Experiment 3-080:Spectrophotometric Determination of Phosphate in a soft drink.

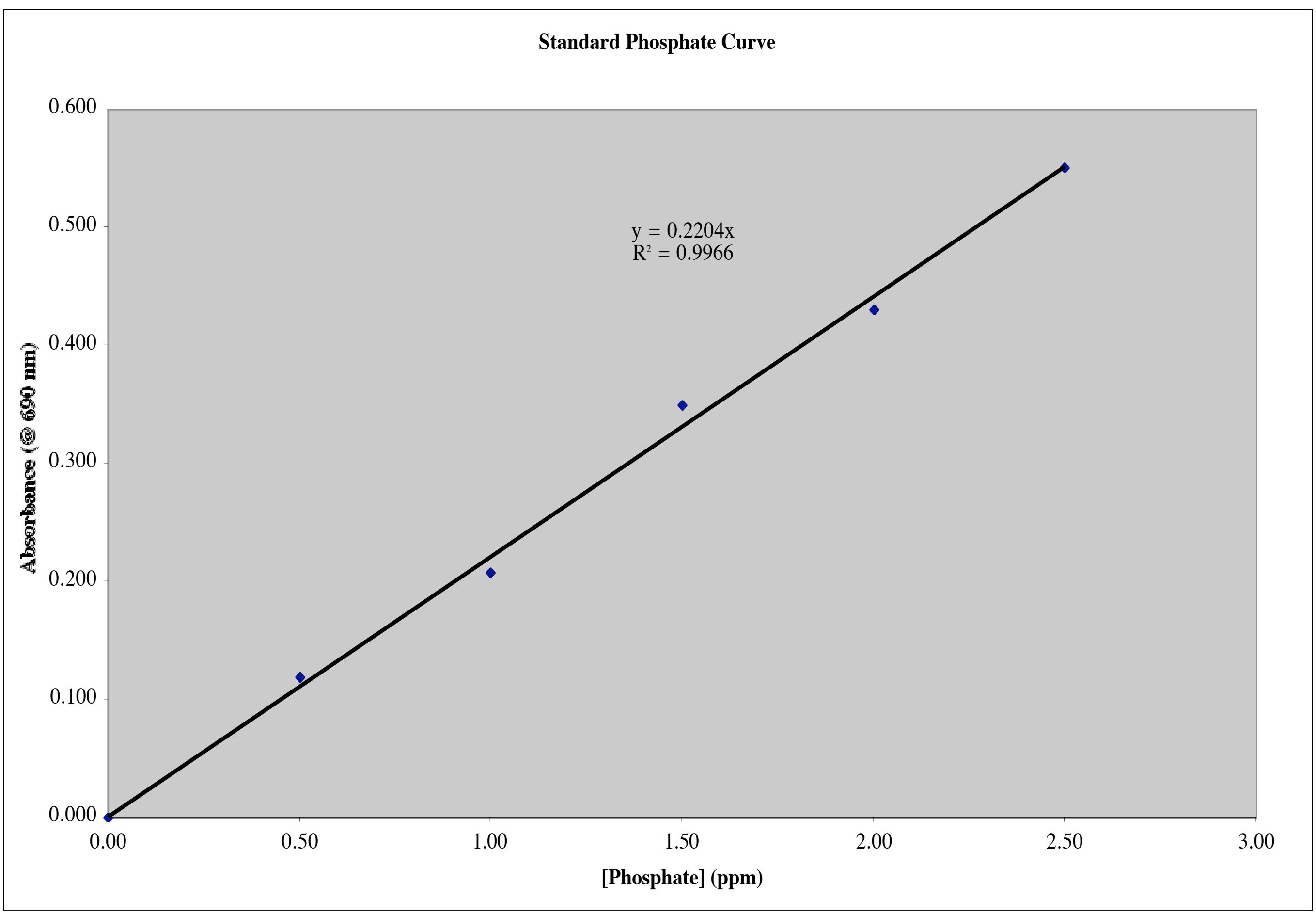
1. Spectroscopic analysis phosphate standard series and generation of a calibration curve:

The absorbance (@ 690 nm) of a standard series of phosphate solutions was measured and a calibration curve was generated by plotting phosphate concentration (ppm) of the standard series vs Absorbance (@ 690 nm).

Note: Absorbance was experimentally determined.

Phosphate Concentration (ppm)	Absorbance (@ 690 nm)
0.00	0.000
0.50	0.119
1.00	0.208
1.50	0.350
2.00	0.430
2.50	0.551

Calibration Curve:



Once a standard curve has been generated, one can use Beer's law to determine the concentration of an unknown concentration of phosphate:

$$A = \varepsilon l c$$

where A = Absorbance, ε = Absorptivity coefficient, l = path length of cuvette (1.00 cm, in our case) and c = concentration.

In our case, we can see that standard curve fits the linear equation:

$$y = mx$$

in which y = Absorbance (A), x = c and the slope of this line is "$\varepsilon\ l$", since l = 1.00 cm, then ε is equivalent to the slope of the graph of the best-fit line. Note the slope of the line = $\Delta y / \Delta x$.

Once ε has been determined, you can use Beer's law to determine the phosphate concentration of your soft drink sample.

2. Spectroscopic analysis of soft drink samples and calculation of the phosphate concentration in soft drink X.

e.g. For soft drink X, the Absorbance of 3 dilutions was measured:

Dilution	Absorbance (@ 690 nm)
1:10	>2.60
1:100	1.460
1:1000	0.146

Note, the 1:1000 dilution falls in the range of absorbances for the standard curve, so we will use that absorbance data (0.146) and the absorptivity coefficient from determined from standard curve (i.e. $\varepsilon = 0.2204\ cm^{-1}ppm^{-1}$).

Using Beer's law: $$A = \varepsilon l c$$

we can solve for c: $\boldsymbol{c} = 0.146/(1.00\ cm)(0.2204\ cm^{-1}ppm^{-1})$

$\boldsymbol{c} = 0.652$ ppm (for 1:1000 dilution)

so for the original soft drink sample

$$\boldsymbol{c} = 651 \text{ ppm}$$