

# SIMON FRASER UNIVERSITY

S. 86-73

## MEMORANDUM

**To:** Senate

**From:** Senate Committee on  
Undergraduate Studies

**Subject:** Department of Chemistry  
Curriculum Changes

**Date:** October 15, 1986

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Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of October 14, 1986 gives rise to the following motion:

### MOTION:

"That Senate approve and recommend approval to the Board of Governors, as set forth in S.86-73, the proposed

New courses - CHEM 102-3 General Chemistry I for Physical Sciences  
CHEM 103-3 General Chemistry II for Physical Sciences  
CHEM 119-2 General Chemistry Laboratory II for Physical Sciences

### **FOR INFORMATION:**

Acting under delegated authority at its meeting of October 14, 1986 the Senate Committee on Undergraduate Studies approved

#### Course revisions including:

CHEM 104-3 Change of title, description, prerequisites  
CHEM 105-3 Change of title, description, prerequisites  
CHEM 118-2 Change of title, prerequisites  
CHEM 115-2 Change of title, prerequisites  
CHEM 218-3 Change of prerequisites  
CHEM 232-3 Change of prerequisites  
CHEM 251-3 Change of prerequisites  
CHEM 256-2 Change of prerequisites  
CHEM 261-3 Change of prerequisites  
CHEM 306-0 Change of prerequisites  
CHEM 361-3 Change of prerequisites  
NUSC 344-3 Change of prerequisites

# SIMON FRASER UNIVERSITY

## MEMORANDUM

W.R. Heath, Registrar

From..... C.H.W. Jones, Chairman

..... Department of Chemistry

Subject..... NEW COURSE TITLES

Date..... October 16, 1986

Following discussion of the question of numbering and titles for the new proposed first year stream in Chemistry, the following are proposed:

Chem 102-3 General Chemistry I for Physical Sciences

Chem 103-3 General Chemistry II for Physical Sciences

~~Chem 104-3 General Chemistry I for Life Sciences~~

Chem 105-3 General Chemistry II for Life Sciences

Chem 115-2 General Chemistry Laboratory I

Chem 118-2 General Chemistry Laboratory II for Life Sciences

Chem 119-2 General Chemistry Laboratory II for Physical Sciences

CHWJ:bw

CHW. Jones.  
C.H.W. Jones

SCUS<sup>1</sup> 86-25

**SIMON FRASER UNIVERSITY  
MEMORANDUM**

**To:** R. Heath,  
Secretary to Senate

**From:** P. Dobud  
Administrative Assistant  
to the Dean of Science

**Subject:** Calendar Changes,  
CHEMISTRY PROGRAM

**Date:** October 2, 1986

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This is to inform you that the Faculty of Science, in its meeting held on Monday September 29, 1986 has approved the following calendar changes for the CHEMISTRY program (Paper FSC 86-3). I would appreciate it very much if you would place these motions in the agenda of the next SCUS meeting for consideration and approval.

a) **New course proposals: CHEM 102-3, CHEM 103-3 & CHEM 119-2**

***"That the following new course proposals for CHEM 102-3, CHEM 103-3 and CHEM 119-2 be approved as follows:***

**CHEM 102-3 General Chemistry I for Physical Sciences . (3-1-0)**

*Atomic structure and chemical bonding; gases, liquids, solids, and solutions; thermochemistry; acids and bases; chemistry of main group elements; periodic table; redox reactions.*

**Prerequisites:** B.C. High School Chemistry 12 (or equivalent) or CHEM 101. CHEM 115 and MATH 151 should be taken concurrently. This course is intended for students who are planning to proceed to CHEM 103. Students may not count more than one of CHEM 102 or 104 for credit.

**CHEM 103-3 General Chemistry II for Physical Sciences . (3-1-0)**

*Chemical equilibria; electrochemistry; chemical thermodynamics; kinetics; transition metal chemistry.*

**Prerequisites:** CHEM 102 (or 104 with a minimum grade of B). CHEM 119, MATH 152, and PHYS 120 or 121 should be taken concurrently. This course is intended for students who are planning to proceed to CHEM 218, 232 and/or 261.

*Students may not count more than one of CHEM 103 or 105 for credit.*

**CHEM 119-2 General Chemistry Laboratory II for Physical Sciences . (0-0-4)**

*Experiments on chemical equilibrium, acids and bases, qualitative analysis, electrochemistry and chemical kinetics.*

**Prerequisites:** CHEM 102 (or 104) and 115.

**Corequisite:** CHEM 103."

(Chemistry Program: Calendar changes)

b) **Change of title, course content and prerequisites for the following courses: CHEM 104 and CHEM 105.**

***"That the title, the course content, and prerequisites for CHEM 104 and 105 be changed as follows:***

i) **FROM: CHEM 104-3 General Chemistry I**

Atomic structure and chemical bonding; gases; liquids; solids and solutions; chemistry of oxygen, hydrogen and other main group elements; the periodic table; basic electrochemical cells.

**Prerequisites:** B.C. High School Chemistry 12 or equivalent, or CHEM 101, MATH 151 or 154 should precede or be taken concurrently. CHEM 115 should be taken concurrently by students intending to proceed to 200 division chemistry courses.

**TO: CHEM 104-3 General Chemistry I for Life Sciences.**

*Atomic structure and chemical bonding; gases; liquids; solids and solutions; thermochemistry; acids and bases; chemistry of main group elements; the periodic table; redox reactions; structure of organic molecules. Examples relevant to the life sciences will be examined.*

**Prerequisites:** B.C. High School Chemistry 12 (or equivalent), or CHEM 101. CHEM 115 and MATH 154 (or 151) should be taken concurrently. Students intending to proceed to CHEM 103 should take CHEM 102 instead of this course.

*Students may not count more than one of CHEM 102 or 104 for credit.*

ii) **FROM: CHEM 105-3 General Chemistry II**

Chemical Equilibria; electrochemistry; chemical thermodynamics; kinetics; transition metal chemistry.

**Prerequisites:** CHEM 104, MATH 152 (or 155) and PHYS 120 (or 101) or 121 (or 102) should be taken concurrently. CHEM 118 is normally taken concurrently by students intending to major in Chemistry, Biological Sciences or Biochemistry.

