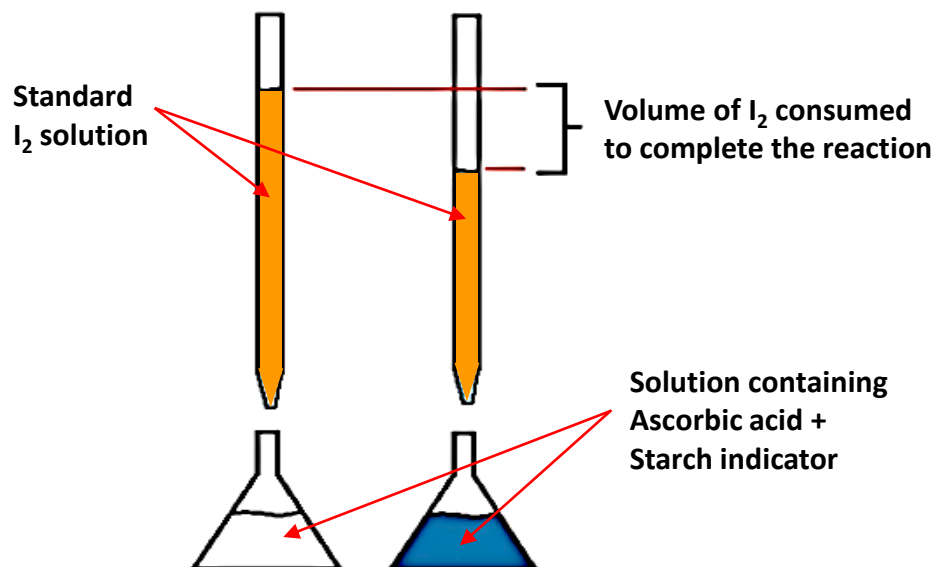
# Titration method - Redox Titration Using Iodine Solution

Iodimetry: A direct titration with only 1 reaction:

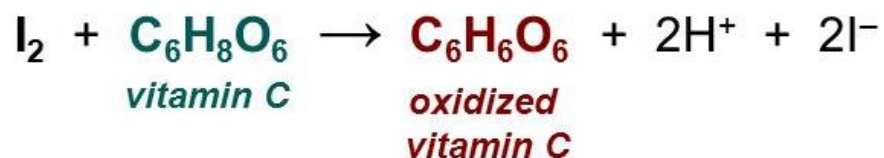analyte          +          titrant (iodine $I_2$)  →  product (iodide $I^-$)
unknown                     known

**Reducing agent**          **Oxidizing agent**

**Standard $I_2$ solution**

**Volume of $I_2$ consumed to complete the reaction**

**Solution containing Ascorbic acid + Starch indicator**

# Theory: Iodimetric titration



l-ascorbic acid      l-dehydroxyascorbic acid

$$I_2 + C_6H_8O_6 \longrightarrow C_6H_6O_6 + 2H^+ + 2I^-$$

*vitamin C*      *oxidized vitamin C*
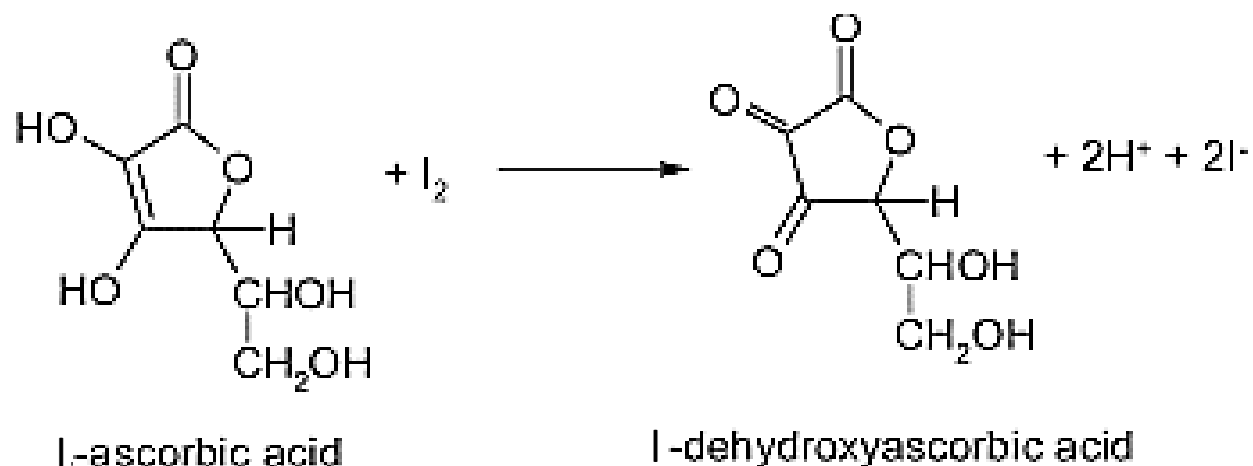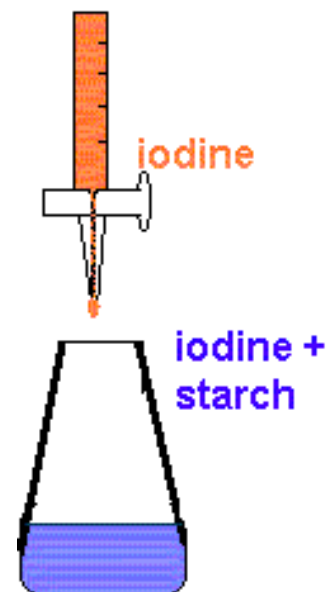
None of these substances have a distinctive color.
**How will we know how much $I_2$ to add?**

