DEPARTMENT OF ACADEMIC UPGRADING

COURSE OUTLINE FALL 2017

CH 0120 (A2,B2): CHEMISTRY GRADE 11 EQUIVALENT –

5(4 – 0 – 2.0) 90 HOURS FOR 15 WEEKS

Instructor	TANYA KELLER	**Phone**	539 – 2980
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Office Hours	Monday 1:30-2:30pm, Thursday 1:30-2:30pm or by appointment		

CALENDAR

DESCRIPTION: Major concepts include: inorganic nomenclature; atomic structure, orbitals; ionic and covalent bonding, hydrogen bonding, metallic bonding, Van der Waal forces, ionization, electronegativity, VSEPR; solutions, stoichiometry, empirical formulas, percent composition, pH, molarity, equilibrium, Arrhenius acids and bases.

PREQUISITES/COREQUISITE(S): SC0110 (Science 10); MA0110 (Math 10C) or MA0120 placement. See also Academic Upgrading Science Requirements.

REQUIRED TEXT/RESOURCE MATERIAL:

Nelson Chemistry (Alberta 20-30)

*** **Chemistry 0110 Review** if you were not in SC 0110 last semester.

– **CH 0120 lab manual**

– Lab coat

– Lab notebook (250 page coiled notebook is fine do not spend the money on a real lab notebook)

– **Non-**programmable calculator – this is the only electronic devise allowed during tests or exams.
– 10 quad to 1 cm graph paper are also required.

SUPPLEMENTARY

TEXTS: *Can be placed on reserve at the Library if needed*

DELIVERY MODE(S): Lecture will be the main method of delivery. There is also a large laboratory component in this course. Moodle will also be used extensively.

COURSE OBJECTIVES:

Students will:

Unit A: The Diversity of Matter and Chemical Bonding

-describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of ionic compounds

-describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of molecular compounds.

Unit B: Quantitative Relationships in Chemical Changes:

-explain how balanced chemical equations indicate the quantitative relationships between reactants and products involved in chemical changes.

-use stoichiometry in quantitative analysis

Unit C: Forms of Matter: Gases

-explain molecular behavior, using models of the gaseous state of matter.

Unit D: Matter as Solutions, Acids and Bases

-investigate solutions, describing their physical and chemical properties

-describe acidic and basics solutions qualitatively and quantitatively

LEARNING OUTCOMES: Please see detailed course outline which follows

TRANSFERABILITY: ** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability

EVALUATION:

Lab Reports	20%
Assignments	10%
Unit Tests:	30%
Final Exam:	40%
Total	100%

GRADING CRITERIA:

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	95-100		C+	2.3	66-69
A	4.0	90-94		C	2.0	63-65
A–	3.7	85-89		C–	1.7	60-62
B+	3.3	80-84		D+	1.3	54-59
B	3.0	75-79		D	1.0	50-54
B–	2.7	70-74		F	0.0	00-49

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It is recommended that you have a grade of 60 % or better to continue to CH 0130.

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STUDENT RESPONSIBILITIES:

Students will:

- Regular attendance is expected of all students, and is crucial to passing this course. Students who miss classes will soon find themselves falling behind and failing. Lateness will **not** be tolerated as it interrupts the instructor and fellow classmates.
- As per Department Policy, if you miss more than 10 per semester of classes in any course, you may be debarred from the final exam for that course.
- A certificate (a doctor's or a note from the funeral home) will be required to make up the midterm or final exam. **You will receive a grade of F if you miss the final.** Call if you are going to miss a test. There may be a deduction of 10% for test rewrites.

***Very important:** **Laboratory attendance to each specific experiment is compulsory; a passing grade in the laboratory component is required to pass the course.** There are **NO** 'make up' labs in this course. Being absent from an experiment will result in a grade of **ZERO** for that experiment.
Lab reports must be submitted on the required date and at the **required time**.
Assignments will not be accepted after the assignment has been returned to the class.

