Review Sci 10

Student Worksheet LSM 1.CS

Chapter 1 Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

classify matter as pure and mixtures as homogeneous and heterogeneous (1.2)	
interpret the periodic table of the elements (1.3)	
use atomic theory to explain the periodic table (1.4)	
classify elements and compounds, and know the properties of each class (1.3, 1.4)	
explain and predict chemical formulas for and name ionic and molecular compounds, acids, and bases (1.5, 1.6)	
identify the state of matter of substances (1.5, 1.6)	
write chemical equations when given reactants and products (1.5, 1.6)	
classify scientific knowledge as qualitative and quantitative, as observations and interpretations, and as empirical and theoretical (1.1)	

STS

describe the natures of science and technology (1.1)	
describe the application of some common chemicals (1.3, 1.5, 1.6)	

Skills

use a textbook, a periodic table, and other references efficiently and effectively (1.1–1.6)	
interpret and write laboratory reports (1.1, 1.2, 1.3, 1.4, 1.6)	
select and use diagnostic tests (1.2, 1.3, 1.4, 1.5, 1.6)	

Key Terms

1.1	science	
	technology	
	chemistry	
	observation	
	interpretation	
	empirical knowledge	
	theoretical knowledge	
	empirical hypothesis	
	empirical definition	
	generalization	
	scientific law	
	law of conservation of mass	
1.2	matter	
	pure substance	
	mixture	
	heterogeneous mixture	
	homogeneous mixture	
	element	
	entity	
	atom	
	compound	
	chemical formula	
1.3	periodic law	
	family	
	group	
	period	
	semi-metal	
	standard ambient temperature and pressure (SATP)	
	metal	
	nonmetal	
	alkali metal	
	alkaline-earth metal	
	halogen	
	noble gas	
	main group element	
	transition element	

1.4	theoretical hypothesis	
	theoretical definition	
	theory	
	mass number	
	atomic number	
	ion	
	monatomic ion	
	cation	
	anion	
1.5	ionic compound	
	molecular compound	
	acid	
	base	
	neutral	
	aqueous solution	
	polyatomic ion	
	formula unit	
	empirical formula	
	hydrate	
1.6	molecule	
	molecular formula	
	diatomic molecule	

Review & The Mole

Student Worksheet LSM 2.CS

Chapter Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

use kinetic molecular theory and collision theory to explain how chemical reactions occur (2.2)	
write balanced chemical equations (2.2, 2.3)	
interpret balanced chemical equations in terms of chemical amount (in moles) (2.3)	
convert between chemical amount and mass (2.4)	
classify chemical reactions (2.5, 2.6)	
predict the solubility of elements and ionic and molecular compounds in water (2.6)	
predict products for chemical reactions (2.5, 2.6)	

STS

state the technological application of important chemicals and chemical reactions (2.1, 2.3, 2.4, 2.5, 2.6)	
identify risks and benefits of some important chemical reactions (2.1, 2.3, 2.5)	

Skills

read and write laboratory reports (2.6)	
create and critique experimental designs (2.6)	

Key Terms

2.1	STS	
	perspective	
	scientific	
	technological	
	ecological	
	economic	
	political	
2.2	physical change	
	chemical change	
	nuclear change	
	kinetic molecular theory	
	diagnostic test	
	balanced chemical equation	
	coefficient	
2.3	chemical amount	
	Avogadro's number	
	mole	
2.4	molar mass	
2.5	formation reaction	
	simple decomposition reaction	
	complete combustion reaction	
2.6	solution	
	solute	
	solvent	
	solubility	
	precipitate	
	single replacement reaction	
	double replacement reaction	
	precipitation	
	neutralization	

Gravimetric Stoich

Student Worksheet LSM 7.CS

Chapter Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

identify limitations and assumptions about chemical reactions (7.1)	
write balanced ionic and net ionic equations, including identification of spectator ions, for reactions taking place in aqueous solutions (7.1)	
recognize limiting and excess reagents in chemical reactions (7.1, 7.2, 7.3, 7.4)	
calculate quantities of reactants and/or products involved in chemical reactions using gravimetric, solution, or gas stoichiometry (7.2, 7.3, 7.4)	
define predicted (theoretical) and experimental (actual) yields, and explain the discrepancy between them (7.2, 7.3)	
identify sources of experimental uncertainty in experiments (7.2, 7.3, 7.4)	

