Friday Worksheet   **Name: ……………….**
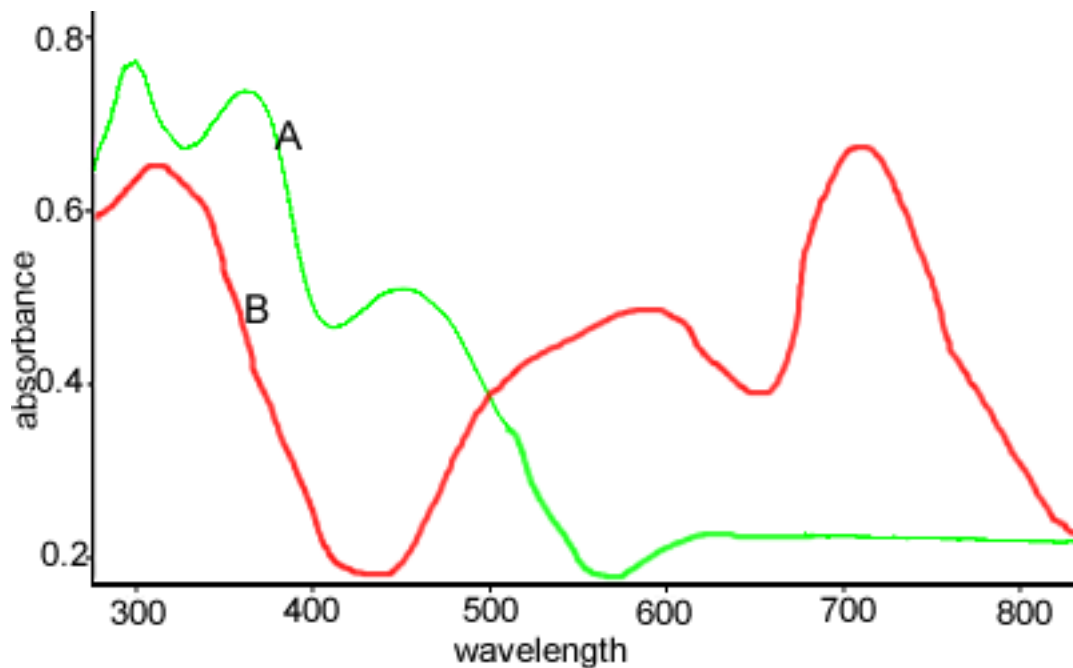
Analytical UV-visible worksheet 5

1) UV-visible spectroscopy was used to measure the spectra of two solutions,, one solution containing compound A and the other compound B. The analyst recorded the absorbance of each solution over a range of wavelengths on the same axes. The resultant absorbance spectrum is shown below.

a) If equal volumes of solution A and solution B were mixed, which wavelength should be used to measure the absorbance of Solution A in this mixture and which wavelength should be used to measure solution B? Justify your answer

>   A wavelength around 430 for solution A and 570 for solution A as these are the wavelengths significantly absorbed by the solution under investigation and least absorbed by the other solution.

b) A chemist used the appropriate wavelengths for each solution and constructed two calibration curves on the same set of axes, shown below.
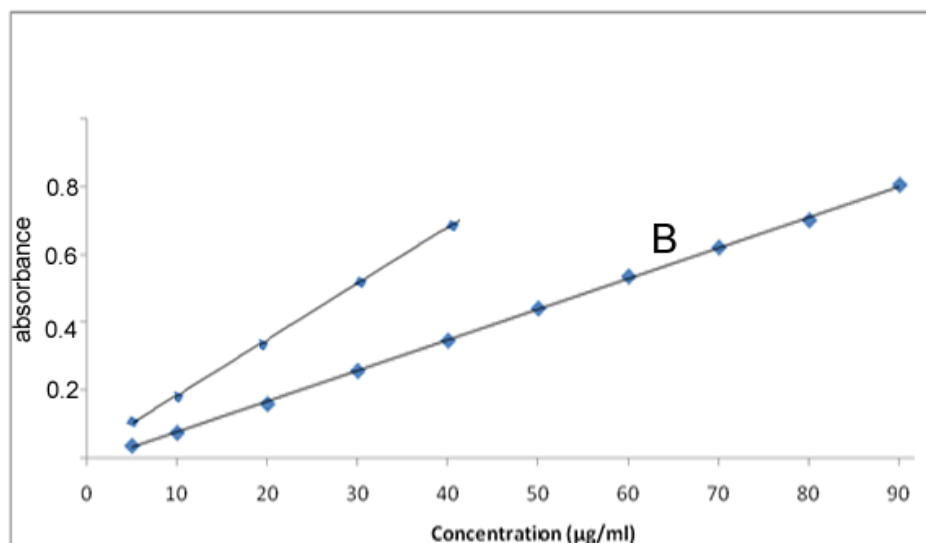
The chemist found that, when it was measured at the appropriate wavelength, Solution B had an absorbance of 0.375. If Solution B contained an organic substance with molecular formula $C_{23}H_{40}O_6N_3$, determine its concentration in mg L^{-1}.

An absorbance of 0.375 relates to a concentration of 40 µg/mL

Convert the units

$$1 \text{ µg} = 10^{-6}\text{grams} = 10^{-3} \text{ mg}$$
$$1\text{mL} = 10^{-3} \text{ L}$$

40 µg/mL = 4.0 X 10^5 mg/L

c) Calculate the molarity of the compound in solution B

(400 g / Fm) / L

(400/454) / L

= 0.88 M

d) A sample of contaminated water containing the same compound as found in solution A was analysed and found to have an absorbance of 0.80. Can the calibration curves above be used to analyse the sample of contaminated water for its concentration of the compound found in solution A? If your answer is yes, Justify your answer or if your answer is no offer a way that it can be used.

NO. Extrapolation is not accurate. The calibration curves are inaccurate if the absorbance falls beyond the range of the calibration curve, hence the calibration curve cannot be used for solution A unless the solution is diluted to bring it within range of the calibration curve for Solution A .