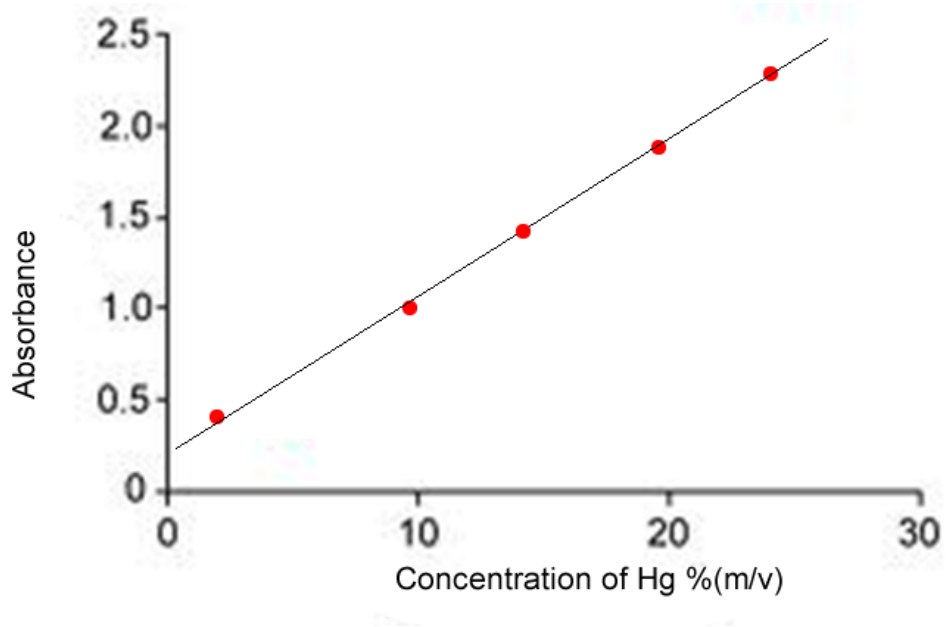
**Friday Worksheet** **Name: …….**
**UV-visible spectroscopy 1**

1) Food important routinely undergoes analysis. A 2.15 kilogram sample of black berries was analysed for heavy metal content, namely mercury. The sample was crushed and dissolved in 100.0 mL of 0.152 M HCl. The resulting solution was filtered into a 250 mL volumetric flask and thoroughly washed with distilled water. The solution in the volumetric flask was made to the mark by the addition of distilled water.
A 5.00 mL aliquot was taken from the volumetric flask and mixed with 15.0 mL of a 0.135 M sodium dithizonate ($C_{26}H_{22}N_8Na_2$) solution. A 2.00 mL sample of this final solution was then analysed using UV-visible colorimeter. The absorbance of this sample was measured at 1.50.

A calibration curve was previously constructed as shown below.




a) What is the concentration of Hg of the 2.00 mL sample tested in the colorimeter?
*15.0% (m/v)*

b) Calculate the mass of Hg in the volumetric flask?

*Before we start we must construct a flow chart. This is extremely helpful in retracing the steps taken to analyse the sample.*

*Step 1 Find the amount of Hg in the 2.00 mL sample analysed in the colorimeter*

*mass = 15.0/100 X 2.00 = 0.300g*

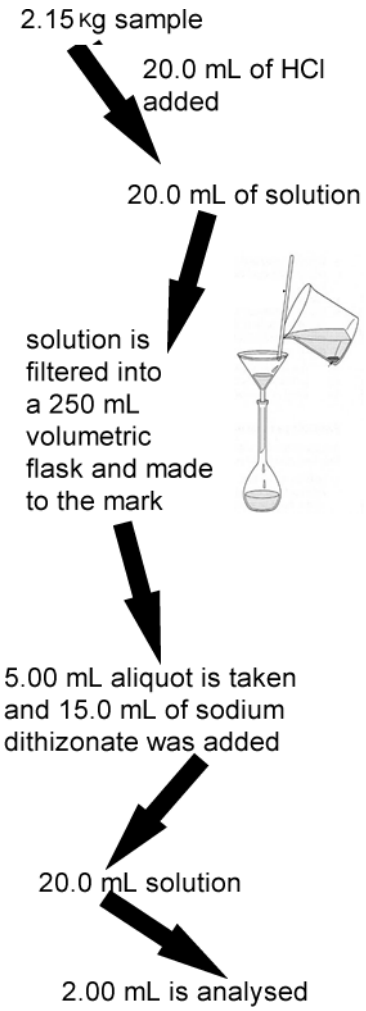
*Step 2 Find the mass of Hg in the 20.0 mL solution with sodium dithizonate.*

*0.300 X (20.0/2.00) = 3.00 g*

*Now keep in mind what was in the 20.0 mL solution came from 5.00 mL of the volumetric flask solution.*

*Step 3 Find the mass of Hg in the volumetric flask.*

*3.00g X (250/5) = 150.0 g*




c) Calculate the % m/m of Hg in the berries

*(150.0g/2,150) X 100 = 6.98% m/m*

d) Why does the calibration curve not pass through the origin?

*This is probably due to the absorbance of the solvent and or absorbance of the container.*

e) Both AAS spectroscopy and UV-Visible spectroscopy are used for analysis of solutions via absorption of electromagnetic radiation. How are they different?

*AAS is far more accurate than UV-Visible. Although both absorb wavelengths of light, UV-visible sends out a band or range of wavelengths. Say for example you select the colour red to send through the sample using the monochromators you will still select a band of wavelength from 600 to 650. With AAS, however, you select only the wavelength that is known to be absorbed specifically by the metal present in the solution. The specificity of the wavelength in AAS is achieved by using a metal cathode lamp that emits light that exactly matches the light absorbed by the metal in the sample.*

*Other differences include :*

*AAS is limited to metal ions in solution whereas UV-visible can do a range of compounds which include organic as well as transition metal ions which form coloured solutions.*

*AAS is far more expensive.*