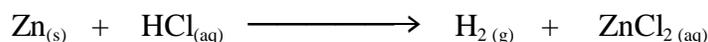


Acid – Base Stoichiometry

- The concentration of hydrochloric acid in the human stomach is approximately 0.10 mol dm^{-3} . Excess of this acid causes discomfort referred to as 'heartburn' or 'acid indigestion'. Remedies designed to neutralize some of this excess acid often contain compounds such as magnesium hydroxide, Mg(OH)_2 , and sodium hydrogencarbonate, NaHCO_3 .
 - Write a balanced chemical equation for the reaction of Mg(OH)_2 with hydrochloric acid.
 - Calculate the number of moles of hydrochloric acid which can be neutralized by 1.00 g of magnesium hydroxide.
 - Calculate the volume of $0.100 \text{ mol dm}^{-3}$ HCl which can be neutralized by 1.00 g of magnesium hydroxide, giving your answer to 3 significant figures.
- A household cleaner contains aqueous ammonia, $\text{NaOH}_{(\text{aq})}$. A 2.447 g sample of the cleaner is diluted with water to 20.00 cm^3 . This solution requires 28.51 cm^3 of $0.4040 \text{ mol dm}^{-3}$ sulphuric acid, $\text{H}_2\text{SO}_{4(\text{aq})}$.
 - Write a balanced equation for the neutralisation of sodium hydroxide solution with sulphuric acid to form sodium sulphate.
 - Calculate the number of moles of sulphuric acid used in the neutralisation.
 - Calculate the number of moles of sodium hydroxide neutralised by the sulphuric acid.
 - Calculate the mass of sodium hydroxide neutralised by the sulphuric acid.
 - Calculate the percentage by mass of sodium hydroxide present in the household cleaner.
- If 5.25 g of barium hydroxide is to be neutralized with phosphoric acid, 0.200 mol L^{-1} according to the equation:
$$\text{Ba(OH)}_2_{(\text{aq})} + \text{H}_3\text{PO}_4_{(\text{aq})} \longrightarrow \text{Ba}_3(\text{PO}_4)_2_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})}$$
 - Balance the above equation.
 - What volume of acid would be required for complete reaction?
- How many grams of $\text{Ca(NO}_3)_2$ can be prepared by reacting 125 mL of 5.00 M HNO_3 with 5.55 g of Ca(OH)_2 ?
$$\text{HNO}_3_{(\text{aq})} + \text{Ca(OH)}_2_{(\text{s})} \longrightarrow \text{Ca(NO}_3)_2_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})}$$

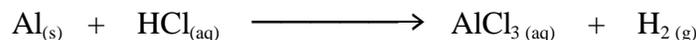
(Balance ???, think Limiting reactant???)

5. Zinc metal reacts with $\text{HCl}_{(\text{aq})}$, according to the following equation:



Determine the mass of zinc that is required to completely react with 75.0 mL of 3.0 M HCl.

6. Calculate the volume of 1.50 M HCl that is required for 5.40 g of Al to react completely.



7. An Alka-Seltzer tablet contains hydrogen carbonate, citric acid, and an analgesic (painkiller). When water is added, the hydrogen ions from the citric acid react with the hydrogen carbonate ion as follows:



If an Alka-Seltzer tablet contains 1.65 g of sodium hydrogen carbonate, $\text{NaHCO}_{3(\text{s})}$, and is reacted with 2.00 mol L^{-1} hydrochloric acid, $\text{HCl}_{(\text{aq})}$, according to the above equation,

- What volume of hydrochloric acid is required for complete reaction?
 - Suggest why citric acid is used rather than any other acid.
8. Tums, essentially calcium carbonate, CaCO_3 , on the market are sold as an antacid. A tablet of Tums was crushed and reacted with hydrochloric acid, $\text{HCl}_{(\text{aq})}$. 28.50 mL of 0.200 mol L^{-1} hydrochloric acid was required to completely neutralize one of the Tums tablet.
- Write a balanced equation for the reaction of the Tums tablet, ($\text{CaCO}_{3(\text{s})}$) with hydrochloric acid, $\text{HCl}_{(\text{aq})}$.
 - Determine the mols of hydrochloric acid consumed.
 - Determine the mols of Tums consumed.
 - Determine the mass of the $\text{CaCO}_{3(\text{s})}$ in each of the Tums tablet.
9. Copper (II) nitrate, $\text{Cu}(\text{NO}_3)_2$, can be prepared by reacting nitric acid, $\text{HNO}_{3(\text{aq})}$, with copper metal.
- Write a balanced chemical equation.
- A student carries out this reaction by adding 0.0345 mol of copper(II) oxide to 36.0 cm^3 of 1.15 mol L^{-1} nitric acid solution.
- Calculate the amount (in mol) of nitric acid.
 - Identify the limiting reactant.
 - Determine the number of mols of copper (II) nitrate that is formed in this reaction.
 - Determine the mass of copper (II) nitrate that is formed in this reaction.