STS

state that a goal of technology is to solve practical problems (7.2, 7.3, 7.4)	
recognize that technological problem solving may incorporate knowledge from various fields (7.2, 7.3)	
classify and evaluate technologies (7.2, 7.3, 7.4)	
explain how the appropriateness and the risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability (7.3)	

Skills

initiating and planning	plan and predict states, products, and theoretical yields for chemical reactions (7.2)	
	describe procedures for safe handling, storing, and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information (7.2, 7.4)	
performing and recording	translate word equations for chemical reactions into chemical equations, including states of matter for the products and reactants (7.2)	
	balance chemical equations for chemical reactions, using lowest whole-number coefficients (7.2)	
analyzing and interpreting	interpret stoichiometric ratios from chemical reaction equations (7.2, 7.3, 7.4)	
	perform calculations to determine theoretical yields (7.2)	
	use appropriate SI notation, fundamental and derived units, and significant digits when performing stoichiometry calculations (7.2, 7.3, 7.4)	
communi-cation and teamwork	work collaboratively in addressing problems and applying the skills and conventions of science in communicating information and ideas and in assessing results (7.2)	

Key Terms

7.1	quantitative reaction	
	stoichiometric reaction	
	net ionic equation	
	spectator ion	
	limiting reagent	
	excess reagent	
7.2	stoichiometry	
	theoretical yield	
	gravimetric stoichiometry	
	percent yield	
7.3	gas stoichiometry	
7.4	solution stoichiometry	

Key STS

evaluate technologies from a variety of perspectives *(Section 7.1 Questions 10, 11; Section 7.2 Question 5; CS: Producing Hydrogen for Fuel Cells q.4; Section 7.3 Question 6; Section 7.4 Question 7)*	
consider technological solutions for society's energy problems *(Extension: Family Farming and Future Fuels; Section 7.3 Practice question 3; CS: Producing Hydrogen for Fuel Cells; Section 7.3 Question 5)*	
recognize the need for stoichiometry in industrial applications *(Sections 7.2 to 7.4; Section 7.2 Practice question 10; CC: Chemical Technologist; Inv. 7.1; Lab Ex.7.A; Inv. 7.2; Lab Ex.7.B; Section 7.3 Practice questions 2, 3; Inv. 7.3; CS: Producing Hydrogen for Fuel Cells; Section 7.3 Question 7; Inv. 7.4; SP 7.4; Section 7.4 Practice questions 1, 2; Lab Ex.7.C; Lab Ex.7.D; Section 7.4 Questions 2, 4, 5, 7)*	
research a variety of careers *(WA: Canadian Achievers—Roberta Bondar; CC: Aerospace Engineer; CC: Chemical Engineer; CC: Chemical Technologist; CS: Producing Hydrogen for Fuel Cells; CC: Soil Scientist)*	

Skills

use lab skills for stoichiometric determinations *(Inv. 7.1: Decomposing Malachite; Lab Ex.7.A: Testing the Stoichiometric Method; Inv. 7.2: Gravimetric Stoichiometry; Lab Ex.7.B: Testing a Chemical Process; Inv. 7.3: Producing Hydrogen; CS: Producing Hydrogen for Fuel Cells; Inv. 7.4: Analysis of Silver Nitrate (Demo); Lab Ex.7.C: Testing Solution Stoichiometry; Lab Ex.7.D: Determining a Solution Concentration)*	
calculate quantity conversions *(Sections 7.2 to 7.4; Inv. 7.1: Decomposing Malachite; Lab Ex.7.A: Testing the Stoichiometric Method; Inv. 7.2: Gravimetric Stoichiometry; Lab Ex.7.B: Testing a Chemical Process; Section 7.2 Questions 8, 10; Inv. 7.3: Producing Hydrogen; Section 7.3 Questions 3-8; Inv. 7.4: Analysis of Silver Nitrate (Demo); Lab Ex.7.C: Testing Solution Stoichiometry; Lab Ex.7.D: Determining a Solution Concentration; Section 7.4 Practice questions 1–3; Section 7.4 Questions 1–6)*	
calculate percent yield *(Section 7.2; Section 7.2 Questions 7, 8, 10; Section 7.4 Question 4)*	

