

In the second experiment, a student is given 2.94 g of a mixture containing anhydrous MgCl_2 and KNO_3 . To determine the percentage by mass of MgCl_2 in the mixture, the student uses excess $\text{AgNO}_3(aq)$ to precipitate the chloride ion as $\text{AgCl}(s)$.

- (d) Starting with the 2.94 g sample of the mixture dissolved in water, briefly describe the steps necessary to quantitatively determine the mass of the AgCl precipitate.

<p>Add excess AgNO_3.</p> <ul style="list-style-type: none"> - Separate the AgCl precipitate (by filtration). - Wash the precipitate and dry the precipitate completely. - Determine the mass of AgCl by difference. 	<p>Two points are earned for <u>all three major steps</u>: filtering the mixture, drying the precipitate, and determining the mass by difference.</p> <p>One point is earned for any two steps.</p>
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- (e) The student determines the mass of the AgCl precipitate to be 5.48 g. On the basis of this information, calculate each of the following.

- (i) The number of moles of MgCl_2 in the original mixture

$5.48 \text{ g AgCl} \times \frac{1 \text{ mol AgCl}}{143.32 \text{ g AgCl}} = 0.0382 \text{ mol AgCl}$ $0.0382 \text{ mol AgCl} \times \frac{1 \text{ mol Cl}}{1 \text{ mol AgCl}} \times \frac{1 \text{ mol MgCl}_2}{2 \text{ mol Cl}} = 0.0191 \text{ mol MgCl}_2$	<p>One point is earned for calculating the number of moles of AgCl.</p> <p>One point is earned for conversion to moles of MgCl_2.</p>
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- (ii) The percent by mass of MgCl_2 in the original mixture

$0.0191 \text{ mol MgCl}_2 \times \frac{95.20 \text{ g MgCl}_2}{1 \text{ mol MgCl}_2} = 1.82 \text{ g MgCl}_2$ $\frac{1.82 \text{ g MgCl}_2}{2.94 \text{ g sample}} \times 100\% = 61.9\% \text{ MgCl}_2 \text{ by mass}$	<p>One point is earned for calculating the correct percentage.</p>
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