After all the vitamin C has reacted, **excess $I_2$ begins to react** with starch indicator solution to form a **colored complex**

$$I_2 + starch \longrightarrow Iodine\text{-}starch\ complex$$

**(blue color)**

iodine

iodine + starch

**Reagents:** Freshly boiled & cooled water, 0.1N iodine solution, 1 N sulfuric acid, 1% Starch solution

**Procedure Sample:** 120 mg of Ascorbic Acid

**Titrimetric system:**

Mode : Direct titration
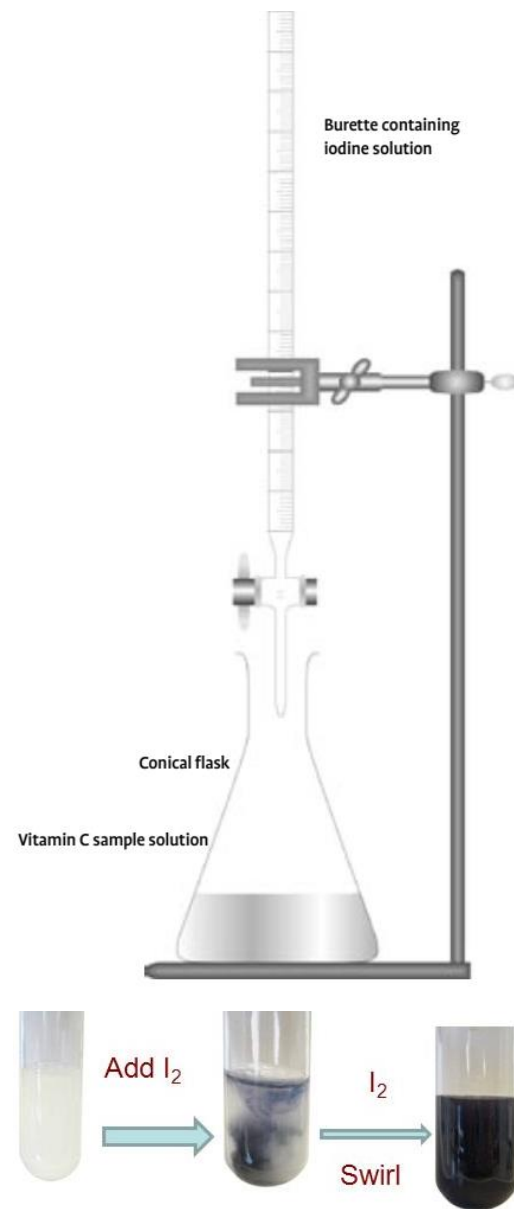
Titrant : 0.1 N $I_2$ solution
Endpoint detection : Visual, using indicator (1% starch solution)

