

KINGSBOROUGH COMMUNITY COLLEGE
The City University of New York
CURRICULUM DATA TRANSMITTAL SHEET

DEPARTMENT: PHYSICAL SCIENCES **DATE:** Fall 2015
Title of Course or Degree Change: CHM02 -INTRODUCTION TO GREEN CHEMISTRY

Change(s) Initiated: (Please Check)

- | | |
|--|--|
| <input type="checkbox"/> Letter of Intent | <input type="checkbox"/> Proposal (Letter of Intent sent previously) |
| <input type="checkbox"/> Closing of Degree Program | <input type="checkbox"/> Change in Degree Requirements |
| <input checked="" type="checkbox"/> New Course* | <input type="checkbox"/> Change in Discipline Code |
| <input type="checkbox"/> New 82 Course | <input type="checkbox"/> Change in Description |
| <input type="checkbox"/> New Certificate Program | <input type="checkbox"/> Deletion of Course |
| <input type="checkbox"/> Change in Pre/Co-Requisite | <input type="checkbox"/> Change in Course Titles, Numbers, Crs. &/or Hours |
| <input checked="" type="checkbox"/> Other (please describe): | |

CUNY Common Core Course Submission

- I. Required Core C. Life and Physical Sciences
- II. Flexible Core E. Scientific World

PLEASE ATTACH PERTINENT MATERIAL TO ILLUSTRATE AND EXPLAIN ALL CHANGES

I. DEPARTMENTAL ACTION

Action by Department &/or Departmental Curriculum Committee, if required:

Date approved:

Signature, Committee Chairperson:

Signature, Department Chair:

Date:

II. PROVOST ACTION

Provost to act within 30 days of receipt and forward to College-wide Curriculum Committee exercising one of the following options:

A. Approved ___

B. Returned to Department with comments ___

Recommendations (if any):

Signature, Provost:

Date:

III. CURRICULUM SUB-COMMITTEE RECOMMENDATIONS (*FOR NEW COURSES ONLY):

Provost to act within 30 days of receipt and forward to College-wide Curriculum Committee exercising one of the following options:

A. Approved ___

B. Returned to Department with comments ___

Recommendations (if any):

Signature, Sub-Committee Chair :

Date:

IV. COLLEGE-WIDE CURRICULUM COMMITTEE ACTION

Committee to act within 30 days of receipt, exercising one of the following options:

A. Approved ___ (and forwarded to Steering Committee)

B. Tabled ___ (and Department notified)

Signature, Chair of Curriculum Committee:

Date:

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**KINGSBOROUGH COMMUNITY COLLEGE
THE CITY UNIVERSITY OF NEW YORK**

FORMAT FOR PRESENTATION OF CURRICULUM PROPOSALS

1. **DEPARTMENT, COURSE NUMBER AND TITLE:**
Physical Sciences, CHM200 Introduction to Green Chemistry
2. **DOES THIS COURSE MEET A GENERAL EDUCATION / CUNY CORE CATEGORY?**
IF YES, PLEASE COMPLETE AND SUBMIT WITH THIS PROPOSAL A CUNY COMMON CORE SUBMISSION FORM.
YES
3. **TRANSFERABILITY OF THIS COURSE. DESCRIBE HOW THIS COURSE TRANSFERS (required for A.S. degree course). If A.A.S. degree course and does not transfer, justify role of course, i.e., describe other learning objectives met:**
This course will satisfy the CUNY Core requirements for science, and serve as an alternate course to *Preview of General Chemistry* CHM100.
4. **BULLETIN DESCRIPTION OF COURSE:**
This introductory course covers the basics in chemistry within the context of "green" principles and their applications. Laboratory modules explore relevant topics such as alternative energy, renewable resources, and environmental chemistry. Fulfills the CHM11 prerequisite.
5. **NUMBER OF WEEKLY CLASS HOURS (please indicate the number of hours per week spent in a lab, hours spent on site doing fieldwork, hours of supervision and hours in classroom-- if applicable):**
The course will meet for 3 hours, which may be divided among lecture, laboratory, and recitation activities depending on the material and the needs of the class. (3 hours, Lecture, Laboratory, and Recitation)
6. **NUMBER OF CREDITS:** 3
7. **COURSE PREREQUISITES AND COREQUISITES**
A. PREREQUISITES:
B. COREQUISITES:
C. PRE OR COREQ: MAT09
8. **BRIEF RATIONALE TO JUSTIFY PROPOSED COURSE TO INCLUDE:**
A. ENROLLMENT SUMMARIES, IF PREVIOUSLY OFFERED AS AN 82
B. PROJECTED ENROLLMENT 100
C. CLASS LIMITS 25
D. FREQUENCY COURSE IS LIKELY TO BE OFFERED EVERY SEMESTER
E. ROLE OF COURSE IN DEPARTMENT'S CURRICULUM AND COLLEGE'S MISSION

The CUNY Pathways initiative was established to provide students a common core of general education classes that facilitates transfer between colleges. For community college students, this could mean a more equitable transition of transfer credits to senior colleges. Kingsborough Community College could further serve our students and attract incoming New York City students by providing general education and gateway courses students find relevant and stimulating.

