Syllabus checklist

MODULE 5 Equilibrium and Acid Reactions

CH12-12

What happens when chemical reactions do not go through to completion?

- [ ] conduct practical investigations to analyse the reversibility of chemical reactions, for example:...
- [ ] model static and dynamic equilibrium and analyse the differences between open and closed systems (ACSCH079, ACSCH091)
- [ ] analyse examples of non-equilibrium systems in terms of the effect of entropy and enthalpy, for example:...
- [ ] investigate the relationship between collision theory and reaction rate in order to analyse chemical equilibrium reactions (ACSCH070, ACSCH094)

What factors affect equilibrium and how?

- [ ] investigate the effects of temperature, concentration, volume and/or pressure on a system at equilibrium and explain how Le Chatelier's principle can be used to predict such effects, for example:...
- [ ] explain the overall observations about equilibrium in terms of the collision theory (ACSCH094)
- [ ] examine how activation energy and heat of reaction affect the position of equilibrium

How can the position of equilibrium be described and what does the equilibrium constant represent?

- [ ] deduce the equilibrium expression (in terms of Keq) for homogeneous reactions occurring in solution (ACSCH079, ACSCH096)
- [ ] perform calculations to find the value of Keq and concentrations of substances within an equilibrium system, and use these values to make predictions on the direction in which a reaction may proceed (ACSCH096)
- [ ] qualitatively analyse the effect of temperature on the value of Keq (ACSCH093)
- [ ] conduct an investigation to determine Keq of a chemical equilibrium system, for example:...
- [ ] explore the use of Keq for different types of chemical reactions, including but not limited to:...

How does solubility relate to chemical equilibrium?

- [ ] describe and analyse the processes involved in the dissolution of ionic compounds in water
- [ ] investigate the use of solubility equilibria by Aboriginal and Torres Strait Islander Peoples when removing toxicity from foods, for example:...
- [ ] conduct an investigation to determine solubility rules, and predict and analyse the composition of substances when two ionic solutions are mixed, for example:...
- [ ] derive equilibrium expressions for saturated solutions in terms of Ksp and calculate the solubility of an ionic substance from its Ksp value
- [ ] predict the formation of a precipitate given the standard reference values for Ksp

MODULE 6 Acid/Base Reactions

CH12-13

What is an acid and what is a base?

- [ ] investigate the correct IUPAC nomenclature and properties of common inorganic acids and bases (ACSCH067)
- [ ] conduct an investigation to demonstrate the preparation and use of indicators as illustrators of the characteristics and properties of acids and bases and their reversible reactions (ACSCH101)
- [ ] predict the products of acid reactions and write balanced equations to represent:...
- [ ] investigate applications of neutralisation reactions in everyday life and industrial processes
- [ ] conduct a practical investigation to measure the enthalpy of neutralisation (ACSCH093)
- [ ] explore the changes in definitions and models of an acid and a base over time to explain the limitations of each model, including but not limited to:...

What is the role of water in solutions of acids and bases?

- [ ] conduct a practical investigation to measure the pH of a range of acids and bases
- [ ] calculate pH, pOH, hydrogen ion concentration ([H+]) and hydroxide ion concentration ([OH−]) for a range of solutions (ACSCH102)
- [ ] conduct an investigation to demonstrate the use of pH to indicate the differences between the strength of acids and bases (ACSCH102)
- [ ] write ionic equations to represent the dissociation of acids and bases in water, conjugate acid/base pairs in solution and amphiprotic nature of some salts, for example:...
- [ ] construct models and/or animations to communicate the differences between strong, weak, concentrated and dilute acids and bases (ACSCH099)
- [ ] calculate the pH of the resultant solution when solutions of acids and/or bases are diluted or mixed

How are solutions of acids and bases analysed?

