

Chemistry 30: Year at a Glance (Grade 12)

Overview

Chemistry 30 is organized into four units: Thermochemical Changes, Electrochemical Changes, Chemical Changes of Organic Compounds, and Chemical Equilibrium Focusing on Acid-Base Systems. Unit A asks students to quantify the energy absorbed or released in chemical reactions, using tools such as calorimetry, Hess' law and enthalpy diagrams, and to weigh the effects of energy use on society and the environment. Unit B turns to oxidation-reduction chemistry, where students explain how electrons transfer between reactants and apply that understanding to voltaic and electrolytic cells, including their industrial and everyday applications. Unit C introduces organic chemistry: students learn to name, classify and describe the structure and reactivity of common organic compounds, and consider how organic chemistry shapes technology and quality of life. Unit D develops the concept of chemical equilibrium and applies it in a quantitative study of acid-base systems, including Brønsted-Lowry theory, equilibrium constants, titrations and buffers. Running through all four units is a set of attitude outcomes that ask students to build interest in science, work collaboratively, act as responsible stewards of materials and the environment, follow safety practices, respect differing viewpoints, and reason carefully from evidence. [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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Attitudes and Habits of Mind	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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Unit A: Thermochemical Changes (20% of course time) 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-öâ Fò 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)

Unit B: Electrochemical Changes (30% of course time) 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)

Unit C: Chemical Changes of Organic Compounds (20% of course time) 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)
Unit D: Chemical Equilibrium Focusing on Acid-Base Systems (30% of course time) 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)

Across the year

- Energy is a thread that connects this unit, where students quantify enthalpy changes in chemical reactions, to broader considerations of energy use and its impacts on society and the environment [See the curriculum: 1, 2.](#)
- The theme of change runs through Unit A, where students study thermochemical change and quantify the energy involved in chemical reactions [See the curriculum: 1, 2, 3, 4.](#)
- Unit B asks students to apply the principles of oxidation-reduction to electrochemical cells, using standard reduction potentials to predict spontaneity and electrolysis to drive non-spontaneous reactions [See the curriculum: 1, 2.](#)
- Safety practices and WHMIS procedures apply to laboratory work throughout the course, from calorimetry in Unit A to electrochemical cell construction in Unit B. [See the curriculum: 1, 2, 3.](#)
- Stewardship and the assessment of technology's risks and benefits appear repeatedly, whether students are evaluating fuel choices in Unit A or considering the disposal and recycling issues raised by electrochemical cells in Unit B. [See the curriculum: 1, 2, 3.](#)