**TO: CHEM 105-3 General Chemistry II for Life Sciences**

*Chemical Equilibria; electrochemistry; chemical thermodynamics; kinetics; transition metal chemistry. Examples relevant to the life sciences will be examined.*

**Prerequisites:** CHEM 104 (or 102). CHEM 118, MATH 155 and PHYS 101 or 102 should be taken concurrently. Students intending to proceed to CHEM 218, 232 and/or 261 should take CHEM 103 instead of this course.

*Students may not count more than one of CHEM 103 or 105 for credit.*

(Chemistry Program: Calendar changes)

c) Change of prerequisites and title for CHEM 118.

*"That the prerequisites and title for CHEM 118 be changed as follows:*

FROM: **CHEM 118-2 General Chemistry Laboratory II**  
Prerequisite: CHEM 104 and 115.  
Corequisite: CHEM 105.

TO **CHEM 118-2 General Chemistry Laboratory II for Life Sciences**  
Prerequisite: CHEM 104 (or 102) and 115.  
Corequisite: CHEM 103 or 105.

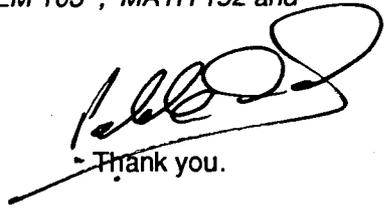
d) Change of prerequisites for the following courses: CHEM 115, CHEM 218, CHEM 232, CHEM 251, CHEM 256, CHEM 261, CHEM 306, CHEM 361 and NUSC 344.

*"That SCUS approves the following changes in prerequisites:*

- i) **CHEM 115-2**  
FROM: Corequisite: CHEM 104.  
TO: Corequisite: CHEM 104 or 102.
- ii) **CHEM 218-3**  
FROM: Prerequisites: CHEM 105 and 118. Students with credit for CHEM 117 may not receive credit for CHEM 218.  
TO: Prerequisites: CHEM 103 (or 105 normally with grade B or better) and 119 (or 118).
- iii) **CHEM 232-3**  
FROM: Prerequisites: CHEM 105.  
TO: Prerequisites: CHEM 103 (or 105 normally with grade B or better)
- iv) **CHEM 251-3**  
FROM: Prerequisites: CHEM 105. CHEM 256 should be taken concurrently.  
TO: Prerequisites: CHEM 103 or 105.  
CHEM 256 should be taken concurrently.
- v) **CHEM 256-2**  
FROM: Prerequisites: CHEM 115. CHEM 118 is recommended.  
TO: Prerequisites: CHEM 115. CHEM 118 or 119 is recommended.

## (Chemistry Program: Calendar changes)

- vi) **CHEM 261-3**  
FROM: **Prerequisites:** CHEM 105, MATH 152 or 155, PHYS 121 or 102.  
TO: **Prerequisites:** CHEM 103 (or 105 normally with grade B or better) , MATH 152 (or 155) and PHYS 121 (or 102).
- vii) **CHEM 306-0**  
FROM: **Prerequisites:** Normally 28 semester hours credit with a minimum cumulative GPA of 2.75 ; and including CHEM 105 and 118 , PHYS 121 and MATH 152.  
Permission of the Co-op Coordinator.  
TO: **Prerequisites:** Normally 28 semester hours credit with a minimum cumulative GPA of 2.75 , and including CHEM 103 (or 105) and 119 (or 118) , PHYS 121 and MATH 152.  
Permission of the Co-op Coordinator.
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- viii) **CHEM 361-3**  
FROM: **Prerequisites:** CHEM 105 , MATH 310, PHYS 221. MATH 232-3 is recommended.  
TO: **Prerequisites:** CHEM 103 (or 105) , MATH 310, PHYS 221 . MATH 232-3 is recommended.
- ix) **NUSC 344-3**  
FROM: **Prerequisites:** Normally 60 semester hours credit in a science program including CHEM 105, MATH 152 and PHYS 121.  
TO: **Prerequisites:** Normally 60 semester hours credit in a science program including CHEM 103 , MATH 152 and PHYS 121. "



Thank you.

# SIMON FRASER UNIVERSITY

## MEMORANDUM

FSC 86-3

To..... Faculty of Science Undergrad Studies  
Committee

From..... A.G. Sherwood and  
E. Kiehlmann  
Dept. of Chemistry

Subject..... Freshman Chemistry Streaming:  
New Courses CHEM 102, 103 and 119

Date..... 1985.12.20  
c5111, d.4

Some changes in our freshman chemistry courses are required in order to meet the needs of different groups of students. At present, the same chemistry courses serve all students at the first-year level: CHEM 104-3 (3-1-0)/115-2 (0-0-4) in the first semester, and CHEM 105-3 (3-1-0)/118-2 (0-0-4) in the second. Engineering students and Physics majors do not take CHEM 118.

