METAL ANALYSIS BY ATOMIC ABSORPTION SPECTROSCOPY: CONCENTRATION OF SODIUM IN SPORTS DRINKS

Figure 1: A new AAS lamp (left) and a burnt out old AAS lamp (right)

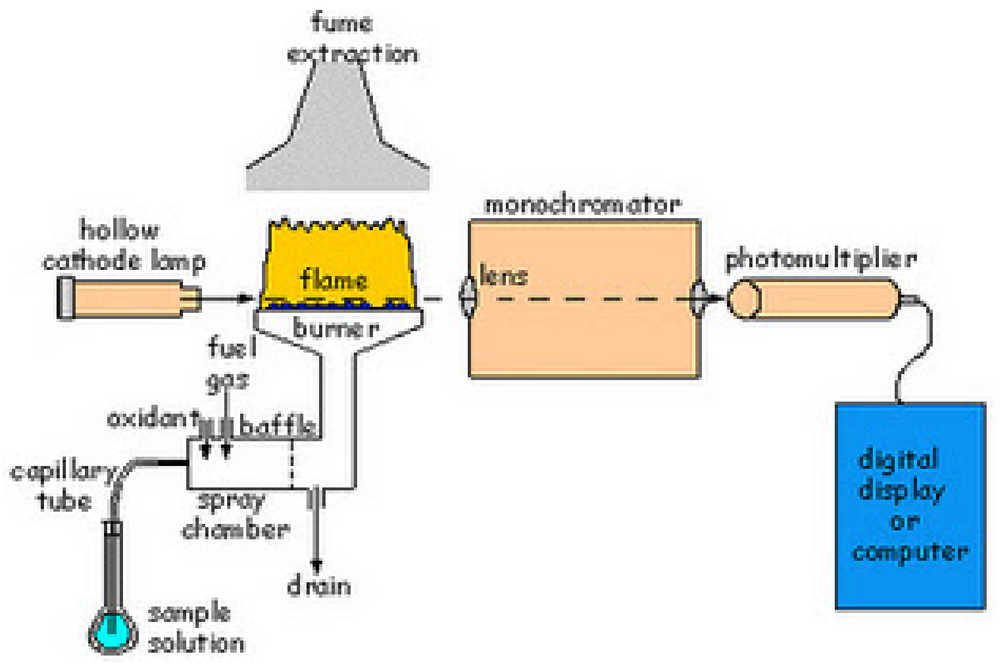


Figure 2: Schematic of a typical AAS instrument.

Element		Window	Current (mA)		Wavelength (nm)	Slit width (nm)	Relative Sensitivity	Relative Intensity
			Max	Recommended				
Na	Sodium	Pyrex	10	5	589.0	0.5	1	100
					589.6	0.5	2	60
					330.3	0.5	500	2
K	Potassium	Pyrex	10	5	766.5	1.0	1	100
					769.9	1.0	2	80
					404.4	0.5	400	5

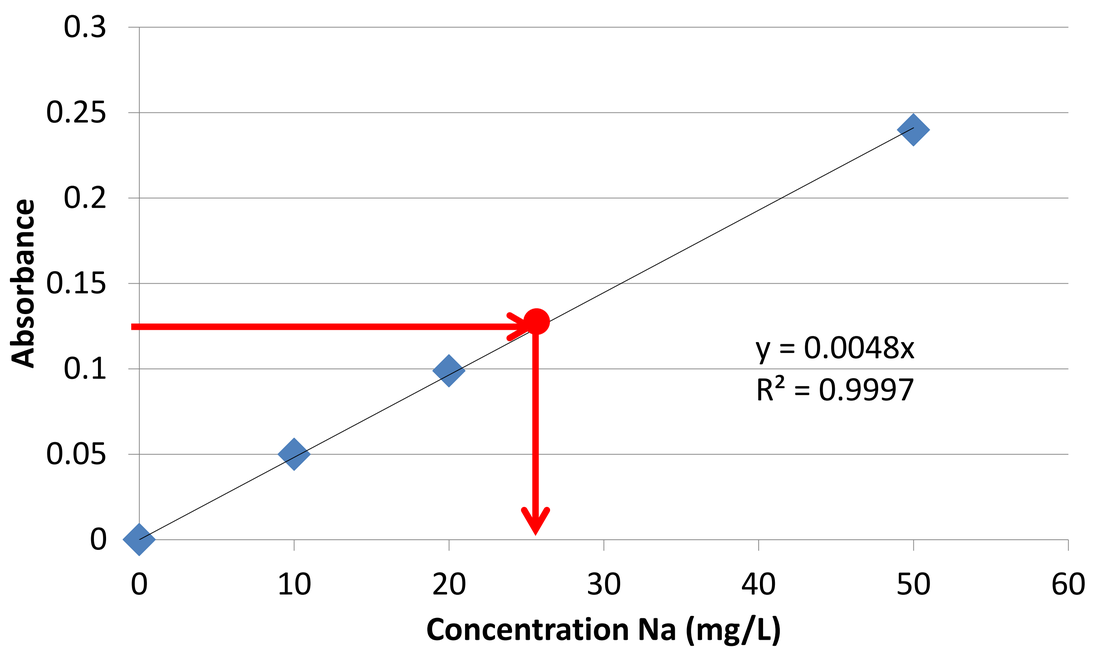
Window material is pyrex for elements with absorbing wavelengths above 300nm, quartz when used below 300nm. Relative sensitivity of alternate wavelengths is an approximate indication of the reduction in absorbance signal which may be expected relative to the most sensitive line. The most sensitive wavelength is assigned a value of 1. Alternative wavelengths are used to avoid sample dilution when the element is present in high concentrations. Relative intensity is an indication of the lamp signal intensity at each wavelength using the recommended current and slit. The most intense wavelength is assigned a value of 100.