Bonding

Student Worksheet Solutions LSM 3.CS

Chapter Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

explain why formulas for ionic compounds refer to the simplest whole-number ratio of ions that result in a net charge of zero (3.1)	
define valence electron, electronegativity, and ionic bond (3.1, 3.3)	
use the periodic table and Lewis structures to support and explain ionic bonding theory (3.1)	
explain how an ionic bond results from the simultaneous attraction of oppositely charged ions (3.1)	
draw or build models of common ionic lattices and relate structures and properties (3.5)	
explain why the formulas for molecular substances refer to the number of atoms of each constituent element (3.2)	
relate electron pairing to covalent bonds (3.1, 3.2)	
build models depicting the structure of simple covalent molecules, including selected organic compounds (3.2)	
draw electron-dot diagrams (Lewis symbols and formulas) of atoms and molecules, writing structural formulas for molecular substances and using Lewis structures (formulas) to predict bonding in simple molecules (3.2)	
apply VSEPR theory to predict molecular shapes (3.3)	
illustrate, by drawing or building models, the structure of simple molecular substances (3.2)	
explain intermolecular forces, London (dispersion) forces, dipole–dipole attractions, and hydrogen bonding (3.4)	
relate properties of substances to the predicted intermolecular bonding in the substance (3.4, 3.5)	
determine the polarity of a molecule based on simple structural shapes and unequal charge distribution (3.3)	
describe bonding as a continuum ranging from complete electron transfer to equal sharing of electrons. (3.3, 3.4)	

STS

state that the goal of science is knowledge about the natural world (3.1, 3.3, 3.5)	
list the characteristics of empirical and theoretical knowledge (3.1)	
evaluate scientific knowledge and restrict, revise, or replace it where necessary (3.1, 3.4, 3.5)	
state examples of science leading technology and technology leading science (3.1, 3.5)	

Skills

initiating and planning	design an investigation to determine the properties of ionic compounds (3.5);	
	describe procedures for safe handling, storage, and disposal of laboratory materials (3.3, 3.4, 3.5);	
performing and recording	draw Lewis formulas and build models of ionic solids (3.5); build models depicting the structure of simple covalent molecules (3.2, 3.4); carry out an investigation to determine the melting points of molecular substances (3.4)	

analyzing and interpreting	identify trends and patterns in the melting points of a related series of molecular substances (3.4); determine the properties of ionic compounds (3.5) communication and teamwork:	
communi-cation and teamwork	working cooperatively, critically analyze and evaluate models and graphs constructed by others (3.2, 3.3, 3.5)	

Key Terms

3.1	structural formula	
	valence electron	
	orbital	
	valence orbital	
	bonding electron	
	lone pair	
	octet rule	
	Lewis symbol	
	electronegativity	
	covalent bond	
	ionic bond	
3.2	bonding capacity	
	empirical formula	
	molecular formula	
	Lewis formula	
	structural formula	
	stereochemical formula	
3.3	stereochemistry	
	VSEPR theory	
	polar molecule	
	nonpolar molecule	
	nonpolar covalent bond	
	polar covalent bond	
	bond dipole	
3.4	intermolecular force	
	van der Waals force	
	dipole–dipole force	
	London force	
	isoelectronic molecules	
	hydrogen bond	
3.5	crystal lattice	
	covalent network	

Key STS

understand the importance of bonding in household products, such as detergents	
appreciate the importance of science and technology in the production of new materials such as semi-conductors	

Key Skills

create models of molecular and ionic compounds	
use empirical observations to draw conclusions about bonding	
predict properties, such as melting or boiling point, of molecular substances	

Solutions

Student Worksheet LSM 5.CS

Chapter Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

explain the nature of solutions and the dissolving process (5.1, 5.2)	
illustrate how dissolving substances in water is often a prerequisite for chemical change (5.1, 5.2)	
differentiate between electrolytes and nonelectrolytes (5.1, 5.2)	
explain dissolving as an endothermic or an exothermic process with regard to breaking and forming of bonds (5.2)	
express concentration in various ways (5.3)	
perform calculations involving concentration, chemical amount, volume and/or mass (5.3)	
use dissociation equations to calculate ion concentration (5.3)	
describe the procedures and calculations required for preparing solutions from a pure solid and by dilution (5.4)	
define solubility and identify the factors that affect it (5.5)	
explain a saturated solution in terms of equilibrium (5.5)	

