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ROWAN COLLEGE
CURRICULUM COMMITTEE

PROPOSAL TITLE: PREPARATORY COLLEGE CHEMISTRY

UNDERGRADUATE GRADUATE 2 CREDIT HOURS

SPONSOR(S): K.V. RAMANUJACHARY and L. DINSMORE

DEPARTMENT & TELEPHONE# CHEMISTRY & PHYSICS X-3573 or X-3576

CHECK ONE: COURSE MINOR PROGRAM CONCENTRATION SPECIALIZATION
 ACHIEVEMENT CERTIFICATE CERTIFICATION PROGRAM MAJOR PROGRAM

STEP #1 (DEPARTMENT)	STEP #2 (RECEIPT)	STEP #3 (SCHOOL)
<input checked="" type="checkbox"/> APPROVED/DATE: <u>10/11/95</u> <input type="checkbox"/> NOT APPROVED/DATE: <u>Robert J. [Signature]</u> DEPT. CURRICULUM CHR.	SCC# _____ DATE RECEIVED: _____ <u>Ronald J. [Signature]</u> SENATE CURRICULUM CHR.	REVIEWED DATE: - <u>2/2/96</u> <input checked="" type="checkbox"/> RECOMMEND TO APPROVE <input type="checkbox"/> RECOMMEND NOT TO APPROVE FORWARD FOR OPEN HEARING <input type="checkbox"/> WITHOUT RESERVATIONS <input type="checkbox"/> WITH RESERVATIONS COMMENTS: _____ <u>[Signature]</u> SCHOOL COMMITTEE CHR.
<input checked="" type="checkbox"/> REVIEWED/DATE: <u>10/11/95</u> <u>[Signature]</u> DEPT. CHR.		

STEP #4 (ACADEMIC DEAN)	COMMENTS:
<input checked="" type="checkbox"/> RECOMMEND <input type="checkbox"/> NOT RECOMMEND <input type="checkbox"/> CONDITIONALLY RECOMMEND (SEE COMMENTS) DATE & SIGNATURE, DEAN OF SCHOOL _____	_____ <u>[Signature]</u>

RECEIVED
 DEAN OF THE DEAN
 DEPT. OF SCIENCE

STEP #5 (SENATE CURRICULUM COMMITTEE)
DATE OF OPEN HEARING _____ APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) <u>3/13/96</u> <input type="checkbox"/> RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS: _____ _____

6 (SENATE)
DATE PRESENTED TO SENATE <u>3/13/96</u> <input checked="" type="checkbox"/> APPROVED <input type="checkbox"/> NOT APPROVED NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) _____ SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE <u>[Signature]</u>

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED 4/29/96

APPROVED: YES NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS 2

FACULTY LOAD HOURS 1

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST [Signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 14 May 96

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 1905-100

DATE/SIGNATURE OF REGISTRAR B. F. Kelsey 14 May 96

NOTIFICATION FORWARD:

SENATE CURRICULUM COMMITTEE CHAIRPERSON

DEPARTMENT CHAIRPERSON(S)

ACADEMIC DEAN(S)

REGISTRAR

SPONSOR(S)

PREPARATORY COLLEGE CHEMISTRY

1. DETAILS:

Course Title:	Preparatory College Chemistry
Sponsors:	K.V. Ramanujachary and Lee Dinsmore Department of Chemistry and Physics
Credit Hours:	2 SH, 2nd quarter course
Course Level:	Undergraduate <i>FRESHMAN</i>
Curricular effect:	Free Elective
Prerequisites:	None
Time of Implementation:	Fall 96, Second Quarter
Adequacy of Resources:	Present faculty and library facilities are adequate.
Short Term Evaluation:	Please see attached.

