

Data and observation

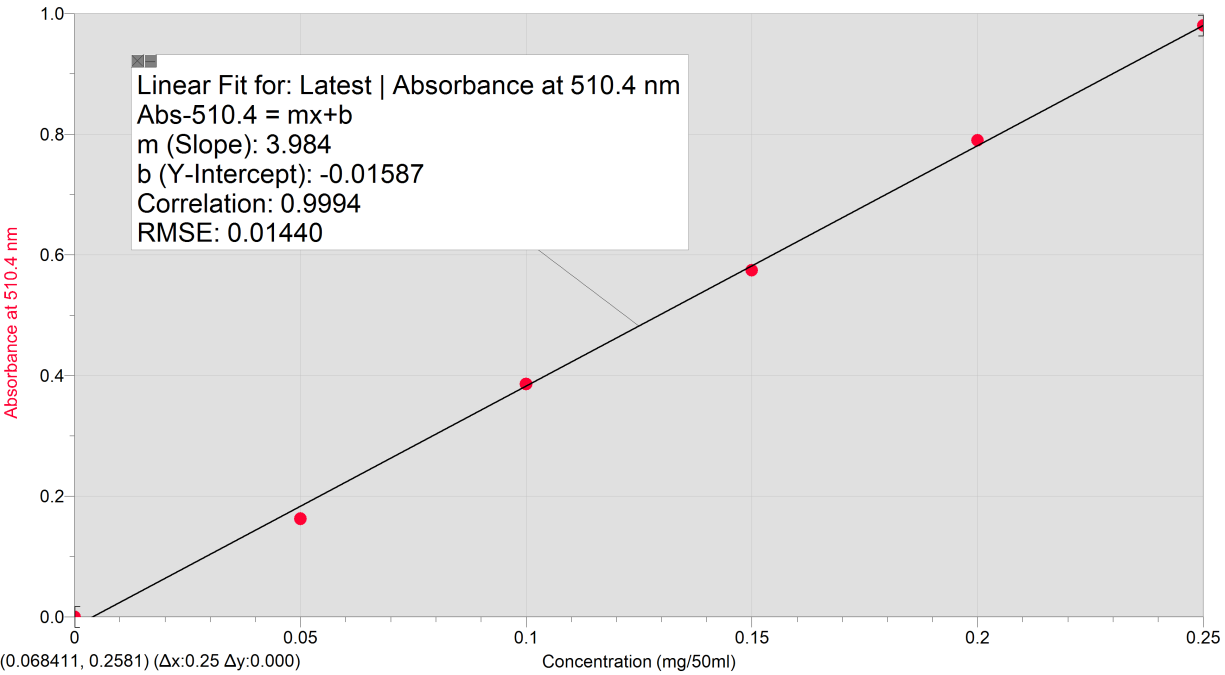


Figure 1 iron concentrantion v.s absorbance at 510.4nm light wavelength

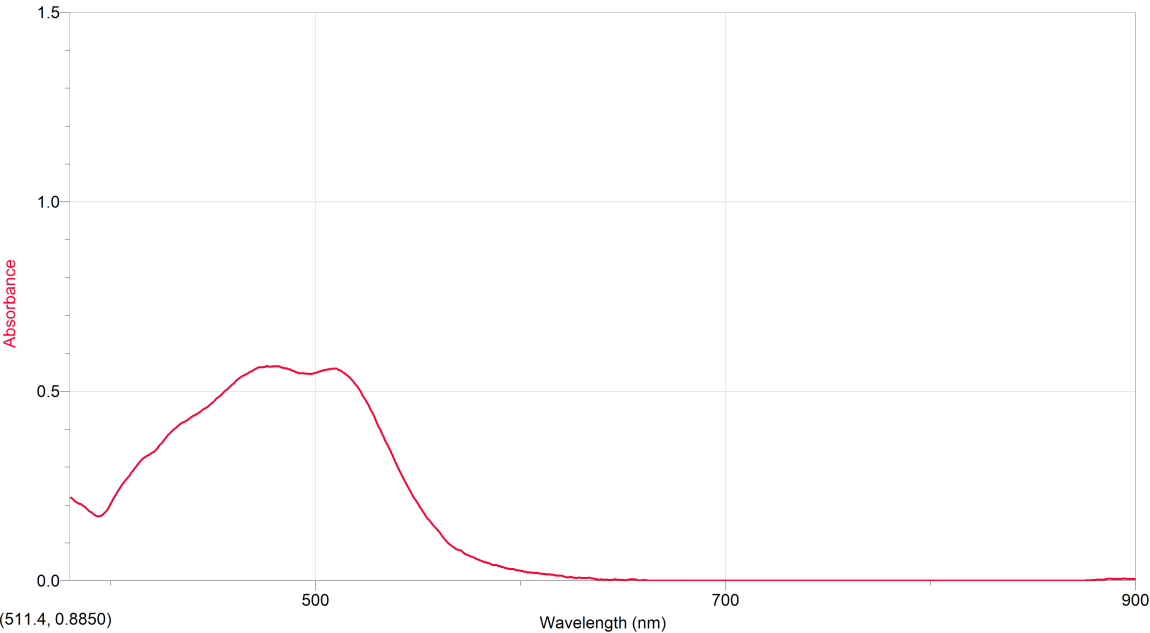


Figure 2

0	0
0.05	0.162554169819
0.1	0.385692805634
0.2	0.789903675158
0.15	0.574313157341
0.25	0.98024759223
unkwn	0.791
unkwn	0.887
avg	0.839

