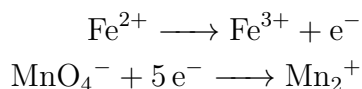


Procedure and data

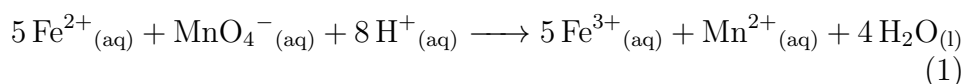
A small piece of steel wool is added to sulphuric acid H_2SO_4 . The solution is heated until the wool is dissolved, then passed through paper filter, approximately 200 ml of water is added and the solution goes to a thermostatic bath. Finally the solution is diluted to 250 ml and titrated.

The titration utilises potassium permanganate KMnO_4 , which also acts as the indicator.

- Half Equations



- Balanced equation



- Data

Mass of steel wool: 0,945 g

Solution	Volume $\text{KMnO}_4 \pm 0,1$ ml
0	16,6
1	16,3
2	15,9
Average	16,3 $\pm 0,4$

Calculations

Amount = Volume · Molar concentration $\Rightarrow n = 16,3\text{ml} \cdot 0,0197\text{mol/l} = 3,21 \cdot 10^{-4}\text{mol}$.

As per equation 1, the ratio of Fe^{2+} to MnO_4^- is 5:1, so the solution must contain following amount of Fe^{2+} :

$$n(\text{Fe}^{2+}) = 3,21 \cdot 10^{-4}\text{mol} \cdot 5 = 1,60 \cdot 10^{-3}\text{mol} \quad (2)$$

Given the molar mass of Fe, $M(\text{Fe}) = 55,8$ g/mol, $n(\text{Fe}^{2+})$ found previously, and only a tenth of the solution being utilised, we can calculate the estimated mass of Fe in the steel wool, $m(\text{Fe}^{2+})$:

$$m(\text{Fe}^{2+}) = M \cdot n = 55,8 \cdot 1,60 \cdot 10^{-3} \cdot 10 = 0,893\text{g} \quad (3)$$

Repeating the process for Solutions 0, 1 and 2 in order to establish margins of error, we have:

Solution	Volume $\text{KMnO}_4 \pm 0,1(\text{ml})$	Fe mass $\pm 0,001(\text{g})$	Fe mass percentage
0	16,6	0,912	96,6%
1	16,3	0,893	94,5%
2	15,9	0,874	92,5%
Average	16,3 $\pm 0,4$	0,893 $\pm 0,019$	94,5%

Considerations

The most obvious issue is the accuracy of our data, which presents an error of about 4% compared to the expected result 98,5%, however the precision of measurements of both the volume and mass is around 2% – well within the acceptable range.

One of the considerations as to why the percentage of mass of iron is lower than expected is a mistake in our procedure: wherein we did pour water through the filter in order to flush any leftover iron stuck on the filter.