2. RATIONALE:

A common problem encountered by nearly a third of the students attempting the introductory course in college level chemistry is that their analytical and mathematical skills are inadequate to comprehend the most simple and fundamental concepts in chemistry. This problem has been recognized by many chemistry instructors both at national and international levels and is being debated actively. The acute nature of this problem can be appreciated better if one considers that a college level chemistry course is a prerequisite for all students aspiring to major in the sciences, medicine or engineering. Further, the college chemistry curriculum itself is very demanding and it is very easy for students who lack the basic math and analytical skills to fall behind rapidly. As a consequence, the instructors often must spend time during the lecture to address in detail simple mathematical relationships. Most college chemistry text books assume student familiarity with these topics. For the same reason, instructors also find it difficult to introduce abstract theories which are the basis of modern chemistry or to adopt a more sophisticated text book for college chemistry. Chemistry is a cumulative subject, one principle builds on the other and if the students have trouble understanding one, the next will be certainly bewildering. More importantly, if the students do not learn enough in the first course, they will find the second level college chemistry to be even more difficult. Overall then, the net result is that the quality of instruction suffers and our students will not be in a position to compete with other students from other institutions. There is an imminent need to change this situation considering that more first level (Chemistry. I) sections will be added for the engineering school (seven such sections are now offered each year).

There are several reasons for the poor performance of these students, among which the most notable are; i) that the students have not taken an elementary math or chemistry courses during their high school career, ii) that the students had elementary math or science courses four or more years ago.

One solution to this problem is to offer a *gateway* course, 'Preparatory College Chemistry' the focus of which would be to familiarize the student with the elementary concepts of chemistry and the relevant mathematics encountered in the Chemistry I course. One of us (K.V.R) has taught a similar course at Rutgers University, New Brunswick and Cook campuses where the general situation is no better than what we face at Rowan. The results of the course were very encouraging; nearly 65% of the students taking the preparatory course succeeded when they took the Chemistry I course. Absent the preparatory course they would have most likely failed Chemistry I. In addition, students who took this course indicated that they developed a better appreciation for chemical sciences because of their improved background.

Preparatory College Chemistry course will be a free elective offered in the second quarter. Students enrolled in Chemistry I will be given a placement exam on the first day of the term. Those who do poorly will be advised to drop Chemistry I and enroll in Preparatory College Chemistry. The first major exam of Chemistry I will be given before the end of the first quarter and will offer another opportunity for students to transfer to the preparatory course. The population of the prep course will be self selected students who have demonstrable difficulty with fundamental concepts of math and chemistry.

3. ESSENCE OF THE COURSE:

a) Objectives:

The students will learn selected fundamental principles of math and their application to solving chemical problems. In class, a group discussion will focus on learning some commonly used chemical vocabulary. After taking this course the student will be able to:

- Understand fractions, exponents, rounding off numbers, scientific notation of numbers, accuracy and precision of a measurement, significant figures, manipulation of numbers in simple algebraic equations
- Understand the metric system of units and dimensional analysis using the factor-label method
- Understand what is meant by matter, physical and chemical properties of matter, conservation of mass and energy in a chemical process.
- Know what is meant by stoichiometry, naming of chemicals, writing simple chemical equations, molar mass, molecular and empirical formulas.

- Understand the concept of a mole and its relation to simple chemical equations.
- Demonstrate familiarity with the periodic table, and predicting formulas using the periodic table.

b) Topical Outline:

The text book is, tentatively, Foundations of College Chemistry by Morris Hein. Another possible choice is Chemistry, Concepts and Models by Robinson et al.

The course will include the following topics:

1. Standards and Measurement:

Measurements and Significant Figures; Rounding off numbers; Scientific Notation of Numbers, Significant figures in Calculations; The metric system; Problem solving; Density.

2. Classification of Matter:

Physical States of matter; substances and mixtures; elements - names and symbols; metals-nonmetals-metalloids; compounds; chemical formulas.

3. Properties of Matter:

Physical and Chemical properties of matter; conservation of mass; energy in chemical changes; conservation of energy.

4. Nomenclature of Inorganic Compounds:

Common and systematic names; oxidation numbers; Using ions to write formulas of compounds; binary and ternary compounds.