- [ ] conduct practical investigations to analyse the concentration of an unknown acid or base by titration
- [ ] investigate titration curves and conductivity graphs to analyse data to indicate characteristic reaction profiles, for example:...
- [ ] model neutralisation of strong and weak acids and bases using a variety of media
- [ ] calculate and apply the dissociation constant (Ka) and pKa (pKa = -log10 (Ka)) to determine the difference between strong and weak acids (ACSCH098)
- [ ] explore acid/base analysis techniques that are applied:...
- [ ] conduct a chemical analysis of a common household substance for its acidity or basicity (ACSCH080) , for example:...
- [ ] conduct a practical investigation to prepare a buffer and demonstrate its properties (ACSCH080)
- [ ] describe the importance of buffers in natural systems (ACSCH098, ACSCH102)

Syllabus checklist

MODULE 7 Organic Chemistry

CH12-14

How do we systematically name organic chemical compounds?

- [ ] investigate the nomenclature of organic chemicals, up to C8, using IUPAC conventions, including simple methyl and ethyl branched chains, including: (ACSCH127)
- [ ] explore and distinguish the different types of structural isomers, including saturated and unsaturated hydrocarbons, including: (ACSCH035)

How can hydrocarbons be classified based on their structure and reactivity?

- [ ] construct models, identify the functional group, and write structural and molecular formulae for homologous series of organic chemical compounds, up to C8 (ACSCH035) :...
- [ ] conduct an investigation to compare the properties of organic chemical compounds within a homologous series, and explain these differences in terms of bonding (ACSCH035)
- [ ] analyse the shape of molecules formed between carbon atoms when a single, double or triple bond is formed between them
- [ ] explain the properties within and between the homologous series of alkanes with reference to the intermolecular and intramolecular bonding present
- [ ] describe the procedures required to safely handle and dispose of organic substances (ACSCH075)
- [ ] examine the environmental, economic and sociocultural implications of obtaining and using hydrocarbons from the Earth

What are the products of reactions of hydrocarbons and how do they react?

- [ ] investigate, write equations and construct models to represent the reactions of unsaturated hydrocarbons when added to a range of chemicals, including but not limited to:...
- [ ] investigate, write equations and construct models to represent the reactions of saturated hydrocarbons when substituted with halogens

How can alcohols be produced and what are their properties?

- [ ] investigate the structural formulae, properties and functional group including:...
- [ ] explain the properties within and between the homologous series of alcohols with reference to the intermolecular and intramolecular bonding present
- [ ] conduct a practical investigation to measure and reliably compare the enthalpy of combustion for a range of alcohols
- [ ] write equations, state conditions and predict products to represent the reactions of alcohols, including but not limited to (ACSCH128, ACSCH136):...
- [ ] investigate the production of alcohols, including:...
- [ ] investigate the products of the oxidation of primary and secondary alcohols
- [ ] compare and contrast fuels from organic sources to biofuels, including ethanol

What are the properties of organic acids and bases?

- [ ] investigate the structural formulae, properties and functional group including:...
- [ ] explain the properties within and between the homologous series of carboxylic acids amines and amides with reference to the intermolecular and intramolecular bonding present
- [ ] investigate the production, in a school laboratory, of simple esters
- [ ] investigate the differences between an organic acid and organic base
- [ ] investigate the structure and action of soaps and detergents

What are the properties and uses of polymers?

- [ ] model and compare the structure, properties and uses of addition polymers of ethylene and related monomers, for example:...
- [ ] model and compare the structure, properties and uses of condensation polymers, for example:...

MODULE 8 Applying Chemical Ideas

CH12-15

How are the ions present in the environment identified and measured?

- [ ] analyse the need for monitoring the environment
- [ ] conduct qualitative investigations – using flame tests, precipitation and complexation reactions as appropriate – to test for the presence in aqueous solution of the following ions:...
- [ ] conduct investigations and/or process data involving:...
- [ ] conduct investigations and/or process data to determine the concentration of coloured species and/or metal ions in aqueous solution, including but not limited to, the use of:...

How is information about the reactivity and structure of organic compounds obtained?

- [ ] conduct qualitative investigations to test for the presence in organic molecules of the following functional groups:...
- [ ] investigate the processes used to analyse the structure of simple organic compounds addressed in the course, including but not limited to:...

What are the implications for society of chemical synthesis and design?

- [ ] evaluate the factors that need to be considered when designing a chemical synthesis process, including but not limited to:...