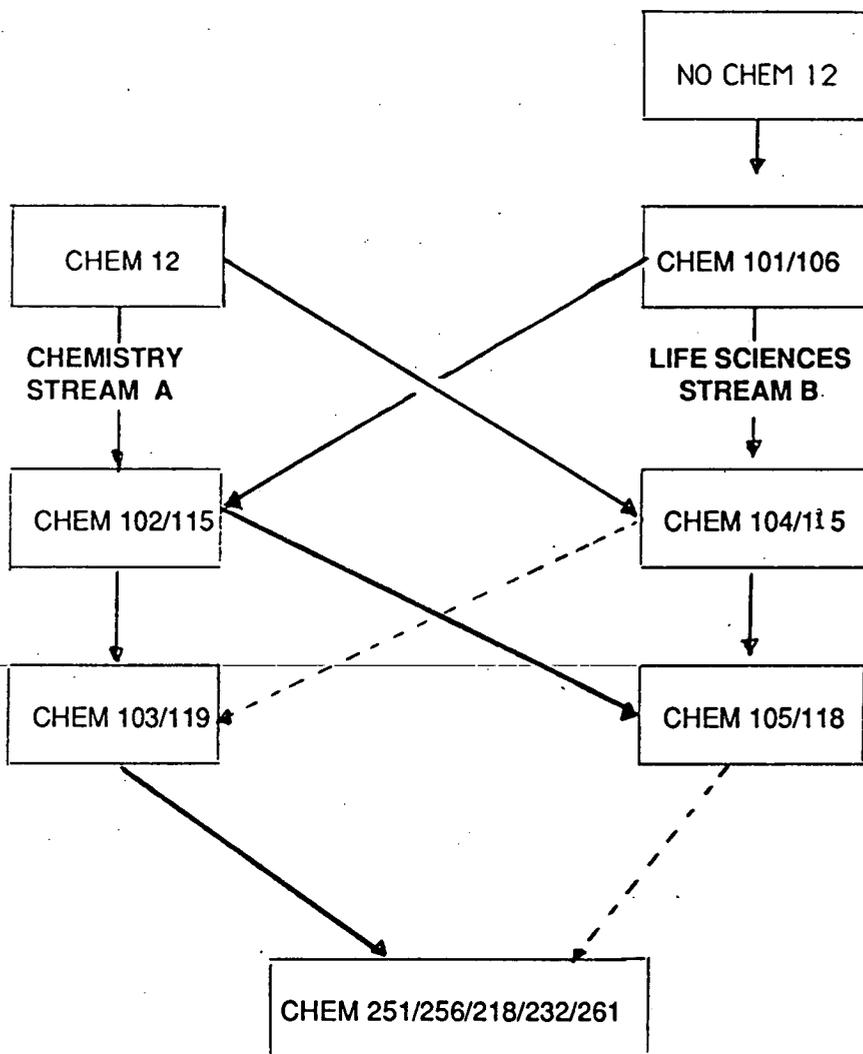
The programs of the students in these courses have very different chemistry requirements beyond the 100-level, as indicated in the following table.

Program	Course	Organic		Anal.	Phys.	Inorganic		Org.
		251 + 256	252	218	261	232	333	356
Chemistry		*	*	*	*	*	*	*
Biochemistry		*	*	*	*		*	*
Pre-Med		*	*					*
Kinesiology		*						
Biosciences		*						
Chem. Physics		*						
Physics		No chemistry beyond first year required.						
Engineering		CHEM 251, 256 and/or 261 required by some streams						

It is clear from the table that there are essentially two groups of students: Group A - those majoring in Chemistry or Biochemistry who require essentially all the 200-division Chemistry courses, and Group B - students in programs which require only organic chemistry.

The present 100-division Chemistry courses include much material designed to provide the base for subsequent courses which students in Group B do not take. These students need a course with greater emphasis on those topics which provide preparation for the second-year organic chemistry and less emphasis on physical, analytical and inorganic chemistry.

This situation suggests some sort of streaming of the first-year program, but such a scheme must have the flexibility to allow students to change streams if their career goals change. This would bring the chemistry programme into line with the Math and Physics programmes, where separate streams are provided for students with separate career goals. A scheme which would serve the purpose is outlined below.



(←----- Grade B or better )

The 102/103 stream is for Group A, those majoring in Chemistry or Biochemistry. The 104/105 stream is for Group B, those students not intending to complete the five second-year Chemistry courses. They will take only organic chemistry courses beyond the first year.

While transfer to CHEM 105 from CHEM 102 is allowed and, while completion of CHEM 105 will provide access to any second-year Chemistry course, students would be advised that such a change of stream will involve considerable disadvantage unless they have performed well (grade: A or B). This situation would parallel that in Physics and Mathematics: PHYS 211 requires PHYS 121 but PHYS 101 and 102 are acceptable if a grade of B or better has been achieved. Similarly, 200-level MATH classes may include students who have completed MATH 154 and 155 or MATH 157 and 158, sometimes with the requirement of an A or B grade.

LAB COURSES: CHEM 115, 118 and 119

Since the first-semester lab course emphasizes apparatus and techniques most of which are necessary for later courses, streaming seems to be unnecessary. CHEM 115-2 would thus serve as the lab course to accompany both CHEM 102 and CHEM 104. The only significant change in CHEM 115 will be the inclusion of some optional experiments in each lab exercise.

The second semester will be streamed. CHEM 118-2 will accompany CHEM 105-3, while CHEM 119-2 will accompany CHEM 103-3. The subjects to be dealt with and the apparatus used will be similar in the two streams. The major differences will be that, in CHEM 118-2, experimental procedures will be outlined in greater detail and more information will be given about how calculations are to be done. In CHEM 119-2, students will be given less detail about procedures as the course proceeds and will learn to devise their own methods for the solution of assigned problems.

Both courses could be conducted in the same laboratory at the same time, would use much of the same apparatus and many of the same reagents and would be supervised by the same instructor.

Grading will be as follows:

	Percentage		
	CHEM 115	119	118
Occasional quizzes	25	25	25
Analyses	20	25	25
Sample problems	20	0	15
Records, graphs, calculations	25	25	25
Discussion	10	25	10

COURSE CONTENT

The same broad topics are treated in the corresponding lectures of the two streams but the 104/105 stream would include a review of basic problem solving skills and an emphasis on those aspects of structure and bonding which are necessary for success in organic chemistry. The 102/103 stream would be more mathematical, more rigorous and would include a good deal of material designed especially to provide preparation for CHEM 218, 232 and 261. This streaming would provide an opportunity to ensure that the scope of topics and the level at which they are treated meet the needs of the students in each group.

Detailed outlines of CHEM 102, 103, 104, 105, 115, 118 and 119 have been circulated (in August 1985) to the Departments of Bioscience, Kinesiology, Physics and Engineering Science, and are available to any other interested parties on request. The above-named Departments have not raised any objections to the proposed course contents nor suggested any modifications.

The Chemistry Department has approved this streaming proposal and is now requesting approval of the three new courses CHEM 102, 103 and 119 by the Faculty of Science Undergraduate Studies Committee.

Please address any questions and correspondence on this matter to Dr. E. Wells, the new Chemistry DUGSC chairman.