There exists a need for chemistry courses that satisfy the CUNY Common Core requirements. The Required Core, Life and Physical Sciences, requires students to take at least one science course that is at least 3 credits with a corresponding lab, as well as giving the students an option to take a science course under the flexible core Group (E): Scientific World. There are ten vetted Pathways courses offered through the Physical Sciences Department, and among these there are only two that are chemistry—General Chemistry I and II (CHM 1100 and CHM 1200), which are each 4 credits. For non-science majors, there are no 3-credit courses offered through the Physical Sciences Department.

There exists a need for gateway chemistry classes that satisfy the CUNY Common Core requirements.

Students wishing to take chemistry courses in Kingsborough need to first demonstrate proficiency in basic chemistry and math, equivalent to a high school level. Thus, students either have to pass an exemption exam or take a two-equated credit Preview of General Chemistry course. This course is a pass/repeat course, and as an equated credit course does not count towards Pathways. The absence of a laboratory component in this course is disadvantageous not only because it does not prepare students to perform laboratory work, but also disconnects them from experiential learning.

Proposed herein is the development of a course that will satisfy both Life and Physical Sciences and Scientific World requirements of CUNY Pathways and serve as an entry course to the study of chemistry and other sciences. The project will explore and develop pedagogy for students with little or no experience in the lab. The experiments will be crafted and tested within classrooms that have limited laboratory facilities, or limited access to a laboratory, keeping in mind that students must be able to safely perform the experiments. The experiments must also engage students and promote the learning of chemical concepts as they apply towards our society's increasing responsibility in protecting the environment and mitigating pollution. The course will be developed to emphasize the applications of the 12 Principles of Green Chemistry, and students will apply these in the laboratory modules.¹

The course addresses the following college mission statements:

1. *To offer a superior general education to all degree students by incorporating practical laboratory experiences to an introductory chemistry course.*
2. *To provide programs of study for those intending to transfer and those seeking immediate employment by providing students a background in green chemistry and green technologies. The green chemistry industry is expected to grow from \$3 bn in 2011 to \$100 bn by 2020.²*
3. *To promote critical reading, writing, and thinking through applications of green chemistry not only within the context of industry, but also environmentalism and human health.³*
4. *To develop student competence in information literacy, oral communication, quantitative skills, and technological literacy by applying the 12 Principles of Green Chemistry in conjunction with introductory chemistry curriculum.*
5. *To promote civic engagement, global awareness, civility, and respect for diversity by examining the local and global impacts of science and technology, particularly in the environment.⁴*
6. *To respond to the educational, social, cultural, and economic needs of the communities we serve by offering our students more choices in fulfilling their CUNY Common Core requirements.*

9. LIST OF COURSES, IF ANY, TO BE WITHDRAWN WHEN COURSE(S) IS (ARE) ADOPTED:

10. IF COURSE IS AN INTERNSHIP OR INDEPENDENT STUDY OR THE LIKE, PROVIDE AN EXPLANATION AS TO HOW THE STUDENTS WILL EARN THE CREDITS AWARDED. THE CREDITS AWARDED SHOULD BE CONSISTENT WITH STUDENTS' EFFORTS REQUIRED IN A TRADITIONAL CLASSROOM SETTING:

11. PROPOSED TEXT BOOK(S) AND/OR OTHER REQUIRED INSTRUCTIONAL MATERIAL(S):

Fundamentals of Environmental Chemistry, Stanley E. Manahan
Laboratory Manual – will be prepared by the PI
Laboratory Goggles

12. REQUIRED COURSE FOR MAJORS AND/OR AREA OF CONCENTRATION? (If course is required, please submit a separate transmittal with a degree requirement sheet noting the proposed revisions, including where course fits into degree requirements, and what course(s) will be removed as a requirement for the degree. NYSED guidelines of 45 crs. of Liberal Arts coursework for an A.A. degree, 30 crs. for an A.S. degree and 20 crs. of Liberal Arts for an A.A.S. degree must be adhered to for all 60 cr. programs).

13. IF OPEN ONLY TO SELECTED STUDENTS (specify):

14. EXPLAIN WHAT STUDENTS WILL KNOW AND BE ABLE TO DO UPON COMPLETION OF COURSE:

The goal of the course is to prepare students for General Chemistry I and II and provide them introductory laboratory skills.

1. Recount basic principles of chemistry such as the modern atomic theory, law of multiple proportions, law of conservation of mass, and so on.
2. Use the periodic table to determine the types of compounds that can be formed, and name them.
3. Write and balance chemical reactions.
4. Perform stoichiometry calculations.
5. Formulate and test hypotheses based on a laboratory exercise.
6. Measure and convert units of measurements to report an experiment.
7. Collect and plot data to examine a chemical principle.
8. Contextualize chemistry as a "green" process, or its role in the environment.

