

Topic 5: Acids and Bases

Knowledge	Application
-----------	-------------

Subtopic 5.1: Acid–Base Concepts

Acids are compounds or ions that donate protons, whereas bases are compounds or ions that accept protons, which are H ⁺ ions. The reactions between acids and bases can be represented using chemical equations that illustrate the transfer of protons.	Write equations showing proton transfer between an acid and a base. Identify the conjugate acid–base pairs given the equation for a proton-transfer reaction.
Acid–base indicators are weak acids or bases where the acidic form is of a different colour from the basic form. Acids can be classified as monoprotic or polyprotic, depending on the number of protons available for donation.	Given the structural formula of an acid, classify it as monoprotic, diprotic, or triprotic.

Subtopic 5.2: Reactions of Acids and Bases

The oxides of non-metals are commonly acidic and generate oxyacids when dissolved in water. Metal oxides are commonly basic.	Draw structural formulae for CO ₂ , SO ₂ and SO ₃ , H ₂ SO ₃ , H ₂ SO ₄ , and H ₃ PO ₄ . Write equations for the reactions with water of CO ₂ , SO ₂ , SO ₃ , and P ₄ O ₁₀ . Write equations for the reactions with water of Na ₂ O, K ₂ O, and CaO.
Similarities in the reactions of different acids with bases (metal oxides, hydroxides, and carbonates) allow products to be predicted from known reactants. Neutralisation is an exothermic reaction. The strength of acids is explained by the degree of ionisation in aqueous solution.	Identify the products obtained and write full and ionic equations for reactions between a given acid and a nominated metal oxide, hydroxide, carbonate, or hydrogencarbonate. Undertake stoichiometric calculations for reactions between acids and bases.

Subtopic 5.3: The pH Scale

The pH scale is a logarithmic scale that describes the concentration of hydrogen ions in aqueous solutions. Solutions with pH < 7 are acidic, solutions with pH > 7 are basic, and solutions with pH = 7 are neutral. CO ₂ dissolves in rainwater to form carbonic acid, which is a weak acid, giving rainwater a pH of about 5.6. Oxides of sulfur and nitrogen in the atmosphere can produce rain with a pH below 5.6.	Undertake calculations using the relationship $\text{pH} = -\log [\text{H}^+]$ and its rearrangements. Write equations for the reaction of CO ₂ with water to produce hydrogen ions. Write equations for the reactions of oxides of sulfur and nitrogen with water that lead to acid rain. Examine the human activities that can cause acid rain to form and the strategies used to prevent this from happening.
--	--