STS

illustrate how science and technology are developed to meet societal needs and expand human capabilities (5.1)	
describe interactions of science, technology and society (5.3, 5.5)	
relate scientific and technological work to personal and social values such as honesty, perseverance, tolerance, open-mindedness, critical-mindedness, creativity and curiosity (5.1, 5.3, 5.4, 5.5)	
illustrate how science and technology have both intended and unintended consequences (5.3, 5.5)	
evaluate technologies from a variety of perspectives (5.4, 5.5)	

Skills

initiating and planning	design a procedure to identify the type of solution (5.1)	
	design a procedure for determining the concentration of a solution containing a solid solute (5.4)	
	describe procedures for safe handling, storing, and disposal of material used in the laboratory, with reference to WHMIS and consumer product labelling information (5.1, 5.4, 5.5)	
performing and recording	use a conductivity apparatus to classify solutions (5.1)	
	perform an experiment to determine the concentration of a solution (5.4, 5.5)	
	use a balance and volumetric glassware to prepare solutions of specified concentration (5.4)	
	perform an investigation to determine the solubility of a solute in a saturated solution (5.5)	
analyzing and interpreting	use experimental data to determine the concentration of a solution (5.5)	
communi-cation and teamwork	compare personal concentration data with the data of other groups (5.4, 5.5)	

Key Terms

5.1	solution	
	solute	
	solvent	
	electrolyte	
	nonelectrolyte	
5.2	dissociation	
	ionization	
5.3	concentration	
	amount concentration	
5.4	standard solution	
	stock solution	
5.5	saturated solution	
	solubility	
	dynamic equilibrium	

Key STS

explore the effects of pesticides in the environment *(CC: Toxicologist; Section 5.3 Question 19; Explore an Issue: Pesticides)*	
identify solutions in everyday life *(Section 5.1; CC: Waste Water and Water Treatment Plant Operator; Section 5.3; WA: David Schindler; CS: Household Chemical Solutions; Section 5.4 Question 10; EI: Pesticides)*	
be familiar with the Responsible Care® program *(CS: Household Chemical Solutions)*	

Key Skills

design laboratory procedures involving concentrations *(Inv.5.4)*	
use volumetric glassware to prepare solutions *(Inv. 5.2 and 5.3)*	
research the risks and benefits of using pesticides on lawns *(Section 5.3 Question 19; Explore an Issue: Pesticides)*	

Acid / Base

Student Worksheet LSM 6.CS

Chapter Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

recall the empirical definitions of acidic, basic, and neutral solutions determined by using indicators, pH, and electrical conductivity (6.1)	
calculate $H_3O^+(aq)$ and $OH^-(aq)$ concentrations, pH, and pOH of acid and base solutions based on logarithmic expressions (6.2)	
use appropriate SI units to communicate the concentration of solutions and express pH and concentration to the correct number of significant digits (6.2)	
compare magnitude changes in pH and pOH with changes in concentration for acids and bases (6.2)	
explain how the use of indicators, pH meters or pH paper can be used to measure $[H_3O^+(aq)]$ (6.3)	
use the modified Arrhenius theory to define acids as substances that produce $H_3O^+(aq)$ in aqueous solutions and bases as substances that produce $OH^-(aq)$ in aqueous solutions, and recognize that the definitions are limited (6.4)	
define neutralization as a reaction between hydronium and hydroxide ions (6.4)	
differentiate between strong acids and bases and weak acids and bases, qualitatively, using the modified Arrhenius (reaction with water) theory and dissociation (6.5)	
compare the reaction with water (ionization) of monoprotic with that of polyprotic acids and bases (6.5)	

STS

state that the goal of technology is to provide solutions to practical problems (all sections)	
recognize that solutions to technological problems may have both intended and unintended consequences (all sections)	

Skills

initiating and planning	design a procedure to determine the properties of acids and bases (6.1, 6.5)	
	design an experiment to differentiate between weak and strong acids, and between weak and strong bases (6.1, 6.3, 6.4)	
	describe procedures for safe handling, storing and disposal of materials (6.1, 6.3, 6.4, 6.5)	
performing and recording	construct and analyze a table or graph comparing pH and hydronium ion concentration (6.2)	
analyzing and interpreting	use a pH meter (or paper) and indicators to determine acidity and pH (6.1, 6.3, 6.4, 6.5)	
communi-cation and teamwork	work collaboratively to assess technologies (6.4)	