Penalties for late **lab reports** are as follows:
5 minutes – 10%, 24 hours – 20%, after that – 100%

- review material that is prerequisite to this course quickly so it does not slow you down.
- be at class regularly and on time. (If you miss more than 10 per semester of classes in any course, you may be debarred from the final exam for that course.)
- complete all pre class and pre-lab assignments before arriving in class.
- keep up with course material.
- if experiencing difficulties with course get help immediately.
- catch up on missed material before the next class.
- provide documentation for missed midterms or finals.
- be aware of penalty for failing the lab component and not writing the final.

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student conduct section of the College Calendar at:
https://www.gprc.ab.ca/files/forms_documents/Student_Misconduct.pdf

Instructors reserve the right to use electronic plagiarism detection services on written assignments. **Instructors also reserve the right to ban the use of any form of electronics (cell phones, Blackberries, iPods, tablets, scanning pens, electronic dictionaries, etc.) during class and during exams.**

**Note: all Academic and Administrative policies are available on the same page.

Additional Information (Optional):

**Note: all Academic and Administrative policies are available at https://www.gprc.ab.ca/about/administration/policies/

CHEMISTRY 20 POS OBJECTIVES

Unit A CHEMICAL BONDING – EXPLAINING THE DIVERSITY OF MATTER

Key Concepts:

- chemical bond
- ionic bond
- covalent bond
- electronegativity
- polarity
- valence electron
- intramolecular and intermolecular forces
- hydrogen bond
- electron dot diagrams
- Lewis structures
- valence-shell electron-pair repulsion (VSEPR) theory

General Outcome 1: Students will describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of ionic compounds.

A11: recall principles for assigning names to ionic compounds

A12: explain why formulas for ionic compounds refer to the simplest whole-number ratio of ions that result in a net charge of zero

A13 define valence electron, electronegativity, ionic bond and intramolecular force

A14 use the periodic table and electron dot diagrams to support and explain ionic bonding theory

A15 explain how an ionic bond results from the simultaneous attraction of oppositely charged ions

A16 explain that ionic compounds form lattices and that these structures relate to the compounds' properties; e.g., melting point, solubility, reactivity

General Outcome 2: Students will describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of molecular substances.

A21: recall principles for assigning names to molecular substances

A22 explain why formulas for molecular substances refer to the number of atoms of each constituent element

A23 relate electron pairing to multiple and covalent bonds

A24 draw electron dot diagrams of atoms and molecules, writing structural formulas for molecular substances and using Lewis structures to predict bonding in simple molecules

A25 apply VSEPR theory to predict molecular shapes for linear, angular (V-shaped, bent), tetrahedral, trigonal pyramidal and trigonal planar molecules

A26 illustrate, by drawing or by building models, the structure of simple molecular substances

A27 explain intermolecular forces, London (dispersion) forces, dipole-dipole forces and hydrogen bonding

A28 relate properties of substances (e.g., melting and boiling points, enthalpies of fusion and vaporization) to the predicted intermolecular bonding in the substances

A29 determine the polarity of a molecule based on simple structural shapes and unequal charge distribution

A210 describe bonding as a continuum ranging from complete electron transfer to equal sharing of electrons.

UNIT D: QUANTITATIVE RELATIONSHIPS IN CHEMICAL CHANGES

Key Concepts:

- chemical reaction equations
- net ionic equations
- spectator ions
- reaction stoichiometry
- precipitation
- limiting and excess reagents
- actual, theoretical and percent yield
- titration
- end point
- equivalence point
- titration curves for strong acids and bases

General Outcome 1: Students will explain how balanced chemical equations indicate the quantitative relationships between reactants and products involved in chemical changes.

D11 predict the product(s) of a chemical reaction based upon the reaction type

D12 recall the balancing of chemical equations in terms of atoms, molecules and moles

D13 contrast quantitative and qualitative analysis

D14 write balanced ionic and net ionic equations, including identification of spectator ions, for reactions taking place in aqueous solutions

D15 calculate the quantities of reactants and/or products involved in chemical reactions, using gravimetric, solution or gas stoichiometry.

General Outcome 2: Students will use stoichiometry in quantitative analysis.

D21 explain chemical principles (i.e., conservation of mass in a chemical change), using quantitative analysis

D22 identify limiting and excess reagents in chemical reactions

D23 define theoretical yields and actual yields

D24 explain the discrepancy between theoretical and actual yields

D25 draw and interpret titration curves, using data from titration experiments involving strong monoprotic acids and strong monoprotic bases

D26 describe the function and choice of indicators in titrations

D27 identify equivalence points on strong monoprotic acid–strong monoprotic base titration curves and differentiate between the indicator end point and the equivalence point.

