

Grade 12 Chemistry 30: Year at a Glance

Overview

Chemistry 30 works through four units that carry students from energy in chemical reactions to the systems that keep those reactions in balance. Unit A, Thermochemical Changes, has students quantify the energy absorbed or released in chemical reactions and think about what that energy use means for society, building on heat and energy concepts from Grade 7 Science and Science 10. Unit B, Electrochemical Changes, moves into oxidation-reduction reactions and the electrochemical cells built from them, connecting back to bonding and quantitative work from Chemistry 20. Unit C, Chemical Changes of Organic Compounds, introduces students to the naming, structure and reactions of common organic compounds and asks them to weigh the role these compounds play in everyday life and technology. Unit D, Chemical Equilibrium Focusing on Acid-Base Systems, closes the year by developing the idea of chemical equilibrium and applying it quantitatively to acid-base systems, drawing on the solutions and quantitative work from Chemistry 20. Running underneath all four units, a set of attitude outcomes asks students to build habits around scientific inquiry, safety, collaboration, stewardship and mutual respect, and to stay curious about science-related careers and issues. [See the curriculum: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.](#)

The year at a glance

Chemistry › Chemistry (20, 30) › Chemistry 30

Unit	General outcomes	Specific outcomes
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Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology.	Interest in Science Students will be encouraged to: show interest in science-related questions and issues and confidently pursue personal interest and career possibilities within science-related fields; e.g. - *appreciate how...; Collaboration Students will be encouraged to: work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; e.g. - assume a variety of roles within a group, as required - *accept...; Stewardship Students will be encouraged to: demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; e.g. - *consider a variety of perspectives when addressing...; Safety Students will be encouraged to: show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information;...; Mutual Respect Students will be encouraged to: appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; e.g. - *use a multiperspective approach,...; Scientific Inquiry Students will be encouraged to: seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; e.g. - value the need for accuracy and precision in data collection -...	(none in the selection)
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Themes: Energy, Change and Systems Overview: In this unit, students study energy as it relates to chemical changes and quantify the energy involved in thermochemical systems, and consider the various aspects of energy use on...	Students will determine and interpret energy changes in chemical reactions.; Students will explain and communicate energy changes in chemical reactions.	Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-A1.1sts explain that the goal of technology is to provide solutions to practical problems ST1) [ICT F2 to 4.4] -... (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Communication and Teamwork Students will: 30-A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating... (see the curriculum); Students will: 30-A1.7k explain and use Hess' law to calculate energy changes for a net reaction from a series of reactions Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Performing and Recording Students will: 30-A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to... (see the curriculum); Students will: 30-A1.2k explain, in a general way, how stored energy in the chemical bonds of hydrocarbons originated from the sun Note: Some of the outcomes are supported by examples. (see the curriculum); Students will: 30-A1.3k define enthalpy and molar enthalpy for chemical reactions Note: Some of the outcomes are supported by examples. (see the curriculum); Students will: 30-A1.4k write balanced equations for chemical reactions that include energy changes Note: Some of the outcomes are supported by examples. (see the curriculum); Students will: 30-A1.10k classify chemical reactions as endothermic or exothermic, including those for the processes of photosynthesis, cellular respiration and hydrocarbon combustion. (see the curriculum); Students will: 30-A1.8k use calorimetry data to determine the enthalpy changes in chemical reactions Note: Some of the outcomes are supported by examples. (see the curriculum); Students will: 30-A1.5k use and interpret 9D, æ÷F F–ö Fö 6öÖDunicate and calculate energy changes in
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chemical reactions Note: Some of the outcomes are supported by examples. (see the curriculum); Students will: 30-A1.1k recall the application of $Q = mc\Delta T$ of heat transfer Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Initiating and Planning Students will: 30-A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues - design... (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Analyzing and Interpreting Students will: 30-A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions - compare energy... (see the curriculum); Students will: 30-A1.6k predict the enthalpy change for chemical equations using standard enthalpies of formation Note: Some of the outcomes are supported by examples. (see the curriculum); Students will: 30-A1.9k identify that liquid water and carbon dioxide gas are reactants in photosynthesis and products of cellular respiration and that gaseous water and carbon dioxide gas are the products of hydrocarbon combustion in an... (see the curriculum); Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-A1.2sts explain that technological problems often require multiple solutions that involve different designs, materials... (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Initiating and Planning Students will: 30-A2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues -... (see the curriculum); Students will: 30-A2.1k define activation energy as the energy barrier that must be overcome for a chemical reaction to occur Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Communication and Teamwork Students will: 30-A2.4s work