Key Terms

6.1	hydronium ion	
6.2	pH	
	pOH	
6.3	acid–base indicator	
6.4	acid (modified Arrhenius)	
	base (modified Arrhenius)	
	neutralization	
6.5	strong acid	
	weak acid	
	strong base	
	weak base	
	monoprotic acid	
	polyprotic acid	
	monoprotic base	
	polyprotic base	

Key STS

be aware of the pH of solutions encountered in everyday life *(Section 6.1 Question 7; Section 6.2 Practice q.1-3, 5, 6; CC: Ecologist; WA: Bad Hair Day; Section 6.3 Questions 3, 5, 10-14; Section 6.3 Question 5; Extension: Soil Acidity and Plant Growth; CS: Acid Deposition)*	
be familiar with some consumer, commercial, and industrial applications of acids and bases *(Exploration: Consumer Products; Section 6.1 Question 6; WA: Bad Hair Day?; Section 6.4 Questions 8, 9)*	
understand strength and concentration of everyday acids and bases *(Section 6.2 Practice q.1, 3; Section 6.3 Questions 3, 5, 1; Section 6.5; Inv. 6.3: Properties of Acids; Section 6.5 Question 14)*	
carry out research into careers *(CC: Ecologist; CC: Medical Laboratory Technologist)*	

Key Skills

design and conduct experiments to determine and compare properties of acids and bases *(Inv.6.1: Properties of Acids and Bases; Section 6.2 Questions 10, 11; Section 6.3 Questions 4, 6; Inv.6.2: Testing Arrhenius' Acid–Base Definitions; Section 6.5 Practice q.6; Section 6.5 Questions 9, 11; Inv. 6.3: Comparing the Properties of Acids (Demo))*	
use pH meters and indicators *(Inv.6.1: Properties of Acids and Bases; Mini Inv.: pH of a Solution; Inv.6.2: Testing Arrhenius' Acid–Base Definitions)*	
assess technologies related to acid deposition *(Section 6.3 Question 5; CS: Acid Deposition)*	

Acid / Base

Student Worksheet LSM 8.CS

Chapter Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

contrast quantitative and qualitative chemical analysis (8.1)	
use the stoichiometric method to calculate quantities of substances in chemical reactions (8.2, 8.3, 8.4)	
describe different designs for determining the concentration of a solution (8.2, 8.4)	
identify and calculate limiting and excess reagents in chemical reactions (8.3)	
identify the equivalence point on a strong acid–strong base titration curve, and differentiate between an indicator endpoint and a reaction equivalence point (8.4, 8.5)	
describe the function and choice of indicators in acid–base titrations (8.4, 8.5)	

STS

state examples of science leading technology and technology leading science (8.1, 8.3)	
state that a goal of technology is the solution of practical problems (8.2, 8.3, 8.4, 8.5)	
evaluate an experiment based on a precipitation reaction, to determine the concentration of a solution (8.2)	
create and interpret titration curve graphs for acid–base experiments restricted to strong monoprotic acid–strong monoprotic base combinations (8.5)	

Skills

initiating and planning	design an experiment to identify an ion (8.1);	
	design a method using crystallization, filtration, or titration to determine the concentration of a solution (8.4)	
	describe procedures for safe handling, storage, and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information (8.3, 8.4)	
	predict the approximate equivalence point for a strong monoprotic acid–strong monoprotic base titration and select an appropriate indicator (8.5)	
performing and recording	perform a titration to determine the concentration of an acid or base restricted to strong monoprotic acid–strong monoprotic base combinations (8.4)	
analyzing and interpreting	interpret stoichiometric ratios from chemical reaction equations (8.2, 8.3, 8.4)	
	calculate theoretical and actual yield and percent yield and error, and account for discrepancies (8.3)	
	use appropriate SI notation, fundamental and derived units, and significant digits when performing stoichiometric calculations (8.1, 8.2, 8.3, 8.4, 8.5)	
communi-cation and teamwork	standardize an acid or base solution and compare group results (8.4)	

Key Terms

8.1	colorimetry	
	gravimetric analysis	
	titration analysis	
8.4	titration	
	titrant	
	sample	
	equivalence point	
	endpoint	
	standard solution	
	primary standard	
	standardizing	

Key STS

evaluate technologies from a variety of perspectives *(Section 8.1; CS: The Haber Process; CS: Analytic Measurement Technology)*	
research a variety of careers *(WA: Ursula Franklin; CC: Hydrologist; WA: Blood Alcohol Content)*	

