A Comparison of Present versus New Chemistry 11 Topics

The following table is meant to give teachers a side-by-side comparison of the topics in the present curriculum versus the topics being presented for the new Chemistry 11 curriculum.

The columns "Unit" and "Present Curriculum Topics" refer to the unit headings and subheadings found in ***Hebden: Chemistry 11, A Workbook For Students*** because the Workbook was written so as to conform as closely as possible to the present curriculum.

The following colour-coding is used:

Topics in the present curriculum and in the new
Topics in the present curriculum but not in the new ("**red light**" stops using the present topic)
Topics not in the present curriculum but present in the new ("**green light**" starts a new topic)

In some cases, an additional colour-code is used:

Topics in the present curriculum and not in the new, but introduced in Grades 8-10

In this latter case, consult the document ***New Curriculum: Grades 8-10 Chemistry Expectations***, which I constructed so as to better understand the chemistry-related topics covered prior to Chemistry 11. The depth to which the material is covered in these courses is unknown, and may vary from teacher-to-teacher and from school-to-school because the published curriculum is mute as to the depth and breadth of a topic's coverage. Hence, no assumption can be made as to whether or not this background is sufficient to serve as a replacement for a particular "Present Curriculum Topic." Since the new curriculum is not mandatory until the 2018-19 year, Chemistry teachers may wish to confer with their colleagues prior to implementing the new curriculum.

All references below come from the Ministry document for the new curriculum found at:
https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/pdf/10-12/science/en_s_11_che_elab.pdf
The following Ministry document location codes are used to reference the topics quoted below:
PgX means the new curriculum topic reference is found on page X
PgXcolY means the new curriculum topic reference is found on page X in column Y

A final comment: I contacted a representative of the Ministry of Education with a query as to a particular topic. She informed me that everything listed under **Elaborations** is meant to be a suggestion and is NOT prescriptive. Hence, only the bare-bones outline listed under **Content** on pages 2, 3 and the top of 4 in the above document is required. To better distinguish a suggested *Elaboration* from required *Content*, all references to *Content* in the "New Curriculum Topics" column are in bold italics.

Unit	Present Curriculum Topics	New Curriculum Topics
I	**Safety In The Chemical Laboratory**	**Gr.9** Ensure that safety and ethical guidelines are followed in their investigations **Gr.10** What safety considerations need to be taken into account when dealing with chemicals?
I.1	Emergency Equipment	***Note:*** In most cases, teachers will have to review this entire Unit because of legal requirements to make sure all students are properly informed and tested on correct safety procedures in the event of an accident.
I.2	Protective Equipment	
I.3	In Case of Fire	
I.4	Some Laboratory Hazards	
I.5	Disposal of Chemicals	
I.6	General Rules of Safe Laboratory Conduct	
II	**Introduction to Chemistry**	
II.1	Unit Conversions	***Note:*** This Section is not part of the present curriculum, but future calculation methods rely on it. This is also true for the new curriculum.
	• How to put everything together	
	• Multiple Unit Conversions	
II.2	SI Units	***Pg2col1. Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data***

II.3	Metric Conversions	**Note:** Omitting this can cause massive problems later!
	• Derived Quantities	Pg7. (The Mole) Calculate uncertainty in derived values Pg7. (Chemical Reactions) How would you calculate uncertainty in derived values? Pg7. (Solution Chemistry) How would you calculate uncertainty in derived values?
II.4	Density	**Note:** If this concept is not introduced, many topics and calculations that depend on understanding density will have to be omitted.
II.5	Significant Figures and Experimental Uncertainty	***Pg2col1. Apply the concepts of accuracy and precision to experimental procedures and data:*** ***– significant figures*** ***– uncertainty*** ***– scientific notation***
	• Significant Figures	
	• How to Read a Scale	
	• Experimental Uncertainty	***Pg3col1. Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions*** Pg6. (The Mole) Estimate the uncertainty in a measurement Pg6. (The Mole) Use significant figures to communicate the uncertainty in a measurement Pg6. (Chemical Reactions) How would you estimate the uncertainty in a measurement? Pg6. (Chemical reactions) How would you use significant figures to communicate the uncertainty in a measurement? Pg6. (Solution Chemistry) How would you estimate the uncertainty in a measurement? Pg6. (Solution Chemistry) How would you use significant figures to communicate the uncertainty in a measurement?
III	**The Physical Properties and Physical Changes of Substances**	
III.1	Some Basic Definitions in Science (this is in red because not all topics are previously covered in Grades 8-10 or spelled out in the new curriculum)	***Pg2col1. Formulate multiple hypotheses and predict multiple outcomes*** ***Pg2col1. Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative)*** Gr8. Qualitative: evidence expressed through words, descriptions, interviews, narratives Gr8. Quantitative: evidence expressed through numbers and measurement
III.2	The Physical Properties of Matter	
III.3	The Classification of Matter	***Pg2col2. Classification of matter***
	• The Difference in Physical Properties Between Different Classifications of Matter	Pg8. The observable properties and characteristics of elements, compounds and mixtures as they are related to the concept of atoms and molecules Pg8. Solution versus pure substance
III.4	The Physical Separation of Substances	
III.5	Phase Changes	***Pg3col2. Physical and chemical change***
III.6	The Role Of Kinetic Energy in Physical Changes	Gr8. kinetic molecular theory (KMT): explains how particles move in different states
	• Practical Applications of Kinetic Energy	
	• The Role of Kinetic Energy in Phase Changes	
IV	**Inorganic Nomenclature**	
IV.1	The Chemical Elements	
IV.2	Naming Inorganic Compounds	Gr9. Compounds: – ionic and covalent – names and formulas