collaboratively in addressing problems and apply the skills and conventions of science in communicating... (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Performing and Recording Students will: 30-A2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to... (see the curriculum); Students will: 30-A2.3k analyze and label energy diagrams of a chemical reaction, including reactants, products, enthalpy change and activation energy Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-A2.2sts explain that the appropriateness, risks and benefits of technologies need to be assessed for each potential... (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Analyzing and Interpreting Students will: 30-A2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions - draw and interpret... (see the curriculum); Students will: 30-A2.4k explain that catalysts increase reaction rates by providing alternate pathways for changes, without affecting the net amount of energy involved; e.g., enzymes in living systems. Note: Some of the outcomes... (see the curriculum); Students will: 30-A2.2k explain the energy changes that occur during chemical reactions, referring to bonds breaking and forming and changes in potential and kinetic energy Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-A2.1sts explain that the goal of technology is to provide solutions to practical problems (ST1) [ICT F2 to 4.4] -... (see the curriculum); Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-A2.3sts explain that the products of technology are devices, systems and

processes that meet given needs;
however, these... (see the curriculum)

Themes: Change and Energy Overview: In this unit, students study electrochemical change and analyze the matter and energy changes within a system.	Students will apply the principles of oxidation-reduction to electrochemical cells.; Students will explain the nature of oxidation-reduction reactions.	Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-B2.2sts describe science and technology applications that have developed in response to human and environmental needs... (see the curriculum); Students will: 30-B2.7k predict the spontaneity or nonspontaneity of redox reactions, based on standard cell potential, and the relative positions of half-reaction equations on a standard reduction potential table Note: Some of the... (see the curriculum); Students will: 30-B2.3k predict and write the half-reaction equation that occurs at each electrode in an electrochemical cell Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-B2.1sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead... (see the curriculum); Students will: 30-B2.5k explain that the values of standard reduction potential are all relative to 0 volts, as set for the hydrogen electrode at standard conditions Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Performing and Recording Students will: 30-B2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to... (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Initiating and Planning Students will: 30-B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues - design... (see the curriculum); Students will: 30-B2.4k recognize that predicted reactions do not always occur; e.g., the production of chlorine gas from the electrolysis of brine Note: Some of the outcomes are supported by examples. (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Communication and Teamwork Students will: 30-B2.4s work collaboratively in addressing
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problems and apply the skills and conventions of science in communicating... (see the curriculum); Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis) Students will: 30-B2.3sts explain that science and technology have influenced, and been influenced by, historical development and societal... (see the curriculum); Specific Outcomes for Skills (Science and Technology Emphasis) Analyzing and Interpreting Students will: 30-B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions - identify the... (see the curriculum); Students will: 30-B2.1k define anode, cathode, anion, cation, salt bridge/porous cup, electrolyte, external circuit, power supply, voltaic cell and electrolytic cell Note: Some of the outcomes are supported by examples. (see the curriculum); Students will: 30-B2.6k calculate the standard cell potential for electrochemical cells Note: Some of the outcomes are supported by examples. (see the curriculum)

Themes: Change, Systems and Equilibrium Overview: In this unit, the concept that chemical change eventually attains equilibrium is developed, followed by a focus on the quantitative treatment of reaction systems involving acid-base...	Students will explain that there is a balance of opposing reactions in chemical equilibrium systems.; Students will determine quantitative relationships in simple equilibrium systems.	(none in the selection)
Themes: Change, Diversity and Energy Overview: In this introduction to organic chemistry, students learn about common organic compounds and describe their properties and reactions.	Students will explore organic compounds as a common form of matter.; Students will describe chemical reactions of organic compounds.	(none in the selection)

Across the year

- Units A, B and D all treat chemical change as a system with a direction and a quantity, whether that is energy released in Unit A, electrons transferred in Unit B, or the position of an equilibrium in Unit D, so students keep returning to the same systems-thinking habits across the year. [See the curriculum: 1, 2, 3, 4.](#)
- Unit A's theme of Energy, Change and Systems carries forward into Unit B's Change and Energy theme, since both units ask students to track energy alongside matter as a reaction proceeds. [See the curriculum: 1, 2.](#)
- Quantitative work builds across the year: calorimetry and Hess' law calculations in Unit A lead into standard cell potential calculations in Unit B, and then into equilibrium constant and titration calculations in Unit D, so each unit's mathematics sets up the next. [See the curriculum: 1, 2, 3.](#)
- The STS strand ties directly to the stewardship and mutual respect attitude outcomes, since units on fuels, corrosion and electrochemical technology all ask students to weigh scientific, economic and environmental factors together. [See the curriculum: 1, 2, 3, 4, 5.](#)
- Safety and collaboration outcomes apply across every laboratory activity in the year, from calorimetry in Unit A to building electrochemical cells in Unit B, so these habits get reinforced unit after unit rather than taught once. [See the curriculum: 1, 2, 3, 4.](#)