Mole Calculations – Redox Titration – Assignment Eleven

Question 1:

A student determined the percentage of iron in iron wire by titration with 0.020 mol/dm^3 potassium manganate(VII), $KMnO_4$, which is purple.

a)   A piece of iron wire was added to a previously weighed container which was then re-weighed.

Mass of container + iron wire = 7.39 g

Mass of container   = 5.74 g

Calculate the mass of iron wire used in the experiment: …………… g

The iron wire was placed in a conical flask as shown below. Sufficient dilute sulfuric acid was added to react completely with the iron wire. The flask was warmed to convert the iron into iron(II) ions, Fe^{2+}. The valve allows the gas to escape, but does not allow air to enter the flask.
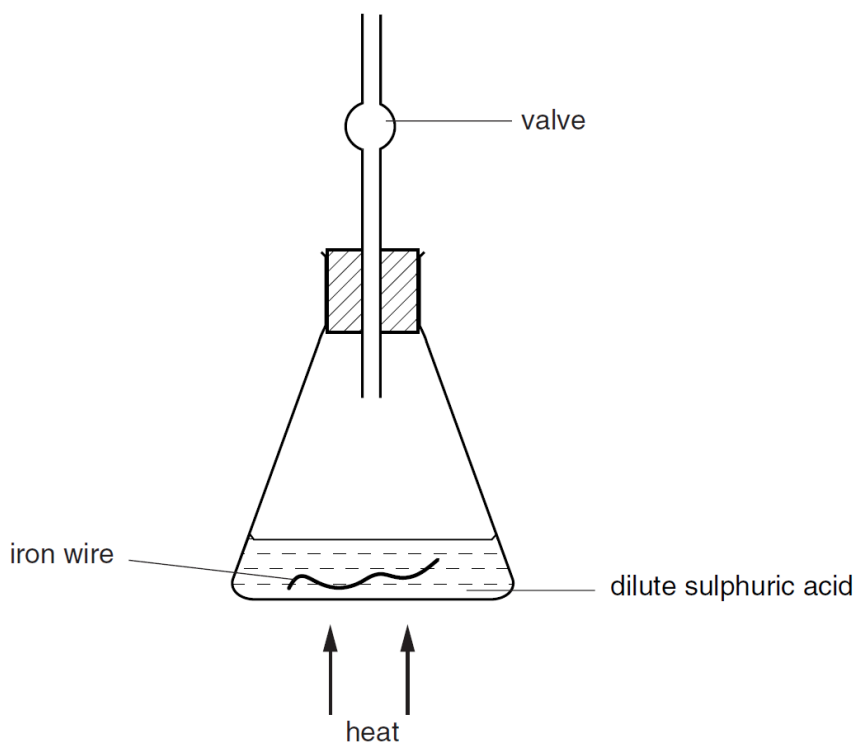
b) **i)** Why was it necessary to prevent the air from entering the flask?

....

ii) Write the balanced chemical equation for the reaction between the iron and sulfuric acid.

....

iii) Describe the qualitative test for the gas that is produced by the reaction between iron and sulfuric acid.

....

When all of the iron had reacted, the solution was cooled and made up to 250 cm^3 with dilute sulfuric acid. In a graduated flask. This was solution **P**.

A 25.0 cm^3 of this solution was pipetted into a conical flask for titration.

Then, 0.020 mol/dm^3 potassium manganate(VII) was added from a burette.

Three titrations were done. Parts of the burette with the levels of solution before and after each titration are shown below.
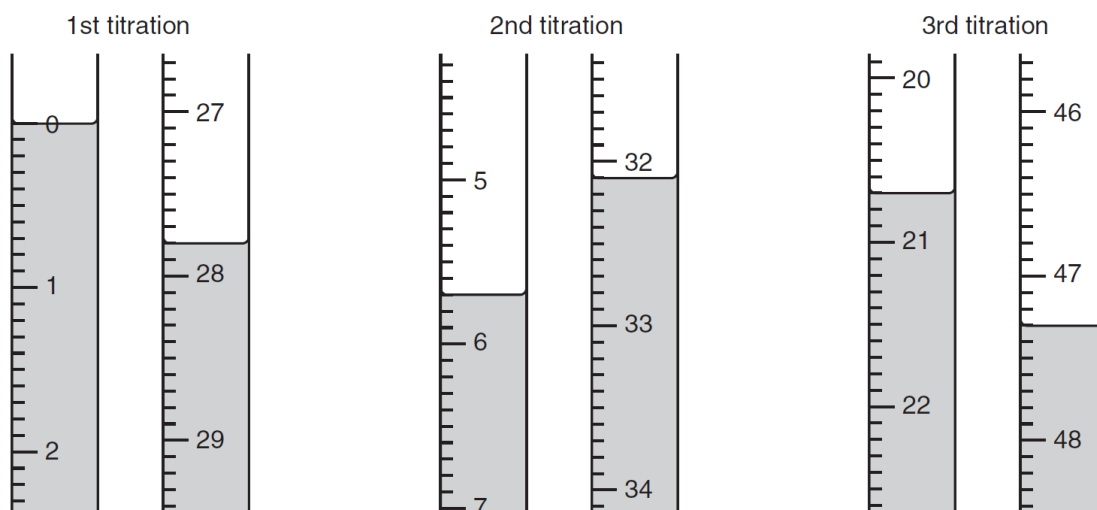
c) Use the diagrams to complete the results table.

| Titration Number	First	Second	Third
Final Burette Reading / cm^3			
Initial Burette Reading / cm^3			
Volume of 0.020 mol/dm^3 potassium manganate(VII) used / cm^3			
Best Titration Results (✓)			

Summary:

Tick the best titration results. Using these results, average the volume of 0.020 mol/dm^3 potassium manganate(VII) required was: .... cm^3

The volume of **P** used was 25.0 cm^3.

d)   Calculate how many moles were present in the average volume of 0.020 mol/dm^3 KMnO$_4$.

e)   The ionic equation for the reaction between acidified KMnO$_4$(aq) and FeSO$_4$(aq) during the titration is given below:

$$MnO_4^-(aq) + 5Fe^{2+}(aq) + 8H^+(aq) \rightarrow Mn^{2+}(aq) + 5Fe^{3+}(aq) + 4H_2O(l)$$
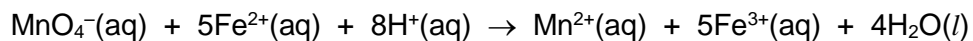
Calculate how many moles of Fe^{2+}(aq) were present in 25.0 cm^3 of solution **P**.

f)   Calculate how many moles of Fe^{2+}(aq) were in 250 cm^3 of solution **P**.

g)   Calculate the mass of iron in 250 cm^3 of solution **P**. (A_r Fe = 56.0).

h)   Using your answers to **a)** and **g)**, calculate the percentage of iron in the iron wire.

• Scan the QR code below for the answers to this assignment.

http://www.chemist.sg/mole/assignments/redox_titration_ans.pdf