## Chemistry 102-3 Course Outline

### Number of Lectures

### Topics

- 3 Review of stoichiometry
- 3 Periodic properties of the elements, the Periodic Table
- 4 Ideal gas behavior, ideal gas mixtures, partial pressures, kinetic theory, non-ideal behavior, intermolecular forces and molecular size, condensation, isotherms, vapor pressure,
- 1 Phase diagrams for one component systems,
- 3 Solutions, molality, molarity, mole fraction, the ideal solution (Raoult's Law), l-v phase diagrams for solvent and one involatile solute (colligative properties), solutions of two volatile components, distillation, deviations from Raoult's Law, azeotropes
- 3 Reactions in solution, acid-base reactions, precipitations, redox reactions, net ionic equations
- 4 Heat effects in chemical reactions, heat and work, calorimetry, path functions, energy and the first law, enthalpy, enthalpies of vaporization and of fusion, enthalpies of reaction, Hess' Law, Standard  $\Delta H^{\circ}_f$ , average bond enthalpies,
- 6 Atomic structure, the Rutherford Experiment and the nuclear model, atomic spectra, the wave nature of light, the photoelectric effect, black-body radiation, quantum theory, The Bohr model of the H-atom, quantum numbers, wave mechanics and the partial-wave duality, the de Broglie wavelength, The Uncertainty Principle, atomic H-atom orbitals, angular and radial parts of the wave functions, polyelectronic atoms, the Pauli Principle, electron spin, Hund's Rule and the Aufbau principle, energy level diagrams for polyelectronic atoms, electron configurations, periodic atomic properties (ionization energies, atomic radii),
- 6 Chemical bonds, experimental data (bond enthalpies, bond lengths, bond angles), the ionic bond, ionic radii, the covalent bond, the Lewis Model, the octet rule, Lewis formulas, multiple bonds, the Formal Charge concept, Valence Bond Theory, hybridization of atomic orbitals, Valence Shell Electron Pair Repulsion Theory,  $\sigma$  and  $\pi$  bonds, molecular orbitals, M.O.'s for homonuclear diatomics, paramagnetism
- 1 Periodic properties of the elements
- 2 The structure of organic compounds, IUPAC nomenclature,

Chemistry 103-3

Number of Lectures

Topics

- 3      Chemical equilibrium, Le Chatelier's Principle,  $Q_p$  as a measure of the extent of a gas phase reaction, the absence of pure condensed phases in the  $Q_p$  expression, the Law of Mass Action, the equilibrium constant ( $K_q$ ), the solution of gas equilibrium problems, systems at constant volume, systems at constant pressure, the effect of inert gas on the position of equilibrium, reactions involving several equilibria,  $K_c$  and  $K_x$ , reactions involving gases and pure condensed phases, the effect of temperature on the position of equilibrium
- 6      Acid-base equilibrium in aqueous solution,  $K_a$  and  $K_b$ , water as an acid and a base ( $K_w$ ), pH, pOH, and pK, degree of dissociation ( $\alpha$ ), conjugate acid and base pairs,  $K_a K_b = K_w$ , buffers, buffer capacity, titrations and titration curves, indicators, conditions for a "good" titration curve, polyprotic acids, amphiprotic species, the titration of polyprotic acids, the solution of complex acid-base problems,  $\alpha$ -values
- 3      Equilibria involving sparingly soluble ionic species ( $K_{sp}$ ), solubility and solubility product, separations by precipitation, the qual scheme,
- 5      Equilibria involving redox reactions, galvanic cells, cell emf and the direction of spontaneous change, conventions for galvanic cells and for cell reactions, half cells and half cell reactions, Standard Reduction Potentials, the Standard Hydrogen Electrode, types of electrodes, the dependence of cell emf on concentration (the Nernst Equation), concentration cells, conditions for equilibrium, the calculation of  $K_{eq}$  from Standard Reduction Potentials, the pH-meter,
- 2      Electrolysis, Faraday's Laws, order of reduction of species in solution, electrolysis of molten salts,
- 3      Review of the First Law, U and H, bomb calorimetry,  $\Delta H_{\text{reaction}}$ , determination of  $\Delta H^{\circ}_f$  values,
- 5      The Second Law, entropy (S), entropy and disorder,  $\Delta S$  as a criterion for spontaneity in isolated systems,  $\Delta S$  for isothermal processes and for mixing, the Gibbs Energy (G),  $\Delta G$  as a criterion for spontaneity in systems at constant T and P,  $\Delta G_{\text{reaction}}$ ,  $\Delta G^{\circ}$ , dependence of  $\Delta G$  on concentration, calculations of  $K_{eq}$  from thermodynamic data, the temperature dependence of  $K_{eq}$

- 6 Chemical kinetics, rates of chemical reaction, differential rate law, order of reaction, integrated rate laws, determination of rate laws, mechanisms, elementary reactions, unimolecular and bimolecular reactions, intermediates, the steady state approximation, chain reactions, the effect of temperature on rates of chemical reactions, the Arrhenius equation, activation energy, steric factor, transition state theory and the activated complex, enzyme kinetics (Michaelis-Menton)
- 3 Transition metal chemistry, coordination chemistry, bonding in coordination compounds, valence bond and crystal field theories, paramagnetism in coordination compounds
-

Chemistry 104-3 Course Outline

<u>Number of Lectures</u>	<u>Topics</u>
3	Introduction, review of laws of chemical combination, Dalton's atomic theory, atomic masses, Avogadro's number, stoichiometry, empirical formulae, calculations of theoretical yields
3	Chemical properties, the periodic table, groups and periods, metals - non metals, valence, nomenclature
3	The Ideal Gas Laws, determination of molecular weights from gas densities, Dalton's Law of Partial Pressures, kinetic theory
2	Condensed phases, intermolecular forces, ions and molecules, vaporization and fusion
1	Solutions, concentration (molarity, molality, mole fraction, ppm ), vapor pressure colligative properties, osmotic pressure, solubility, ionic and molecular solutes,
1	Acids and bases, strength of acids and bases, water as an acid and base, hydronium and hydroxide ions
2	Oxidation and reduction in solution, oxidation state, balancing redox equations
3	Thermochemistry, heat effects in chemical reactions, enthalpy, enthalpies of formation, average bond enthalpies
4	Atomic structure, the nuclear atom, electrons, protons and neutrons, the photoelectric effect, atomic spectra, the Bohr model of the H-atom, quantum theory, quantum numbers, the wave mechanical model, orbitals, orbital shapes, orbital energies electron configurations in atoms, Pauli principle, Hund's Rule, periodic atomic properties, ionization energies, atomic radii,
6	Chemical bonding, ionic bonding, covalent bonding, bond polarity, Lewis structures, formal charge, the octet rule, multiple bonds, valence bond theory, resonance, hybridization , electronegativity, molecular geometry and VSEPR,
3	Periodicity and atomic structure