5. Quantitative Composition of Compounds;

Mole; Molar Mass of compounds; Percent composition and empirical formulas; Calculation of molecular formula from the empirical formula.

6. Chemical Equations:

Format for writing chemical equations; writing and balancing equations; types of chemical equations.

7. Calculations from Chemical Equations:

Stoichiometry- the mole ratio method; mole-mole, mole-mass, mass-mass calculations and limiting reactant and yield calculations.

8. Atomic Theory:

Dalton's theory of matter; Composition of compounds; the nature of electrical charge; Subatomic Parts of the Atom; General Arrangement of Subatomic Particles; The Bohr atom; Energy Levels of Electrons; Atomic Structures of the first 20 elements; Lewis-Dot representation of atoms; the octet rule.

9. Periodic Classification of elements;

Historical introduction; the periodic law; groups and periods; predicting formulas by use of the periodic table; transition elements; noble gases.

c) Evaluations Procedures:

Students will be evaluated by homework, quizzes, class participation and exams.

d) Course Evaluations:

The departmental course evaluation form will be used at the end of the course.

4. RESULTS OF CONSULTATIONS:

Robert Newland, Chairman, Department of Chemistry and Physics.

Richard Meagher, Chair of Biological Sciences.

Jim Tracey, Dean, School of Engineering

Pearl Bartelt, Dean, School of Liberal Arts and Sciences.

Catalog Description:

This course familiarizes students with elementary concepts of chemistry and relevant math skills. The students will learn fundamental chemical principles which will enable them to succeed in Chemistry I, a first course in college chemistry. Selected topics of this course include: Standards and Measurement, Classification and Properties of Matter, Nomenclature of Inorganic compounds, Quantitative Composition of Compounds, Chemical Equations, Atomic Theory and Periodic Classification of elements. There are no prerequisites for this course. This course will be offered during the second quarter of the semester.

STUDENT EVALUATION

Course: **PREPARATION FOR CHEMISTRY**

Instructor: Lee A. Dinsmore

Time: Fall 1995

QUESTIONS/COMMENTS

1. Why did you enroll in this course?

- A. To get the basics in chemistry so I'll be better prepared in Chem I
- B. I was struggling to pass Chem I and hoped this course would help me.
- C. I enrolled in this course because before I took this course I was lacking in the basic fundamentals of chemistry.
- D. I was advised to take it because I was doing poorly in Chem I. I needed extra help!
- E. I took this course to refresh my mind on things that I learned in high school.
- F. I wasn't doing too well in Chem I. So I came to this class in order to get the basics.
- G. Because Chemistry I was too hard.
- H. I was having trouble with Chemistry I
- I. I was failing Chemistry and thought the extra help would be good.
- J. Teacher recommendation
- K. I was considering changing to a Bio course and my Bio teacher suggested that a chemistry would be needed. Since I have absolutely no background in Chem, this course seemed like a good option.
- L. To be more prepared for Chemistry I

2. What was your chemistry background coming in to the course? Did you have H.S.Chem? Were you enrolled in Chem I?

- A. Both
- B. High School Chem Jr. year - Chem I
- C. I was enrolled in one year of H. S. Chem w/lab. However, my teacher in H. S. was a teacher that should have been fired.
- D. I had H. S. Chem for 1 year and half the semester w/Chem I here.
- E. I had chemistry in high school. I was also previously enrolled in a Chem I course but I was having problems.
- F. Yes. I did have high school chemistry. However, we didn't go into much detail or have labs. Yes, I was enrolled in Chem I
- G. I had high school chemistry and I was enrolled in Chem I at the beginning of the semester.
- H. I had H. S. Chem and I was enrolled in Chem I.
- I. Yes. H. S. chem was 4 yrs ago and I remembered nothing.
- J. High School Chem. I was enrolled in Chem I
- K. I have had nothing.
- L. I had High School chemistry 18 years ago. Yes, I was enrolled in Chem I.

