

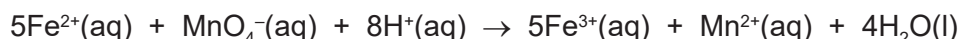
EXPERIMENT NO. 18

Quantitative analysis

Read through the whole method before starting any practical work. Where appropriate, prepare a table for your results in the space provided.

Show your working and appropriate significant figures in the final answer to **each** step of your calculations.

- 1 Iron(II) sulfate crystals, $\text{FeSO}_4 \cdot x\text{H}_2\text{O}$, contain water of crystallisation. You will carry out a titration to determine the value of x in the formula, where x is an integer. A solution containing a known mass of the crystals will be titrated with acidified aqueous potassium manganate(VII) of known concentration.



FA 1 contains 26.52 g dm^{-3} of hydrated iron(II) sulfate, $\text{FeSO}_4 \cdot x\text{H}_2\text{O}$.

FA 2 is $0.0200 \text{ mol dm}^{-3}$ potassium manganate(VII), KMnO_4 .

FA 3 is dilute sulfuric acid, H_2SO_4 .

(a) Method

- Fill the burette with **FA 2**.
- Pipette 25.0 cm^3 of **FA 1** into a conical flask.
- Use the 25 cm^3 measuring cylinder to transfer 25 cm^3 of **FA 3** into the same conical flask.
- Carry out a rough titration and record your burette readings in the space below.

The rough titre is cm^3 .

- Carry out as many accurate titrations as you think necessary to obtain consistent results.
- Make sure any recorded results show the accuracy of your practical work.
- Record in a suitable form below all your burette readings and the volume of **FA 2** added in each accurate titration.

I	
II	
III	
IV	
V	
VI	
VII	

[7]

- (b) From your accurate titration results, obtain a suitable value to be used in your calculations. Show clearly how you obtained this value.

25.0 cm³ of **FA 1** required cm³ of **FA 2**. [1]

(c) Calculations

- (i) Give your answers to (c)(ii), (c)(iii) and (c)(iv) to an appropriate number of significant figures. [1]
- (ii) Calculate the number of moles of potassium manganate(VII) present in the volume of **FA 2** calculated in (b).

moles of $\text{KMnO}_4 = \dots\dots\dots$ mol [1]

- (iii) Calculate the number of moles of iron(II) sulfate present in 1.00 dm³ of **FA 1**.

moles of $\text{FeSO}_4 = \dots\dots\dots$ mol [1]

- (iv) Calculate the mass of iron(II) sulfate present in 1.00 dm³ of **FA 1**.

mass of $\text{FeSO}_4 = \dots\dots\dots$ g [1]

- (v) Calculate the value of x in $\text{FeSO}_4 \cdot x\text{H}_2\text{O}$.

$x = \dots\dots\dots$ [2]

(d) Iron(II) sulfate in solution is readily oxidised by air to form iron(III) sulfate.

State the effect, on the value of x calculated in (c)(v), if some of your sample of **FA 1** had oxidised before you carried out the titration.
Explain your answer.

.....
.....
.....
..... [2]

[Total: 16]