Table 1

Calculation

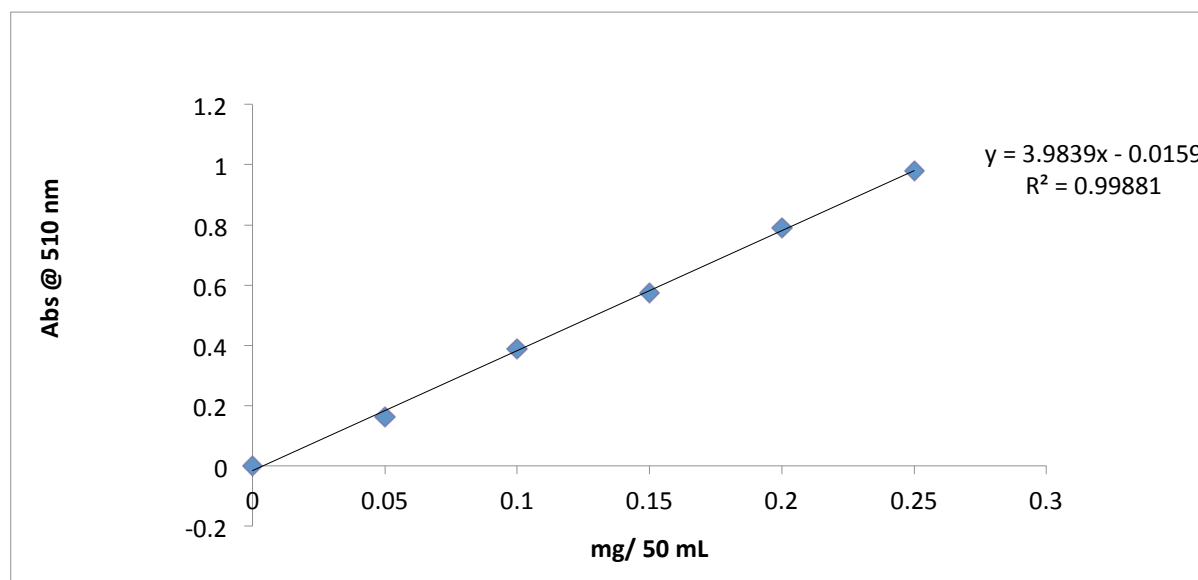


Figure 3 iron concentration v.s absorbance at 510.4nm light wavelength

concentration of unknown:

dilution factor:

$$(250/10)(50/25)=50$$

$$y = 3.984 x - 0.01587$$

$$0.839 = 3.984 x - 0.01587$$

$$x = \frac{0.839 + 0.01587}{3.984} = 0.2145758 \approx 0.215 \frac{\text{mg}}{50\text{ml}} = 0.00429 \frac{\text{mg}}{\text{mL}}$$

$$x(\text{concentration}) = 0.00429 \frac{\text{mg}}{\text{mL}} \times 50 = 0.214 \frac{\text{g}}{\text{L}}$$

relative spread:

$$\text{unkwn\#1}(\text{concentration}) = \frac{0.791+0.01587}{3.984} \times \frac{1}{50} \times 50 = 0.203 \frac{\text{g}}{\text{L}}$$

$$\text{unkwn\#2}(\text{concentration}) = \frac{0.887+0.01587}{3.984} \times \frac{1}{50} \times 50 = 0.227 \frac{\text{g}}{\text{L}}$$

$$\left(\frac{0.227 - 0.203}{0.214} \right) \times 1000 \text{ppt} = 112 \text{ppt}$$

relative error:

$$\left(\frac{0.214 - 0.1735}{0.1735} \right) \times 100\% = 23.3\%$$

extinction coefficient:

$$c = 0.214 \frac{\text{g}}{\text{L}} \times \frac{1}{55.845} \frac{\text{mol}}{\text{g}} = 0.003832 \frac{\text{mol}}{\text{L}}$$

$$0.839 = \epsilon * \left(0.003832 \frac{\text{mol}}{\text{L}} \right) * (1 \text{ cm})$$

$$\epsilon = \frac{0.839}{\left(0.003832 \frac{\text{mol}}{\text{L}} \right) * (1 \text{ cm})} = 219 \frac{\text{L}}{\text{cm} \cdot \text{mol}}$$

Discussion

When we were performing the last part of dilution on three of the six standard samples, we diluted them a little over the marked line. This resulted in a lower concentration than recorded concentration in Table 1.

And the wrong concentration had further lead to a smaller tangent (m) on the linear fit line in Figure 3, hence, when we use this linear function to calculate concentration of unknown samples, we should have a bigger m parameter than we did and our result would have been smaller and closer to 0.1735.