	• Naming Monatomic Ions	
	• Naming Polyatomic Ions	
	• Constructing the Formula of an Ionic Compound, Given the Name of the Compound	
	• Constructing the Name of an Ionic Compound, Given the Formula of the Compound	
	• Naming Hydrates	
	• Naming Compounds by Using the Prefix–Naming System	
	• Some Common Acids	
IV.3	Extension : The Colours of Some Common Aqueous Ions	**Note:** This is not part of the present curriculum
V	**The Mole Concept**	
V.1	Atomic Masses and Avogadro's Hypothesis	***Pg2col2. Avogadro's Hypothesis*** Pg4. How could you demonstrate Avogadro's Hypothesis?
V.2	The Mole	***Pg2col2. The significance and use of the mole*** ***Pg2col2. Stoichiometric calculations (using significant figures) involving:*** ***– atomic mass, molecular mass, molar mass*** ***– molar quantities of gases at STP, SATP*** Pg6. What variables affect the behaviour of gases?
	• Finding the Molar Mass of a Compound	
	• Calculations Relating the Number of Moles and the Mass of a Substance	
	• Calculations Relating the Number of Moles and the Volume of a Gas	
	• Calculations Relating the Number of Moles and the Number of Particles	
V.3	Multiple Conversions Between Moles, Mass, Volume and Number of Particles	
		Gas laws: – Boyle (PV) – Charles (VT) – Gay-Lussac (PT) Ideal gas
V.4	Percentage Composition	**Note:** Not mentioned in new curriculum but required for empirical and molecular formulae
V.5	Empirical and Molecular Formulae	***Pg2col2. Stoichiometric calculations (using significant figures) involving:*** ***– molecular and empirical formulae to identify a substance***
	• Finding the Molecular Formula	
V.6	Molar Concentration	Pg6. What variables affect: – concentration (molarity) Pg9. concentration of ions: – dilution effect
	• Making up Solutions	
	• Dilution Calculations	
VI	**Chemical reactions**	
VI.1	Introduction to Chemical Equations	
VI.2	The Conservation Laws	***Pg1. Matter and energy are conserved in chemical reactions***
VI.3	Balancing Chemical Reaction Equations	***Pg2col3. Formula equations:*** ***– balancing*** Pg8. Balancing: – coefficients
VI.4	Writing Phases in Reaction Equations and Using Chemical Word Equations	Pg8. Balancing: – representation of solid, liquid, gas or aqueous species
VI.5	Types of Chemical Reactions	***Pg3col2. Formula equations:*** ***– predicting products and reactants*** Pg8. formula equations: –synthesis –decomposition –single replacement –double replacement –combustion –acid-base neutralization