15. METHODS OF TEACHING --eg., LECTURES, LABORATORIES, AND OTHER ASSIGNMENTS FOR STUDENTS, INCLUDING ANY OF THE FOLLOWING: DEMONSTRATIONS, GROUP WORK, WEBSITE OR E-MAIL INTERACTIONS AND/OR ASSIGNMENTS, PRACTICE IN APPLICATION OF SKILLS:

Textbook-based lectures will capitalize on the material organization and prepare the students for the in-text assignments. Worksheets will be given as recitation materials, so that students may test their skills in class. The laboratory will consist of demos, videos, and laboratory modules. For example:

Lab Module: Biodiesel

Week 1: Synthesis of Biodiesel

Week 2: Functional groups: IR and NMR

Week 3: Chemical tests for Biodiesel

Lab Module: Superstorm Sandy Sediments

Week 1: Metal analysis

Week 2: Polychlorinated Biphenyls (PCBs) Extraction

Week 3: Biogeochemical Exploration of Sandy Sediments

Week 4: Arsenic and Mercury Testing

16. ASSIGNMENTS TO STUDENTS:

Students will be given homework from the textbook. In addition, they are to pre-laboratory and post-laboratory reports.

17. DESCRIBE METHOD OF EVALUATING LEARNING SPECIFIED IN #15:

Student Self-Evaluation: in-class worksheets, homework's

Instructional Evaluation: midterm, final, pre- and post-lab

18. TOPICAL COURSE OUTLINE (WHICH SHOULD BE AS SPECIFIC AS POSSIBLE REGARDING TOPICS COVERED, LEARNING ACTIVITIES AND ASSIGNMENTS):

INTRODUCTION TO CHEMISTRY

Chemistry and Environmental Chemistry

A Mini-Course in Chemistry

The Building Blocks of Matter

Chemical Bonds and Compounds

Chemical Reactions and Equations

Numbers in Chemistry: Exponential notation Significant Figures and Uncertainties in Numbers

Measurement and Systems of Measurement

Units of Mass

Units of Length

Units of Volume

Temperature, Heat, and Energy

Pressure

Units and Their Use in Calculations

Learning Activities: Density of Vegetable Oil Lab, Measurements, Conversions

MATTER AND PROPERTIES OF MATTER

Classification of Matter

Quantity of Matter: the Mole

Physical Properties of Matter

States of Matter

Gases

Liquids and Solutions

Solids

Thermal properties

Separation and Characterization of Matter

Learning Activities: Chemistry of Soil

ATOMS AND ELEMENTS

Atoms and Elements

The Atomic Theory

Subatomic Particles

The Basic Structure of the Atom

Development of the Periodic Table

Hydrogen, the Simplest Atom

Helium, the First Atom With a Filled Electron Shell

Lithium, the First Atom With Both Inner and Outer Electrons

The Second Period, Elements 4–10

Elements 11–20, and Beyond

A More Detailed Look at Atomic Structure

Quantum and Wave Mechanical Models of Electrons in Atoms

Energy Levels of Atomic Orbitals

Shapes of Atomic Orbitals

Electron Configuration

Electrons in the First 20 Elements

Electron Configurations and the Periodic Table

Learning Activities: Worksheets, Molecular Models

CHEMICAL BONDS, MOLECULES, AND COMPOUNDS

Chemical Bonds and Compound Formation

Chemical Bonding and the Octet Rule

Ionic Bonding

Fundamentals of Covalent Bonding

Covalent Bonds in Compounds

Some Other Aspects of Covalent Bonding

Chemical Formulas of Compounds

The Names of Chemical Compounds

Acids, Bases, and Salts

Learning Activities: Biodiesel Module

CHEMICAL REACTIONS, EQUATIONS, AND STOICHIOMETRY

The Sentences of Chemistry

The Information in a Chemical Equation

Balancing Chemical Equations

Will a Reaction Occur?

How Fast Does a Reaction Go?

Classification of Chemical Reactions

Quantitative Information from Chemical Reactions

What is Stoichiometry and Why is it Important?

Learning Activities: Formation of Salt Lab

ACIDS, BASES, AND SALTS

The Importance of Acids, Bases, and Salts

The Nature of Acids, Bases, and Salts

Conductance of Electricity by Acids, Bases, and Salts in Solution

Dissociation of Acids and Bases in Water

The Hydrogen Ion Concentration and Buffers

pH and the Relationship Between Hydrogen Ion and Hydroxide Ion Concentrations

Preparation of Acids

Preparation of Bases

Preparation of Salts

Acid Salts and Basic Salts

Names of Acids, Bases, and Salts

Learning Activities: Superstorm Sandy Module

19. SELECTED BIBLIOGRAPHY AND SOURCE MATERIALS:

1. <http://www.epa.gov/sciencematters/june2011/principles.htm>
2. <http://www.sustainablebusiness.com/index.cfm/go/news.display/id/25050>
3. <http://www.beyondbenign.org>
4. Gurney, R.; Stafford, S. P. "Integrating Green Chemistry Throughout the Undergraduate Curriculum via Civic Engagement." In: Anastas, P. T.; Levy, I. J.; Parent, K. E. *Green Chemistry Education*. Washington, D.C.: American Chemical Society, 2009, 79-116.

Please contact your Department Chairperson or Associate Dean Stanley Bazile at the Office of Academic Affairs x5328, if you require any assistance completing a course proposal according to this format. Copies of this format are available electronically.

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