- 3 Introduction to the structure of organic compounds, alkanes, structural isomers, IUPAC nomenclature, alkenes, geometric isomers, optical isomers, alkynes, benzene molecular geometry, halogenated hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, amines, amino acids
  
  - 2 Radiochemistry and nuclear chemistry, subatomic particles, nuclides, nuclear reactions,  $\alpha$ ,  $\beta$ , and  $\gamma$  decay, nuclear binding energies, natural radioactivity, induced radioactivity, nuclear reactors, decay kinetics, half life, dating methods
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## Chemistry 105-3 Course Outline

### Number of Lectures

### Topics

- 3 Chemical equilibrium, the dynamic nature of equilibrium, Le Chatelier's Principle,  $Q_p$  as a measure of the extent of reaction, the Law of Mass Action, the equilibrium constant ( $K_{eq}$ ), heterogeneous reactions involving gases and pure condensed phases, the effect of temperature on  $K_{eq}$
- 2 Problems involving equilibria in the gas phase ( $K_p$ ), simultaneous reactions
- 6 Acid-base equilibria in aqueous solutions, acid and base strength,  $K_a$  and  $K_b$ , autoionization of water ( $K_w$ ), pH, pOH, pK, degree of dissociation ( $\alpha$ ), problems involving solutions of weak acids and of weak bases, conjugate acid and base pairs, polyprotic acids, buffer solutions, the Henderson-Hasselbalch equation, titrations ( $w_a + s_b$ ,  $w_b + s_a$ ), indicators, amphiprotic species, amino acids
- 3 Heterogeneous equilibria involving sparingly soluble ionic compounds ( $K_{sp}$ ), solubility and solubility product, the "qual" scheme
- 5 Equilibria involving redox reactions, the electrochemical series, galvanic cells, cell potentials and cell reactions, cell conventions, Standard Reduction Potentials, the Nernst Equation, determination of K for redox reactions
- 3 Electrolysis of aqueous solutions, Faraday's Laws, electrolysis of molten salts
- 4 Introduction to thermodynamics, work, heat, heat capacity, calorimetry, the First Law (U), enthalpy (H), thermochemistry,  $\delta H^\circ$  for a chemical reaction, Hess' Law,  $\delta H^\circ_f$
- 3 The Second Law, entropy (S), entropy and disorder, the Gibbs Energy (G),  $\delta G$  as a criterion for spontaneity,  $\delta G_{reaction}$ ,  $\delta G^\circ$ ,  $\delta G^\circ$  and equilibrium constants, the temperature dependence of equilibrium constants
- 4 Chemical kinetics, rates of chemical reaction, the rate constant (k), order, the determination of order from initial rates, the effect of temperature on rates, the Arrhenius equation, activation energy, transition state theory, mechanisms, the rate determining step
- 3 Transition metal chemistry, variations of oxidation states, coordination chemistry, coordination number, the Lewis acid-base concept, bonding in coordination compounds, geometry, isomerism, coordination equilibria

CHEM 118	WEEK	CHEM 119
<p><b>Check-in and Qualitative Equilibrium</b></p> <p>a) <math>\text{Fe}^{3+} + \text{HSCN} \rightleftharpoons \text{FeSCN}^{2+} + \text{H}^+</math> (concentration effect)</p> <p>b) <math>\text{CoCl}_4^{2-} + 4\text{H}_2\text{O} \rightleftharpoons \text{Co}(\text{H}_2\text{O})_4^{2+} + 4\text{Cl}^-</math> (temperature effect)</p>	1	<p><b>Check-in and Equilibria Involving <math>\text{I}_2</math></b></p> <p>a) solubility of <math>\text{I}_2</math> in <math>\text{H}_2\text{O}</math></p>
<p><b>Determination of Equilibrium Constant</b></p> <p>- for formation of <math>\text{FeSCN}^{2+}</math> complex, done with spectrophotometer</p>	2	<p>b) <math>\text{I}_2 + \text{I}^- \rightarrow \text{I}_3^-</math></p> <p>c) solubility of <math>\text{I}_2</math> in heptane</p>
<p><b>Determination of <math>K_{sp}</math></b></p> <p>a) of <math>\text{Ca}(\text{OH})_2</math> by titration of <math>\text{OH}^-</math> in equilibrium with <math>\text{Ca}(\text{OH})_2(\text{s})</math></p> <p>b) of <math>\text{PbI}_2</math> by titration</p>	3	d) $K_d$ for $\text{I}_2$ in heptane-water
<p><b>Titration Curves and Indicators</b></p> <p>a) determination of colors of indicators as function of pH</p> <p>b) determination of titration curves for HCl and HOAc solutions</p>	4	<p><b>Titration Curves</b></p> <p>a) titration curves for HCl, HOAc and mixture of these</p> <p>b) colors of indicators</p>
<p><b>Analysis of Acids.</b> Titrations with color indicator, 1 weak acid, 1 strong</p> <p><b>Titration Curves</b> - diprotic acid (ex. maleic) and weak base (ex. <math>\text{OAc}^-</math>)</p>	5	<p><b>Analysis of Acid</b></p> <p>a) titration of monoprotic acid</p> <p>b) titration curves for polyprotic acid (ex. <math>\text{H}_3\text{PO}_4</math> and tartaric)</p>
<p><b>Buffers</b></p> <p>a) prepare buffer of given pH and test buffering capacity</p> <p>b) analysis of buffer by titration, given total concentration, calculate <math>K_a</math></p>	6	<p><b>Buffer</b></p> <p>a) as in 118</p> <p>b) color indicator titrations of <math>\text{H}_3\text{PO}_4\text{-H}_2\text{PO}_4^-</math> mixtures</p>
<p><b>Acid Base Analysis</b></p> <p>assign a given solution to one of the classes: strong acid, strong base, weak acid, weak base, buffer, diprotic acid (use pH meter)</p>	7	<p><b>Acid Base Analysis</b></p> <p>weak base, buffers, strong base, NaCl, mixtures of acids, polyprotic acids, etc.</p>
<p><b>Inorganic Qualitative Analysis</b></p> <p>- explore the "qual" scheme and</p> <p>- identify cations and anions in a set of samples</p>	8 { 9 } 10	<p><b>Inorganic Qualitative Analysis</b></p> <p>as in CHEM 118</p>

