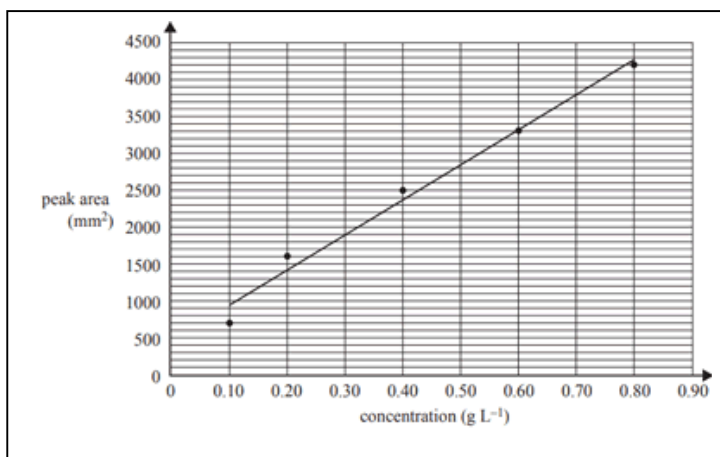


Friday worksheet – 9 – HPLC, volumetric analysis

1) High-performance liquid chromatography (HPLC) was used to determine the salt (NaCl) concentration in a sample taken from a can of sports drink. Standard solutions were made up using pure salt and deionised water. A 1 mL sample of each standard solution was injected into the HPLC column and its peak area was recorded and used to construct a calibration line of the concentration of salt against peak area as shown in the graph below.

A 10.0 mL sample of the sports drink was diluted to 100 mL in a 100 mL measuring cylinder. A 10.0 mL measuring cylinder was used to transfer a 10.0 mL volume of this into a 500 mL measuring cylinder and filled up to the 250 mL mark using deionised water. A small sample of this solution, around 1 mL, was then taken using a 5 mL syringe filled to the 1 mL mark, and injected into the HPLC column. The peak area of the sample solution at the same retention time and under the same conditions as those used to determine the calibration line was found to be 3300 mm².



- i. Determine the sucrose content of the sample tested in the HPLC, in grams per litre

- ii. Calculate the percentage mass/volume (% m/v) of sucrose in the 10.0 mL sample of sports drink

- iii. The can used to obtain the sample contained 330 mL of sport drink. Assuming that the only salt in the soft drink is NaCl, calculate the mass of salt in the can of sport drink.

- iv. Based on the results obtained, is the experimental method valid? Give your reasoning.

v. Identify a strength of the method and a weakness. Give a reason for each.

Strength –

Weakness –

2) The concentration of vitamin C in a filtered sample of grapefruit juice was determined by titrating the juice with 9.367×10^{-4} M iodine, I_2 , solution using starch solution as an indicator. The molar mass of vitamin C is 176.0 g mol^{-1} . The reaction can be represented by the following equation.



The following method was used:

1. Weigh a clean 250 mL conical flask.
2. Use a 10 mL measuring cylinder to measure 5 mL of grapefruit juice into the conical flask and reweigh it.
3. Add 20 mL of deionised water to the conical flask.
4. Add a drop of starch solution to the conical flask.
5. Titrate the diluted grapefruit juice against the I_2 solution

a) What impact would each of the following have on the calculation of the concentration of vitamin C in grapefruit juice?

- A. 10 mL of deionised water was added to the conical flask.
- B. The concentration of the I_2 solution was actually 8.972×10^{-4} M.
- C. The initial volume of the I_2 solution in the burette was 1.50 mL, but it was read as 2.50 mL.
- D. The balance was faulty and the measured mass of grapefruit juice was lower than the actual mass.
- E. The burette was washed with distilled water but not dried before use.

b) If the measured mass of grapefruit juice was 4.85 g and the titre was 21.50 mL, what was the measured percentage mass/mass (% m/m) concentration of vitamin C in the grapefruit juice, to the right number of significant figures?

c) Give one assumption made in this titration.

d) What difference would it make if the 5 mL of grapefruit juice was delivered with a 5 mL pipette as opposed to a 10 mL measuring cylinder.

e)



Give the balanced oxidation half equation

Give the balanced reduction half equation