3. Has It been useful to you?

A. Was the level of the course too easy, about right, too hard?

- a. about right
- b. perfect
- c. about right
- d. It was just about right for me because I needed extra help w/some of Chapt 1-3 before moving on.
- e. about right
- f. Yes. The level of the course was too easy at first but when it got to the stuff I didn't know, it was about right.
- g. about right
- h. about right
- i. about right
- j. about right
- k. Yes. About right
- l. about right

B. Was the speed of coverage too slow, about right, or too fast?

- a. about right
- b. perfect
- c. The speed of coverage was about right
- d. For me, about right cause the extra help was beneficial
- e. About right. Dr. Dinsmore really took time out to explain things.
- f. The speed was about right.
- g. Slow ---- about right
- h. About right. I need this knowledge because if you don't know the basics then you really can't continue on without struggling.
- i. About right
- j. About right
- k. Yes. About right
- l. A little too slow

C. Was the format of the course satisfactory?

i. Would you prefer more or less lecture?

- | | |
|---------------------|---------------------------|
| a. more | g. Its fine the way it is |
| b. perfect | h. Yes. The same |
| c. more lecture | i. Satisfactory |
| d. about right | j. Yes. More |
| e. Yes. It was fine | k. No |
| f. same | l. the same |

ii. more or less worksheets?

- | | |
|-------------------------|---------------------------------------------------------------------|
| a. less | g. worksheet were extremely helpful to do in and out of class. More |
| b. perfect | h. same |
| c. more worksheets | i. same |
| d. neither, about right | j. less |
| e. also fine | k. no |
| f. same | l. same |

iii. More or less homework?

- | | |
|------------------|------------------|
| a. less | g. less homework |
| b. more | h. same |
| c. less homework | i. same |
| d. a little more | j. satisfactory |
| e. fine | k. no |
| f. less | l. more |

iv. more or less quizzes?

- | | |
|------------------|-----------------|
| a. less | g. less quizzes |
| b. more | h. same |
| c. less quizzes | i. same |
| d. a little more | j. satisfactory |
| e. less quizzes | k. no |
| f. same | l. more quizzes |

4. Do you feel prepared for Chem I as a result of taking this course? (If you are currently enrolled in Chem I, has this course helped you to do better in it?)

- A. I feel more confident than I had before taking Chem I next semester.
- B. I feel this course will help me to do well on the final.
- C. I feel prepared for Chem I now.
- D. For the first couple of Chapters I do.
- E. Yes, I now have learned things that I had forgotten.
- F. Yes.
- G. I think that I could take Chem I and pass it (in contrast to the 'F' I was getting).
- H. I do feel prepared
 - I. I feel better prepared, but not totally
 - J. I feel more prepared than I was
- K. If I were to take it, I know I would do better than just starting off w/Chem I. It also helped me decide about the Bio major, oddly enough
- L. I feel more prepared.

5. Any general comments on how to improve the course or aspects of the course that you liked or disliked would be appreciated. Use the back of this sheet if you wish.

- A. NA
- B. NA
- C. This course has been one of the most beneficial courses I have taken at Rowan. I feel no need for it to be improved
- D. The course could use a little more in depth for later chapters, but that is just about right.
- E. The course was excellent as was the teacher
- F. NA
- G. I liked the way this course was taught and the information was very clear. This course should be continued because I think that Chem I was a big jump from H. S. chemistry.
- H. NA
 - I. It should be a full semester and take you through all the general terms of Chem I
- J. NA
- K. I thought this course was good and should be kept for future students who have no chem background or are considering a major where Chem I is a requirement and they are unsure about the major still
- L. We could have used an introductory tour of the lab and equipment.

Preparation for Chemistry
Fall, 1995

Comparison of grades for exam 1 in Chemistry I prior to taking prep chem (Fall 95)
with the grade for the course taken as a repeat this semester (S96)

<u>Student</u>	<u>Fall 95 Exam 1 grade</u>	<u>Spring 96 Exam 1 grade</u>
1	F	C
2	D	C
3	F	B
4	C-	C
5	F	B
6	W	B