CHEM 118	WEEK	CHEM 119
<p><b>Electrochemical Cells</b>            a) galvanic cells - determine potentials of half cells, <math>K_{sp}</math>'s and <math>K_{dis}</math>            b) electrolysis cells - determine equivalent mass of copper</p>	11	<p><b>Electrochemical Cells</b>            as in CHEM 118 but fewer instructions and more complex systems</p>
<p><b>Kinetics</b>            iodine clock reaction - determination of order and rate constant</p>	12	<p><b>Kinetics</b>            the determination of the order and rate constant for the <math>I^-</math> catalyzed decomposition of <math>H_2O_2</math></p>

SENATE COMMITTEE ON UNDERGRADUATE STUDIESNEW COURSE PROPOSAL FORM1. Calendar Information

Department: Chemistry

Abbreviation Code: CHEM

Credit Hours: 3

Course Number: 102

Vector: 3-1-0

Title of Course: General Chemistry I for Physical Sciences

Calendar

Description:

Atomic structure and chemical bonding; gases, liquids, solids and solutions; thermochemistry; acids and bases; chemistry of main group elements; periodic table; redox reactions.

Nature of Course: --

Prerequisites (or special instructions):

B.C. High School Chemistry 12 (or equivalent) or CHEM 101. CHEM 115 and MATH 151 should be taken concurrently. This

course is intended for students who are planning to proceed to CHEM 103. Students may not count more than one of CHEM 102 or 104

What course (courses), if any, is being dropped from the calendar if this is approved: None.

for cre

2. Scheduling

How frequently will the course be offered?

Twice a year

Semester in which the course will first be offered?

~~87-3~~ 87-3

Which of your present faculty would be available to make the proposed offering possible? All Chemistry faculty.

3. Objectives of the Course

To teach general chemistry to Chemistry and Biochemistry majors who intend to proceed to third- and fourth-year chemistry courses.

4. Budgetary and Space Requirements: (for information only)

What additional resources will be required in the following areas:

Faculty

These offerings (equivalent to an additional 1/4 of a faculty load) will be accommodated within the present complement of faculty by, for example, lowering the frequency of course offerings.

Staff

Library

Audio Visual

Space

Equipment

5. ApprovalDate: Dec. 18 1985. Oct. 02, 1986CHW. Jones

Department Chairman

Glenn H. Lee

Dean

Chairman, SCUS

## New stream pallel to CHEM 105

SENATE COMMITTEE ON UNDERGRADUATE STUDIESNEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 3  
 Course Number: 103 Vector: 3-1-0  
 Title of Course: General Chemistry II for Physical Sciences  
 Calendar  
 Description: Chemical equilibria; electrochemistry; chemical thermodynamics; kinetics; transition metal chemistry.  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 CHEM 102 (or 104 with a minimum grade of B). CHEM 119, MATH 152, and PHYS 120 or 121 should be taken concurrently. This course is intended for students who are planning to proceed to CHEM 218, 232 and/or 261. Students may not count more than one of CHEM 103 or 105 for credit.  
 What course (courses), if any, is being dropped from the calendar if this is approved: None
2. Scheduling  
 How frequently will the course be offered? Twice a year  
 Semester in which the course will first be offered? ~~1986-87~~ 1987-3  
 Which of your present faculty would be available to make the proposed offering possible? All Chemistry faculty
3. Objectives of the Course  
 To teach general chemistry to Chemistry and Biochemistry majors who intend to proceed to third- and fourth-year chemistry courses.
4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas:  
 Faculty These offerings (equivalent to an additional 1/4 of a faculty load) will be accommodated within the present complement of faculty by, for example, lowering the frequency of other course offerings.  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment
5. Approval Date: Dec. 18 1985 Oct. 2, 1986

CHW. JonesL. G. H. Jones

Department Chairman

Dean

Chairman, SCUS

Modification of pre- and corequisite based on streaming.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Chemistry

Abbreviation Code: CHEM

Credit Hours: 2

Course Number: 119

Vector: 0-0-4

Title of Course: General Chemistry Laboratory II for Physical Sciences  
Calendar

Description: Experiments on chemical equilibrium, acids and bases, qualitative analysis, electrochemistry and chemical kinetics.

Nature of Course: --

Prerequisites (or special instructions):

CHEM 102 (or 104) and 115. Corequisite CHEM 103.

What course (courses), if any, is being dropped from the calendar if this is approved: None

2. Scheduling

How frequently will the course be offered? Every semester

Semester in which the course will first be offered? ~~86x3~~ 87-3

Which of your present faculty would be available to make the proposed offering possible? All Chemistry faculty

3. Objectives of the Course

To teach general chemistry laboratory techniques to Chemistry and Biochemistry majors who intend to proceed to third-year chemistry laboratory courses.