UNIT B: FORMS OF MATTER: GASES

Key Concepts

- Celsius and Kelvin temperature scales
- Boyle's law
- ideal gas law
- standard temperature and pressure (STP)
- standard ambient temperature and pressure (SATP)
- absolute zero
- real and ideal gases
- law of combining volumes
- Charles's law

General Outcome 1: Students will explain molecular behaviour, using models of the gaseous state of matter.

B11 describe and compare the behaviour of real and ideal gases in terms of kinetic molecular theory

B12 convert between the Celsius and Kelvin temperature scales

B13 explain the law of combining volumes

B14 illustrate how Boyle's and Charles's laws, individually and combined, are related to the ideal gas law (PV = nRT)

- express pressure in a variety of ways, including units of kilopascals, atmospheres and millimetres of mercury
- perform calculations, based on the gas laws, under STP, SATP and other defined conditions.

UNIT C: MATTER AS SOLUTIONS, ACIDS AND BASES

Key Concepts

- homogeneous mixtures
- solubility
- electrolyte/nonelectrolyte
- concentration
- dilution
- strong acids and bases
- weak acids and bases
- monoprotic/polyprotic acid

- monoprotic/polyprotic base
- Arrhenius (modified) theory of acids and bases
- indicators
- hydronium ion/pH
- hydroxide ion/pOH
- neutralization

General Outcome 1: Students will investigate solutions, describing their physical and chemical properties.

C11 recall the categories of pure substances and mixtures and explain the nature of homogeneous mixtures

C12 provide examples from living and nonliving systems that illustrate how dissolving substances in water is often a prerequisite for chemical change

C13 explain dissolving as an endothermic or exothermic process with respect to the breaking and forming of bonds

C14 differentiate between electrolytes and nonelectrolytes

C15 express concentration in various ways; i.e., moles per litre of solution, percent by mass and parts per million

C16 calculate, from empirical data, the concentration of solutions in moles per litre of solution and determine mass or volume from such concentrations

C17 calculate the concentrations and/or volumes of diluted solutions and the quantities of a solution and water to use when diluting

C18 use data and ionization/dissociation equations to calculate the concentration of ions in a solution

C19 define solubility and identify related factors; i.e., temperature, pressure and miscibility

C110 explain a saturated solution in terms of equilibrium; i.e., equal rates of dissolving and crystallization

C111 describe the procedures and calculations required for preparing and diluting solutions

General Outcome 2: Students will describe acidic and basic solutions qualitatively and quantitatively

C21 recall International Union of Pure and Applied Chemistry (IUPAC) nomenclature of acids and bases

C22 recall the empirical definitions of acidic, basic and neutral solutions determined by using indicators, pH and electrical conductivity

C23 calculate $H_3O^+_{(aq)}$ and $OH^-_{(aq)}$ concentrations and the pH and pOH of acidic and basic solutions based on logarithmic expressions; i.e., $pH = -\log[H_3O^+]$ and $pOH = -\log[OH^-]$

C24 use appropriate Système international (SI) units to communicate the concentration of solutions and express pH and concentration answers to the correct number of significant digits; i.e., use the number of decimal places in the pH to determine the number of significant digits of the concentration

C25 compare magnitude changes in pH and pOH with changes in concentration for acids and bases

C26 explain how the use of indicators, pH paper or pH meters can be used to measure $H_3O^{+}_{(aq)}$

C27 define Arrhenius (modified) acids as substances that produce $H_3O^{+}_{(aq)}$ in aqueous solutions and recognize that the definition is limited

C28 define Arrhenius (modified) bases as substances that produce $OH^{-}_{(aq)}$ in aqueous solutions and recognize that the definition is limited

C29 define neutralization as a reaction between hydronium and hydroxide ions

C210 differentiate, qualitatively, between strong and weak acids and between strong and weak bases on the basis of ionization and dissociation; i.e., pH, reaction rate and electrical conductivity

C211 identify monoprotic and polyprotic acids and bases and compare their ionization/dissociation.