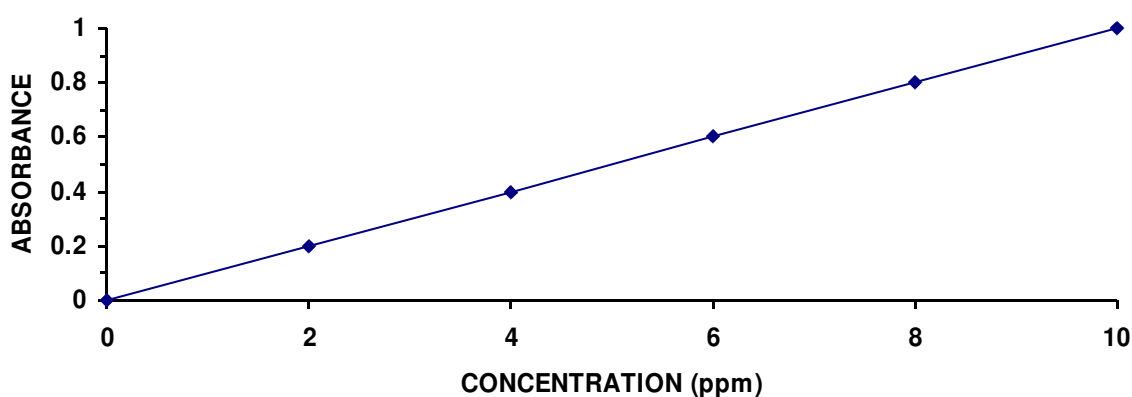


- 1.
- (a) Explain why only some wavelengths of light are absorbed in AAS. /2
  - (b) Describe the changes in the atom indicated by absorption and emission spectra. /2
  - (c) State and explain whether, for the same element, the wavelengths for absorption and for emission would be the same. /2
2. Magnesium is present in chlorophyll, the green pigment in plants, which is involved in photosynthesis. When sugar is extracted from sugar cane the crushing adds very small amounts of magnesium. How much is present is determined by AAS. Standard solutions containing magnesium are prepared; their concentrations covering the expected range of concentrations in the samples to be tested.

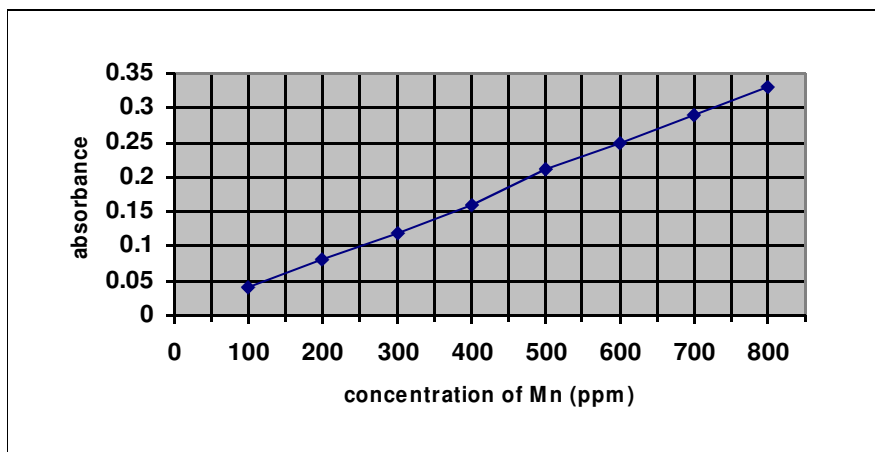


This graph is called a calibration curve and is now used for analysis.

Three samples were tested:

- 1, containing 0.39 g of sugar in 100 mL of water, gave an absorbance reading of 0.45 units.
  - 2, containing 0.53 g of sugar in 100 mL of water, gave an absorbance reading of 0.58 units.
  - 3, containing 0.71 g of sugar in 100 mL of water, gave an absorbance reading of 0.77 units.
- (a) State how ppm is related to  $\text{mg L}^{-1}$ ? /1
  - (b) Determine the concentration of magnesium in each sample, using the calibration curve. /3
  - (c) Calculate the amount, in grams, of magnesium present in each sample. /3
  - (d) Calculate the % of magnesium in each sample, and using the average, calculate the mass in grams of magnesium per tonne (1000 kg) of sugar. /3

3. To find the concentration of manganese ions in a sample, the absorbance of different solutions containing known concentrations of manganese ions was also measured. The results are shown in the graph below.



The absorbance reading for a 10 mL sample of manganese ions of unknown concentration is 0.18.

- (a) From the graph, determine the concentration of the manganese ions
- (i) in ppm /1
  - (ii) in  $\text{mg L}^{-1}$  /1
- (b) Determine the amount (in mg) of manganese ions in the 10 mL sample. /1
- (c) Manganese and other alloying metals can be analysed from one sample by AAS. Explain why the presence of other metal ions does not interfere with the analysis of manganese. /2

TOTAL /23