**Friday Worksheet**                                                      **Name:** ………………..

**Gravimetric worksheet 5**

1) A heat-resistant alloy composed of aluminium and iron is analysed to determine the percentage by mass of iron. An 90.50 g sample of alloy is dissolved in concentrated hydrochloric acid where the iron atoms are converted to $Fe^{2+}$(aq) ions. This solution is accurately transferred to a 250.0 mL volumetric flask and made up to the mark. 20.00 mL aliquots of this solution are then titrated against a standard 0.0395 M potassium permanganate solution.
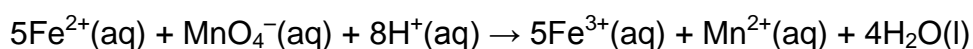
$5Fe^{2+}$(aq) + $MnO_4^-$(aq) + $8H^+$(aq) → $5Fe^{3+}$(aq) + $Mn^{2+}$(aq) + $4H_2O$(l)
Four titrations were carried out and the volumes of potassium permanganate solution used were recorded in the table below.

| Titration number | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Volume of $KMnO_4$ (mL) | 22.02 | 21.92 | 22.15 | 21.98 |

a. Write a balanced half-equation, including states, for the conversion of MnO4⁻ ions, in an acidic solution, to $Mn^{2+}$ ions.

b. Calculate the average volume, in mL, of the concordant titres of the potassium permanganate solution.

c. Use your answer to part b. to calculate the amount, in mol, of $MnO_4^-$ (aq) ions used in this titration.

d. Calculate the amount, in mol, of $Fe^{2+}$(aq) ions present in the 250.0 mL volumetric flask.

e. Calculate the percentage, by mass, of iron in the 90.50 g sample of alloy. Express your answer to the correct number of significant figures.