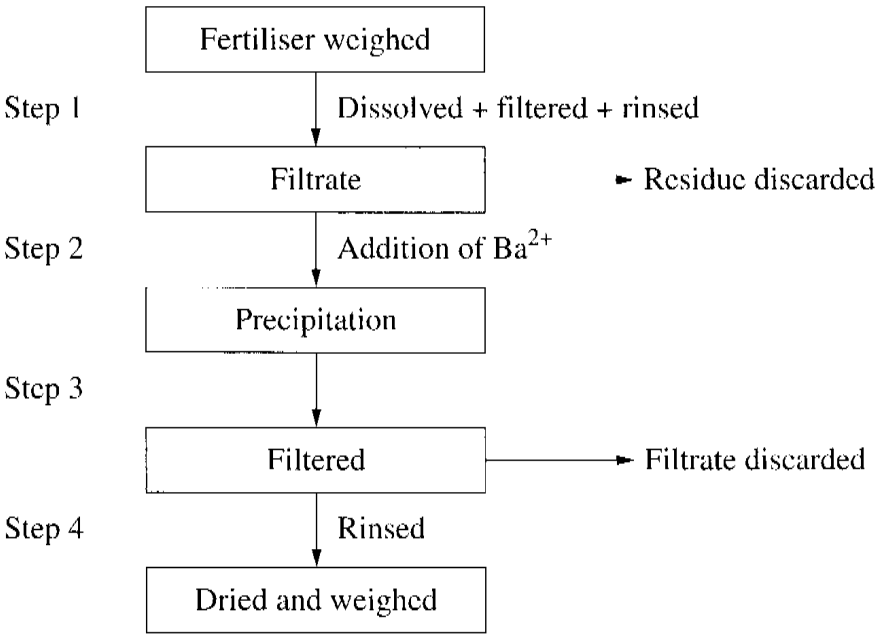
Question 29 (6 marks)

The flowchart shown outlines the process used to determine the amount of sulfate present in a sample of lawn fertiliser.



(a) What assumptions were made and how do these affect the validity of this process? **3**

An assumption was made that all the SO_4^{2-} ions were completely precipitated. Another assumption was made that the Ba^{2+} only precipitated the SO_4^{2-}. There may have CO_3^{2-} to precipitate with. Finally there was large assumption that all the $BaSO_4$ precipitate was caught as residue during filtration. There are lots assumptions to be making which lowers the validity of the process because the aim will not be accurately and reliably achieved. It will always be too high or too low (the SO_4^{2-})

(b) It was found that 4.25 g had a sulfate content of 35%.

What is the mass of the dried precipitate at Step 4? Include a chemical equation in your answer.

$4.25\text{ g} \times 35\% = 1.4875\text{ g}$

$\therefore n(SO_4^{2-}) = \frac{m}{M} = \frac{1.4875}{32.07 + 16 \times 4}$

$= 0.015483502\text{ mols}$

Some $BaSO_4 \rightarrow Ba^{2+} + SO_4^{2-}$

$n(BaSO_4) = 0.01548$

$\therefore m(BaSO_4) = (0.0154\ldots)(137.3 + 32.07 + 4 \times 16)$

$= 3.61\text{ g}$ (3 sig fig)