Key Skills

perform titrations *(Inv. 8.4: Titration Analysis of Vinegar; Inv. 8.6: Titration Analysis of ASA)*	
draw and interpret titration curves *(Section 8.5; Inv. 8.5: pH Curves (Demo); Extension: Indicator Choice; Section 8.5 Practice question 2; Mini Inv: Titration Curves (Simulation); Inv. 8.6; Section 8.5 Question 1)*	
predict the equivalence point pH for a strong monoprotic acid–strong monoprotic base titration *(Section 8.5; Inv. 8.5: pH Curves (Demonstration); Mini Inv.: Titration Curves (Simulation); Section 8.5 Question 3)*	

Gas Laws

Student Worksheet LSM 4.CS

Chapter Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

express atmospheric pressure in a variety of ways, including units of mm Hg, atm, and kPa (4.1)	
convert between the Celsius and absolute (kelvin) temperature scales (4.1, 4.4)	
describe and compare the behaviour of real and ideal gases in terms of kinetic molecular theory (4.2, 4.4)	
explain the law of combining volumes (4.2)	
illustrate how Boyle's, Charles', and combined gas laws are related to the ideal gas law (4.4)	
perform calculations based on the ideal gas law under STP, SATP, and other conditions (4.4)	

STS

identify and use a scientific problem-solving model (all sections)	
state that the goal of science is knowledge about the natural world (all sections)	

Key Terms

4.1	pressure	
	atmospheric pressure	
	STP	
	SATP	
	Boyle's law	
	absolute zero	
	absolute temperature scale	
	Charles' law	
	combined gas law	
4.2	law of combining volumes	
	Avogadro's theory	
4.3	molar volume	
4.4	ideal gas	
	ideal gas law	
	universal gas constant	

Skills

initiating and planning	state hypotheses and make predictions related to the pressure, temperature, and volume of a gas (4.1, 4.4);	
	describe procedures for safe use and disposal of laboratory materials (4.1, 4.4)	
performing and recording	perform laboratory and simulated experiments to illustrate the gas laws, identifying and controlling variables (4.1, 4.4); use thermometers, balances, and other measuring devices to collect data on gases (4.1, 4.4); use research tools to collect information about real and ideal gases and applications of gases (all sections); perform an investigation to determine the molar mass from gaseous volume (4.4)	
analyzing and interpreting	draw and interpret graphs of experimental evidence that relate pressure and temperature to gas volume (4.1); identify the limitations of measurement (4.1, 4.4); identify a gas based on an analysis of experimental evidence (4.4)	
communi-cation and teamwork	use appropriate SI notation and certainty in significant digits (all sections); work collaboratively and communicate effectively (all sections)	

Key STS

use measurement technologies related to gases *(Section 4.1; Inv.4.1, 4.2; CS: Weather Forecasts; Lab Ex.4.B; Inv.4.3)*	
examples of the role of gases in breathing *(CC: Respiratory Therapist; DYK: Gas Laws and Breathing)*, balloons *(Section 4.1, 4.3)*, weather *(CS: Weather Forecasts)*, scuba diving *(CS: Compressed Gases)*, air bags *(Chapter opener)*, and chemical industries *(Section 4.2 Questions)*	
understand nature of weather forecasting *(CC: Meteosrologist; CS: Weather Forecasts)*	
careers (*CC: Respiratory Therapist; CS: Compressed Gases; WA: Canadian Achievers—Elizabeth MacGill; CC: Meteorologist)*	

Key Skills

design, perform, analyze, and evaluate gas law experiments *(Lab Ex.4.A; Inv.4.1, 4.2; Section 4.1 Questions; Section 4.3 Question; Lab Ex.4.B: Evaluating an Experimental Design; Inv.4.3; Unit Review)*	
use library and electronic research tools to collect information about gases *(Bio Connection: Gas-Dependent Processes; CS: Compressed Gases; WA: Web Quest—"Designer Air" for Tires; WA: Simulation—The Ideal Gas Law; Section 4.4 Questions; Unit Review)*	
use laboratory equipment and computer software to collect and analyze results of gas law experiments *(Inv.4.1, 4.2; WA: The Combined Gas Law; WA: Simulation—The Ideal Gas Law)*	
communicate evidence and calculations using SI notation and appropriate certainty *(all)*	