VI.6	Energy Changes in Chemical Reactions	***Pg3col2. The rearrangement of the atoms as bonds are broken and new bonds are formed*** **Pg3col2. Formula equations:** **– energy changes: ΔH**
		Pg3col2. practical applications, including local chemical processes Pg9. Practical applications: – smelting – pulp and paper industry – food industry – petrochemical smog –traditional First Peoples medicine preparation techniques
VII	**Calculations Involving Reactions (Stoichiometry)**	
VII.1	The Meaning of the Coefficients in a Reaction Equation	***Pg3col2. Stoichiometric calculations (using significant figures) involving:*** ***– mass*** ***– number of molecules*** ***– gas volumes*** ***– molar quantities***
VII.2	Stoichiometry Calculations Involving Moles, Mass, Gas Volume and Molecules	
VII.3	Stoichiometry Calculations Involving Molar Concentration	***Pg3col2. Stoichiometric calculations (using significant figures) involving:*** ***– molarity***
VII.4	Stoichiometry of Excess Quantities	***Pg3col2. Stoichiometric calculations (using significant figures) involving:*** ***– excess and limiting reactants***
		Pg3col2. practical applications, including local chemical processes
VII.5	Extension: Percentage Yield and Percentage Purity	**Note:** This is not part of the present curriculum
VIII	**Atoms and the Periodic Table**	
VIII.1	The Structure of the Atom	
	A. Early Models of the Atom	***Pg2col2. Model of the atom*** Pg8. Development of the model of the atom
	B. The Rutherford–Bohr Model of the Atom	
	C. Atomic Number and Atomic Mass	***Pg2col2. The subatomic structures of atoms, ions and isotopes*** Pg4. How does the number of protons, electrons and neutrons in an atom influence its properties?
	D. Isotopes	***Pg2col2. The subatomic structures of atoms, ions and isotopes*** Pg4. How does the number of protons, electrons and neutrons in an atom influence its properties? Pg8. Isotopes: distinguish between atomic mass and mass number
	E. Natural Mixtures of Isotopes	Pg8. Isotopes: distinguish between atomic mass and mass number
	F. The Electronic Structure of the Atom	***Pg2col2. Quantum mechanical model*** ***Pg2col2. Electron configuration*** Pg4.How does the arrangement of electrons around the nucleus of an atom influence the chemical properties of an element? Pg5. Relate spectral lines to the quantum mechanical model
VIII.2	The Periodic Table	
	A. Early Attempts to Organize the Elements: Mass Confusion	Pg8. development of the periodic table
	B. The Modern Periodic Table	Pg8. development of the periodic table
	• The major divisions within the Periodic Table	Pg4.How does the arrangement of electrons around the nucleus of an atom influence the chemical properties of an element? Pg4. How do the properties of the elements support their position on the periodic table?

	• The major divisions within the Periodic Table	Pg4.How does the arrangement of electrons around the nucleus of an atom influence the chemical properties of an element? Pg4. How do the properties of the elements support their position on the periodic table?
	• Metals, nonmetals and Semiconductors	Pg4.How does the arrangement of electrons around the nucleus of an atom influence the chemical properties of an element?
VIII.3	Chemical Bonding	
	A. The Electronic Nature of Chemical Bonding	
	• The electrostatic forces between charged particles	Pg4.How does the arrangement of electrons around the nucleus of an atom influence the chemical properties of an element?
	• Electron shells revisited	***Pg2col2. Periodicity*** Pg4.How does the arrangement of electrons around the nucleus of an atom influence the chemical properties of an element?
	• Valence electrons revisited	
	• The valence of an atom	
	• Ionization energy	
	An extension to "Ionization Energy"	
	B. Types of Chemical Bonding	
	(a) Ionic bonding	***Pg2col2. Chemical bonding*** Pg8. various types of chemical bonding: – names, formulas, and Lewis structures
	Interlude: Electronegativity	Pg8. various types of chemical bonding: – based on electronegativity Pg7. Analyze and interpret graphs: • electronegativity
	Interlude: Investigating the size of an ion relative to the size of a neutral atom	Pg7. Analyze and interpret graphs: • atomic radii • ionic radii
	(b) Covalent bonding	***Pg2col2. Chemical bonding*** ***Pg4col2. bonds/forces in organic compounds*** Pg8. various types of chemical bonding: – based on electronegativity Pg9. (Organic Chemistry) bonds/forces: – covalent, hydrogen – impact on properties
	Predicting the formula of covalent compounds	Pg8. various types of chemical bonding: – names, formulas, and Lewis structures
	(c) London forces	***Pg2col2. Chemical bonding*** ***Pg4col2. bonds/forces in organic compounds*** Pg8. various types of chemical bonding: – polarity Pg9. (Organic Chemistry) bonds/forces: – intra- and intermolecular forces – impact on properties
	C. Writing Lewis Structures	
	(a) The Lewis structures of simple ionic compounds	***Pg2co2. Lewis structures***
	(b) The Lewis structures of covalent compounds that obey the octet rule	***Pg2col2. Lewis structures*** Pg8. Molecular geometry
	(c) Extension: The Lewis structures of covalent compounds that violate the octet rule	
		Pg8. Valence shell electron pair repulsion (VSEPR) theory Pg6. How does VSEPR theory allow you to predict the number and location of electrons in orbitals?
VIII.4	Chemical Families	Pg5. Observe physical characteristics and chemical reactivity of families of elements
	A. The Noble Gases	***Pg2col2. The similarities and trends in the properties of elements*** ***Pg2col2. Chemical and physical properties of the elements***
	B. The Alkali Metals	
	C. The Alkaline Earth Metals	
	D. The Halogens	