Calibration Curves

A Calibration curve is used to determine the unknown concentration of an element, in this case sodium, in a solution. The instrument is calibrated by analysing the absorbance of several solutions of known concentrations. These are known as standard solutions. The absorbance of these solutions is directly proportional to concentration, so the higher the concentration, the higher the absorbance. This concept is known as the Beer-Lambert Law. A *linear* calibration curve is produced when the absorbance is plotted against the concentration of the standard solutions. The equation of this line can be displayed in the form y = mx + b.

Where:
y= absorbance
m= gradient of line
x= concentration (mg/L)
b= y intercept

This equation is rearranged and used to calculate the concentration (x) from the absorbance (y) of the unknown (sports drink).



Example Calculation using the absorbance of sports drink = 0.1224

Rearranging equation to solve for x
x = y / 0.0048
= 0.1224 / 0.0048
= 25.50 mg/L

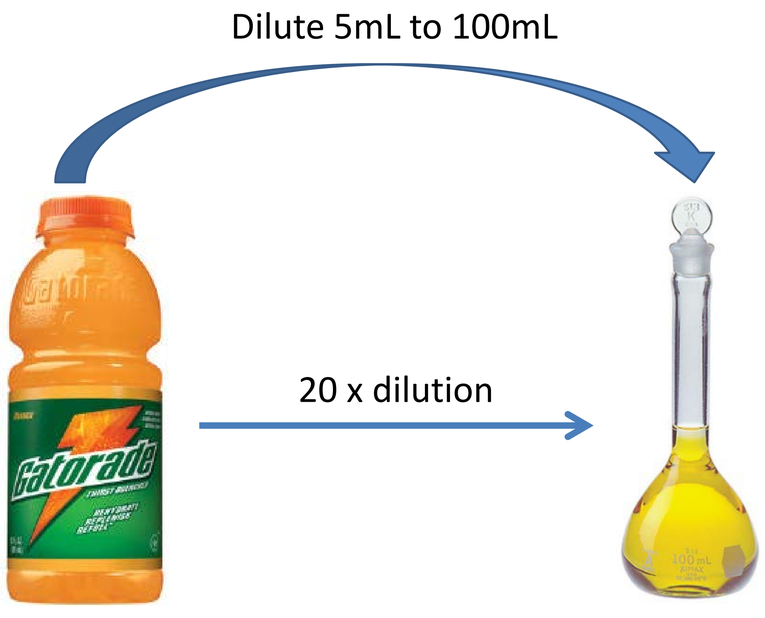
Dilution Calculations

The dilution must be taken into account to accurately calculate the concentration of sodium present in the sports drink

100 ÷ 5 = 20 fold dilution

e.g.
Concentration of **diluted** sample calculated
= 25.50 mg/L

Concentration of **original** sample in bottle
= 25.50 x 20
= 510 mg/L



Sports drink labels

The labels on the analysed sports drinks display the sodium concentration in mg/100mL and mg/600mL so convert to either of these to compare your results to the bottles.