A 1.1105 g sample of bauxite (the primary ore of aluminium) was analysed for aluminium. The sample was pulverized and dissolved in concentrated nitric acid. The HNO_3 was removed by evaporation and solids dissolved in hot water with a very small quantity of nitric acid added. Insoluble solids were removed by gravity filtration. The solution was made basic by the slow addition of dilute NH_3 at which point a gelatinous solid precipitated ($Al(OH)_3$ and $Al_2O_3.xH_2O$). The precipitate was heated to coagulate it as much as possible then filtered over "fast" filter paper. The paper and solids were placed in a porcelain crucible and the paper ashed and precipitate "ignited" at 600°C to convert the precipitate to pure Al_2O_3. The mass of Al_2O_3 isolated was 0.3605 g. The average mass of ash remaining after charring 10 sheets of the identical filter paper was 0.0006 g. What is the percentage aluminium in the bauxite ore?

This is a good example of trawling through the question to find the relevant information and excluding the extraneous information.

All that is needed to find the percentage of aluminium in the bauxite is the mass of bauxite sample and the mass of Al_2O_3, which are 1.1105g and 0.3605g respectively.

Step 1 find the mole of Al_2O_3 present.

Formula mass (102)

=> mol of $A_2 0_3$= 0.3605 /102 = 3.53×10^{-3}

=> mol of Al = 7.07×10^{-3}

=> mass of Al = 54.0 X 7.07×10^{-3}=0.382g

Step 2 find the percentage by mass of Al in the bauxite.

=> (0.382 / 1.1105) X 100

=> 34.4%

A more challenging problem …Problem 2

1) A 0.8870 g sample containing only NaCl and KCl was treated with $AgNO_3$. The AgCl formed had a mass of 1.913 g. Calculate the %Na and %K in the sample.

The mol of AgCl = 1.913 / 143.5 = 1.33×10^{-2}

This is also the number of mol of Cl present in the 0.8870 g mixture of NaCl and KCl.

Let's say the percentage of Cl^- ions present in the mixture that came from NaCl was x%.
So the percent of Cl^- ions that came from KCl must be 100 – x.

n_{Cl} from NaCl = 1.33×10^{-2} X x%

n_{Cl} from KCl = 1.33×10^{-2} X (100 – x)%

So the 0.8870 g sample must be made up of
$x/100 \times 1.33 \times 10^{-2} \times (Fm_{NaCl}) + (100 - x)/100 \times 1.33 \times 10^{-2} \times (Fm_{KCl})$

=> $x/100 \times 1.33 \times 10^{-2} \times (Fm_{NaCl}) + (100 - x)/100 \times 1.33 \times 10^{-2} \times (Fm_{KCl}) = 0.8870$

Multiply both sides by 100

=> $x \times 1.33 \times 10^{-2} \times (Fm_{NaCl}) + (100 - x) \times 1.33 \times 10^{-2} \times (Fm_{KCl}) = 88.70$

=> $x \times 1.33 \times 10^{-2} \times (58.5) + (100 - x) \times 1.33 \times 10^{-2} \times (74.6) = 88.70$

=> 0.778x + 99.2 – 0.992x = 88.7

=> - 0.214x = -10.5

=> x = 49.0

So Nacl forms 49.0% of the mass of the mixture and KCl forms the remaining 51.0%