Blank solution : 50 mL of freshly boiled & cooled water, 10 mL of 1N sulfuric acid, and 3 mL of 1% starch solution
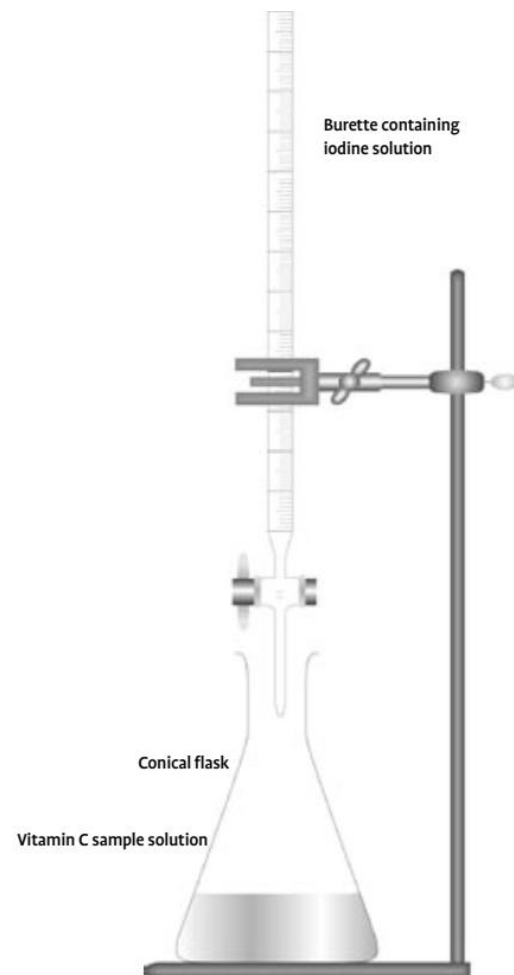
**Procedure**

**Blank estimation:** Take blank solution & titrate against 0.1 N $I_2$ solution. End point marked by appearance of blue color. Let the volume of titrant consume be B
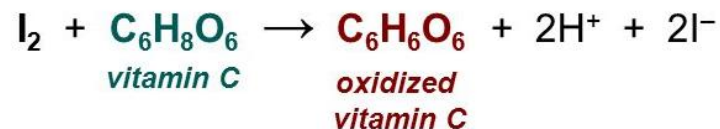
**Actual estimation:** Dissolve the given sample (120g of Ascorbic acid) in 50 mL of freshly boiled & cooled water. Then, add 10 mL of 1N sulfuric acid, and 3 mL of 1% starch solution. Titrate against 0.1 N $I_2$ solution until a persistent blue color is obtained. Let the volume of titrant consume be V. Then, calculate the percentage of ascorbic acid in the given sample

Burette containing iodine solution

Conical flask

Vitamin C sample solution

Add $I_2$

$I_2$

Swirl

## OBSERVATION :

| Blank Estimation : | | | | Actual Estimation | | | |
|---|---|---|---|---|---|---|---|
| Burette : 0.1 N $I_2$ Solution | | | | Burette : 0.1 N $I_2$ Solution | | | |
| Pipette : 10ml. 1 N $H_2 SO_4$ solution + 50 ml. Freshly boiled and cooled water. | | | | Pipette : Weigh sample + 50 ml. Freshly boiled and cooled water+ 10ml 1 N $H_2 SO_4$ | | | |
| Indicator : 1% starch solution. (1/4 TT) | | | | Indicator : 1% starch solution. (1/4 TT) | | | |
| Endpoint : Appearance of blue color | | | | Endpoint : Appearance of blue color | | | |
| Concurrent Burette Reading =A........ mL | | | | Concurrent Burette Reading = B....... mL | | | |
| I.B.R. | F.B.R. | Diff | Concurrent | I.B.R. | F.B.R. | Diff | Concurrent |
| 0 | 0.1 | 0.1 | | 0 | 10.1 | 10.1 | |
| 0 | 0.1 | 0-1 | 0-1 | 0 | 10 | 10 | 10.1 |
| 0 | 0.1 | 0.1 | | 0 | 10.1 | 10.1 | |
| 0 | 0.1 | 0-1 | | 0 | 10.1 | 10.1 | |



Burette containing iodine solution

Conical flask

Vitamin C sample solution

$$I_2 \ + \ C_6H_8O_6 \ \longrightarrow \ C_6H_6O_6 \ + \ 2H^+ \ + \ 2I^-$$

vitamin C      oxidized
vitamin C

1 eq $I_2$ ≡ 1 eq of Ascorbic acid

$$1N = \frac{1 \ gm.eq.}{1 \ L}$$

## CALCULATION :

| | |
|---|---|
| 1000 ml 1 N $I_2$ Solution | = 88 gm of / - ascorbic acid |
| 1 ml 0.1 N $I_2$ Solution | = 8.8 mg of / - ascorbic acid |
| (B-A) ml 0.1 N $I_2$ Solution. | = 8.8 X (B-A) mg of / - ascorbic acid |
| D | = _____ mg of / - ascorbic acid |

Now percentage purity of /-ascorbic acid = 100 X D/wt of sample

## RESULT:

Percentage purity of give sample of l-Ascorbic acid $= \dfrac{D}{120} \times 100$