IX	**Solution Chemistry**	
IX.1	Solutions and Solubility	***Pg3col2. Properties of solutions*** Pg9. properties: – physical Pg6. What variables affect: – solubility
	General rules for classifying compounds as ionic or molecular	***Pg3col2. Solubility of molecular and ionic compounds***
IX.2	The Conductivity of Aqueous Solutions	Pg9. properties: – electrical conductivity Pg6. What variables affect: – solubility
IX.3	Molecular Polarity	***Pg3col2. Polarity of water and other solvents***
	A. Dipole–Dipole Forces	***Pg3col2. Polarity of water and other solvents*** Pg8. various types of chemical bonding: – polarity Pg4. How does the bent shape of the water molecule cause polarity?
	B. Hydrogen Bonding	***Pg3col2. Polarity of water and other solvents*** Pg8. various types of chemical bonding: – polarity Pg9. (Organic Chemistry) bonds/forces: – covalent, hydrogen – impact on properties
IX.4	Polar and Nonpolar Solvents	***Pg3col2. Solubility of molecular and ionic compounds*** ***Pg3col2. Polarity of water and other solvents*** Pg4. Why do some materials dissolve in water or other liquids, but other materials do not?
IX.5	The Nature of Solutions of Ions	***Pg3col2. Dissociation of ions*** Pg9. Dissociation of ions: –equations
		Pg9. Lewis acids and bases
IX.6	Calculating the Concentrations of Ions in Solution	***Pg3col2. Stoichiometric calculations (using significant figures) involving:*** ***– concentration of ions in solution*** Pg9. concentration of ions: – dilution effect – when two solutions are mixed (assuming no reaction occurs)
		Pg9. properties: – colligative ***Pg3col2. Solubility tables and predicting precipitates*** Pg6. Perform trial-and-error precipitation reactions to determine basic solubility rules Pg6.Use a solubility chart to predict whether ions can be separated from solution through precipitation, and outline an experimental procedure that includes compound added, precipitate formed, and method of separation. Pg6. How is the solubility of ions related to their position on the periodic table?
		Pg3col2. analysis techniques Pg6. Use solution chemistry analysis techniques to investigate local water, soil, and/or air samples. Pg9. analysis techniques: – dissolved oxygen – pH – nitrates – phosphorus

		Pg3col2. Environmental impacts of non-metal oxide solutions Pg9. non-metal oxide solutions: – CO_2 (e.g. Acid rain, ocean carbon uptake, greenhouse effect, contribution to climate change) – nitrogen oxides (e.g. Pollution, petrochemical smog) Pg5. How do carbon dioxide solutions contribute to climate change? Pg7.What changes or solutions would you propose to address the concerns around carbon dioxide in the environment?
X	**Organic Chemistry**	**NOTE: This is an OPTIONAL unit**
X.1	Introduction	***Pg4col2. Features and common applications of organic chemistry*** Pg5. How is carbon the basis for all living things? Pg5. What aspects of organic chemistry apply to your life (e.g., medicine, nutrition, cosmetics, transportation)?
X.2	Alkanes	***Pg4col2. Names, structures and geometry of simple organic compounds*** Pg9. alkanes, alkenes, alkynes Pg5. How do organic compounds differ in structure and properties?
	A. Unbranched ("Straight Chain") Alkanes	Pg9. alkanes, alkenes, alkynes
	B. Alkyl Groups and Branched Hydrocarbons	***Pg4col2. Names, structures and geometry of simple organic compounds*** Pg9. structural isomers
	C. Cycloalkanes	
X.3	Alkyl Halides	Pg10. Common functional groups, including: – halogens
X.4	Multiple Bonds ("Alkenes and Alkynes")	***Pg4col2. Names, structures and geometry of simple organic compounds*** Pg9. alkanes, alkenes, alkynes
	• The geometry of Alkenes and Alkynes	***Pg4col2. Names, structures and geometry of simple organic compounds***
X.5	Aromatic Compounds	Pg10. Common functional groups, including: – phenols
X.6	Functional Groups	***Pg4col2. Common functional groups*** Pg5. How do organic compounds differ in structure and properties?
	• Alcohols	***Pg4col2. Common functional groups*** Pg10. Common functional groups, including: – alcohols – aldehydes – ketones – ethers – ethers – amines – carboxylic acids
	• Aldehydes	
	• Ketones	
	• Ethers	
	• Amines	
	• Carboxylic acids	
	• Amides	**Note:** this is not part of the present curriculum
	A digression on amino acids	**Note:** this is not part of the present curriculum
	• Esters	***Pg4col2. An organic synthesis*** Pg6. Design and carry out a single-step synthesis of an ester (e.g., banana, orange, pineapple, wintergreen)
		Pg10. Organic synthesis: – single-step – multi-step