Friday worksheet – 6 volumetric analysis

1) 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.

$$C_6H_8O_6(aq) + I_2(aq) \rightarrow C_6H_6O_6(aq) + 2H^+(aq) + 2I^-(aq)$$

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.