4. Budgetary and Space Requirements: (for information only)

What additional resources will be required in the following areas: None

Faculty

Staff

Library

Audio Visual

Space

Equipment

5. Approval

Date: Dec 18 1985 Oct. 2, 1986

CHW. Jones

John H. Green

Department Chairman

Dean

Chairman, SCUS

SCUS 73-34b:- When completing this form, for instructions see Memorandum SCUS 73-34a

Minor rearrangement of course content, and modification of prerequisites.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 3  
 Course Number: 104 Vector: 3-1-0  
 Title of Course: General Chemistry I for Life Sciences  
 Calendar  
 Description: Atomic structure and chemical bonding; gases, liquids, solids and solutions; thermochemistry; acids and bases; chemistry of main group elements; the periodic table; redox reactions; structure of organic molecules. Examples relevant to the life sciences will be examined.  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 B.C. High School Chemistry 12 (or equivalent) or CHEM 101. CHEM 115 and MATH 154 (or 151) should be taken concurrently. Students intending to proceed to CHEM 103 should take CHEM 102 instead of this course. \*
- What course (courses), if any, is being dropped from the calendar if this is approved: None.
2. Scheduling  
 How frequently will the course be offered? Every semester  
 Semester in which the course will first be offered? N/A  
 Which of your present faculty would be available to make the proposed offering possible? All Chemistry faculty.
3. Objectives of the Course  
 To teach general chemistry to life science students who may proceed to CHEM 251 and/or 252 (organic chemistry) but do not intend to take any third-year chemistry courses.
4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment
5. Approval Date: CHEM 104 Oct. 2, 1986  
20 Dec. 85 [Signature]  
 Department Chairman Dean Chairman, SCUS

SCUS 73-34b:- When completing this form, for instructions see Memorandum SCUS 73-34a

\* Students may not count more than one of CHEM 102 or 104 for credit.

Addition of advisory statement with regard to streaming (CHEM 103).

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Chemistry

Abbreviation Code: CHEM

Credit Hours: 3

Course Number: 105

Vector: 3-1-0

Title of Course: General Chemistry II for Life Sciences

Calendar

Description: Chemical equilibria; electrochemistry; chemical thermodynamics; kinetics; transition metal chemistry. Examples relevant to the life sciences will be examined.

Nature of Course: --

Prerequisites (or special instructions):

CHEM 104 (or 102). CHEM 118, MATH 155, and PHYS 101 or 102 should be taken concurrently. Students intending to proceed to CHEM 218, 232 and/or 261 should take CHEM 103 instead of this course. Students may not count more than one of CHEM 103 or 104 for credit.

What course (courses), if any, is being dropped from the calendar if this is approved: None.

2. Scheduling

How frequently will the course be offered? Every semester

Semester in which the course will first be offered? N.A.

Which of your present faculty would be available to make the proposed offering possible? All Chemistry faculty

3. Objectives of the Course

To teach general chemistry to life science students who may proceed to CHEM 251 and/or 252 (organic chemistry) but do not intend to take any third-year courses.

4. Budgetary and Space Requirements: (for information only)

What additional resources will be required in the following areas: None.

Faculty

Staff

Library

Audio Visual

Space

Equipment

5. Approval

Date: CHW Jew Oct 2, 1986

20 Dec 85 [Signature]

Department Chairman

Dean

Chairman, SCUS

Modification of prerequisite to allow entrance from both CHEM 104 and 102

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Chemistry

Abbreviation Code: CHEM

Credit Hours: 2

Course Number: 118

Vector: 0-0-4

Title of Course: General Chemistry Laboratory II for Life Sciences

Calendar

Description: No change

Nature of Course: --

Prerequisites (or special instructions):

CHEM 104 (or 102) and 115. Corequisite: CHEM 105 or 103.

What course (courses), if any, is being dropped from the calendar if this is approved: None

2. Scheduling

How frequently will the course be offered? As before

Semester in which the course will first be offered? As before

Which of your present faculty would be available to make the proposed offering possible? As before

3. Objectives of the Course

As before

4. Budgetary and Space Requirements: (for information only)

What additional resources will be required in the following areas: None

Faculty

Staff

Library

Audio Visual

Space

Equipment

5. Approval

Date: Dec 18 1985 Oct 2, 1986

CHW Jones

[Signature]

Department Chairman

Dean

Chairman, SCUS

Modification of prerequisite to allow entrance from both CHEM 104 and 102

SENATE COMMITTEE ON UNDERGRADUATE STUDIES  
NEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 2  
 Course Number: 115 Vector: 0-0-4  
 Title of Course: General Chemistry Laboratory 1  
 Calendar  
 Description: No change  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 Corequisite: CHEM 104 or 102  
 What course (courses), if any, is being dropped from the calendar if this is approved: None

2. Scheduling  
~~How frequently will the course be offered? As before~~  
 Semester in which the course will first be offered? As before  
 Which of your present faculty would be available to make the proposed offering possible? As before

3. Objectives of the Course  
 As before

4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment

5. Approval Date: Dec 18 1985 Oct 2, 1986

CHW Jones Glen H. Jones  
 Department Chairman Dean Chairman, SCUS

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 3  
 Course Number: 218 Vector: 2-0-4  
 Title of Course: Introduction to Analytical Chemistry  
 Calendar  
 Description: No change  
 Nature of Course: --  
 Prerequisites (or special instructions): CHEM 103 (or 105\*) and 119 (or 118). \*normally with a grade of B or better)  
 What course (courses), if any, is being dropped from the calendar if this is approved: None

2. Scheduling  
 How frequently will the course be offered? As before  
 Semester in which the course will first be offered? As before  
 Which of your present faculty would be available to make the proposed offering possible? As before

3. Objectives of the Course  
 As before

4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment

5. Approval Date: Dec. 18 1985 Oct. 2, 1986

CHW Jones [Signature]  
 Department Chairman Dean Chairman, SCUS

Modification of prerequisite to allow entrance from both CHEM 103 and 105.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 3  
 Course Number: 232 Vector: 3-1-0  
 Title of Course: The Chemistry Nontransition Elements  
 Calendar  
 Description: No change  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 CHEM 103 (or 105 normally with a grade of B or better)  
 What course (courses), if any, is being dropped from the calendar if this  
 is approved: None

2. Scheduling  
 How frequently will the course be offered? As before  
 Semester in which the course will first be offered? As before  
 Which of your present faculty would be available to make the proposed offering  
 possible? As before

3. Objectives of the Course  
 As before

4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment

5. Approval Date: Dec 17 1985 Oct 2, 1986

CHW Jones Qu H Jones  
 Department Chairman Dean Chairman, SCUS

Modification of prerequisite to allow entrance from both CHEM 103 and 105.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Abbreviation Code: CHEM	Department: Chemistry
Course Number: 251	Credit Hours: 3
Title of Course: Organic Chemistry I	Vector: 3-1-0
Calendar Description: No change.	
Nature of Course: --	
Prerequisites (or special instructions):	
CHEM 103 or 105. Chem 256 should be taken concurrently.	
What course (courses), if any, is being dropped from the calendar if this is approved:	None

2. Scheduling

How frequently will the course be offered?	As before
Semester in which the course will first be offered?	As before
Which of your present faculty would be available to make the proposed offering possible?	As before

3. Objectives of the Course

As before

4. Budgetary and Space Requirements: (for information only)

What additional resources will be required in the following areas: None

Faculty

Staff

Library

Audio Visual

Space

Equipment

5. Approval

Date: Dec 18 1985 Oct. 2, 1986

CHW Jones Glen H Jones

Department Chairman Dean Chairman, SCUS

Modification of recommended prerequisite.

SENATE COMMITTEE ON UNDERGRADUATE STUDIESNEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 2  
 Course Number: 256 Vector: 0-0-4  
 Title of Course: Organic Chemistry Laboratory I  
 Calendar  
 Description: No change  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 CHEM 115. CHEM 118 or 119 is recommended.  
 What course (courses), if any, is being dropped from the calendar if this  
 is approved: None

2. Scheduling  
 How frequently will the course be offered? As before  
 Semester in which the course will first be offered? As before  
 Which of your present faculty would be available to make the proposed offering  
 possible? As before

3. Objectives of the Course  
 As before

4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment

5. Approval Date: Dec. 18 1985 Oct 2, 1986 \_\_\_\_\_

C. H. Jones G. H. Jones \_\_\_\_\_  
 Department Chairman Dean Chairman, SCUS

SCUS 73-34b:- When completing this form, for instructions see Memorandum SCUS 73-34a

Modification of prerequisites to allow entrance from both CHEM 103 and 105.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Chemistry

Abbreviation Code: CHEM

Credit Hours: 3

Course Number: 261

Vector: 3-1-0

Title of Course: Physical Chemistry I

Calendar

Description: No change

Nature of Course: --

Prerequisites (or special instructions):

CHEM 103 (or 105), MATH 152 (or 155) and PHYS 121 (or 102).

What course (courses), if any, is being dropped from the calendar if this is approved: None  
*\*normally with a grade of B or better*

2. Scheduling

How frequently will the course be offered? As before

Semester in which the course will first be offered? As before

Which of your present faculty would be available to make the proposed offering possible? As before

3. Objectives of the Course

As before

4. Budgetary and Space Requirements: (for information only)

What additional resources will be required in the following areas: None

Faculty

Staff

Library

Audio Visual

Space

Equipment

5. Approval

Date: Dec. 18 1985 Oct. 2, 1986

CHW. Jones

Glen H. Jones

Department Chairman

Dean

Chairman, SCUS

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 0  
 Course Number: 306 Vector: --  
 Title of Course: Practicum I  
 Calendar  
 Description: No change  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 Replace "CHEM 105 and 118" by "CHEM 103 (or 105) and 119 (or 118)".  
 What course (courses), if any, is being dropped from the calendar if this is approved: None

2. Scheduling  
 How frequently will the course be offered? As before  
 Semester in which the course will first be offered? As before  
 Which of your present faculty would be available to make the proposed offering possible? As before

3. Objectives of the Course  
 As before

4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment

5. Approval Date: Dec. 18 1985 Oct. 2, 1986

CHU. Jones [Signature]  
 Department Chairman Dean Chairman; SCUS

Modification of prerequisites to allow entrance from both CHEM 103 and 105.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: CHEM Credit Hours: 3  
 Course Number: 361 Vector: 3-1-0  
 Title of Course: Physical Chemistry II  
 Calendar  
 Description: No change  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 Replace "CHEM 105" by "CHEM 103 (or 105)"  
 What course (courses), if any, is being dropped from the calendar if this  
 is approved: None

2. Scheduling  
 How frequently will the course be offered? As before  
 Semester in which the course will first be offered? As before  
 Which of your present faculty would be available to make the proposed offering  
 possible? As before

3. Objectives of the Course  
 As before

4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment

5. Approval Date: Dec 18 1985 Oct 2, 1986 \_\_\_\_\_

CHW Jones [Signature] \_\_\_\_\_  
 Department Chairman Dean Chairman, SCUS

Modification of prerequisites to allow entrance from both CHEM 103 and 105.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information Department: Chemistry  
 Abbreviation Code: NUSC Credit Hours: 3  
 Course Number: 344 Vector: 3-1-0  
 Title of Course: Nucleosynthesis and Distribution of the Elements.  
 Calendar  
 Description: No change  
 Nature of Course: --  
 Prerequisites (or special instructions):  
 Replace "CHEM 105" by "CHEM 103 (or 105 with a grade of B or better)  
 What course (courses), if any, is being dropped from the calendar if this  
 is approved: --

2. Scheduling  
 How frequently will the course be offered? As before  
 Semester in which the course will first be offered? As before  
 Which of your present faculty would be available to make the proposed offering  
 possible? As before

3. Objectives of the Course  
 As before

4. Budgetary and Space Requirements: (for information only)  
 What additional resources will be required in the following areas: None  
 Faculty  
 Staff  
 Library  
 Audio Visual  
 Space  
 Equipment

5. Approval Date: Dec. 17 1975 Oct 2, 1986

CHW Jones Allen H. Jones  
 Department Chairman Dean Chairman, SCUS

SIMON FRASER UNIVERSITY

MEMORANDUM

To..... Mr. R. HEATH, Registrar  
REGISTRAR'S OFFICE  
.....  
Subject..... CHEMISTRY COURSE RENUMBERING

From..... R. FRINDT, Chairman  
Faculty of Science UGCC  
.....  
Date..... 14 October 1986

Because of the introduction of new first year Chemistry courses for Biological Science students, CHEM 102 should replace CHEM 104, CHEM 103 should replace CHEM 105 and CHEM 119 should replace CHEM 118 in the following programs (where appropriate):

- CHEMISTRY
- CHEMICAL PHYSICS
- BIOCHEMISTRY
- PHYSICS AND APPLIED PHYSICS
- ENGINEERING SCIENCE

*R F Frindt*

Dr. R.F. Frindt

/wy