DOCTOR OF PHILOSOPHY DEGREE

A. Program Entrance Requirements

An applicant to the program at the doctoral level must meet all requirements established by the Graduate School. Although students will be evaluated on an individual basis, they will be expected to submit Graduate Record Examination (GRE) scores as well as a complete transcript to the CMB program. Students admitted to the program will be expected to have obtained at least a 3.0 undergraduate grade point average (4 point system). In addition, all students admitted to the program in good standing will be expected to have completed the following courses:

Calculus, 5 semester hours (or equivalent)
Organic Chemistry, 8 semester hours
Physics, 6 semester hours
Biology, 8 semester hours

B. Program of Study

1. Degree Requirements

CMB core curriculum,	28 credits
CMB research and dissertation,	24 credits
Electives,	20 credits
Total credits required,	72 credits

2. Core Curriculum (28 credits required)

a. Biochemistry (B CH) 613, Molecular Biophysics, 3 credits
b. B CH 705, Molecular Genetics, 4 credits
c. Cell and Molecular Biology (CMB) 701-702-703, Laboratory Practicum I, II, and III (0+3) 3 credits each for a total of 9 credits (see Appendix A)
d. CMB 710, Cell Biology, 4 credits
e. CMB 730, Classroom/Laboratory Teaching, 0 credits (see Appendix B)
f. CMB 790, Graduate Seminar (1+0), 2 credits
g. CMB/B CH/BIOL/CMPP 794, Colloquium (1+0) 1 credit each to maximum of 6 credits

3. Some Representative Electives (17 credits required)

Biochemistry Courses:

B CH 612 Plant Biochemistry (3+0) 3 credits
B CH 617 Metabolic Regulation (4+4) 4 credits
B CH 660 Laboratory Safety (1+0 or 2+0) 1 or 2 credits
B CH 701-702 Experimental Biochemistry I and II (0+9) 3 credits
B CH 711-712 Biochemical Techniques (0+4 or 8) 1 or 2 credits each
B CH 722 Metabolism (3+0) 3 credits
B CH 731 Physical Biochemistry (3+0) 3 credits
B CH 740 Enzymology (3+0) 3 credits
B CH 751 Nucleic Acids (3+0) 3 credits
B CH 752 Mitochondrial Structure and Function (3+0) 3 credits

Biology Courses:

BIOL 675 Neurobiology (3+3) 4 credits
BIOL 680 Developmental Biology (3+0) 3 credits
BIOL 705 Current Topics in Cell and Molecular Biology (3+0) 3 credits

Cell and Molecular Biology Graduate Program

BIOL 711 Advanced Cellular Biology (3+0) 3 credits
BIOL 764 Current Research in Developmental Biology (3+0) 3 credits

Cell and Molecular Biology Courses:

CMB 793 Independent Study (1-6+0) 1 to 6 credits

Chemistry Courses:

CHEM 642 Advanced Organic Chemistry (3+0) 3 credits
CHEM 643 Modern Methods of Organic Analysis (2+3 or 6) 3 or 4 credits
CHEM 740 Advanced Organic Synthesis (3+0) 3 credits
CHEM 741 Advanced Organic Structure Elucidation (3+0) 3 credits
CHEM 742 Theoretical Organic Chemistry (3+0) 3 credits
CHEM 743 Special Topics in Organic Chemistry (3+0) 3 credits
CHEM 744 Stereochemistry and Conformational Analysis (3+0) 3 credits
CHEM 745 Chemistry of Natural Products (3+0) 3 credits
CHEM 750 Theoretical Physical Chemistry (3+0) 3 credits
CHEM 751 Special Topics in Physical Chemistry (3+0) 3 credits
CHEM 753 Physical Chemistry of Macromolecules (3+0) 3 credits

Computer Science Courses:

CS 686 Principles of Computer Operating Systems (3+0) 3 credits
CS 687 Computer Database Management Systems (3+0) 3 credits

Microbiology Courses:

MICR 601 Medical Microbiology (7+6) 9 credits
MICR 682 Medical Mycology (1+6) 3 credits
MICR 711 Recombinant DNA Technology (0+9) 3 credits
MICR 780 Introductory Cellular Immunology (3+0) 3 credits
MICR 781 Advanced Molecular Genetics (3+0) 3 credits
MICR 784 Molecular Mechanisms of Viral Replication (3+0) 3 credits
MICR 785 Experimental Immunochemistry (1+6) 3 credits
MICR 787 Cellular and Molecular Biology of Cancer (3+0) 3 credits

Pharmacology Courses:

PHAR 730 Cell and Molecular Pharmacology (3+0) 3 credits
PHAR 740 Neuroeffector Pharmacology (3+0) 3 credits

Other Courses:

Psychology 706-707, Intermediate Statistics I and II (3+0) 3 credits each

Courses not listed above may meet lecture course requirements. Please inquire about specific courses.

4. <u>An Example Plan of Study</u>

Semester I:

B CH 705 Molecular Genetics	4
CMB 701 Laboratory Practicum I	3
CMB/B CH/BIOL/CMPP 794 Colloquium	1
Electives	2
	10 credits

Semester II (Spring):

CMB 10 Cell Biology	4
CMB 702 Laboratory Practicum II	3
CMB/B CH/BIOL/CMPP 794 Colloquium	1
	8 credits

Summer Session I:

CMB 703 Laboratory Practicum III	3
	3 credits

<<SELECT ADVISER AND BEGIN TO DEFINE RESEARCH PROJECT>>

Semester III (Fall):

B CH 613 Molecular Biophysics	3
Electives	4
CMB/B CH/BIOL/CMPP 794 Colloquium	1
	8 credits

<<SELECT COMPREHENSIVE EXAMINATION COMMITTEE & INITIATE EXAM>>

Semester IV (Spring):

Electives	5
Dissertation	3
CMB/B CH/BIOL/CMPP 794 Colloquium	1
	9 credits

<<COMPLETE COMPREHENSIVE EXAMINATION BEFORE REGISTERING FOR SEMESTER V>>

Semester V (Fall):

CMB 790 Graduate Seminar	1
CMB/B CH/MICR/PHAR 793 Independent Study	3
CMB/B CH/BIOL/CMPP 794 Colloquium	1
Dissertation	3
	8 credits

Semester VI (Spring):

CMB 730 Classroom/Laboratory Teaching	0
Dissertation	8
	8 credits

Semester VII (Fall):

CMB/B CH/BIOL/CMPP 794 Colloquium	1
Electives	3
Dissertation	6
	10 credits

Semester VIII (Spring):

Dissertation	8
CMB 790 Graduate Seminar	1
	9 credits
Grand Total	72 credits

C. Program Completion Requirements

It is the student's responsibility to fulfill all requirements in a timely manner, failure to do so may result in dismissal from the program.

1. Academic Requirements

Academic requirements as determined by the Graduate School and the Program will be met by all CMB students. Required courses will be chosen from core and elective courses as outlined in section (**B**) above.

2. General Procedures for the Comprehensive Examination

a. During the first year of residence in the CMB program students will complete their laboratory rotations. These are designed to expose students to research in cellular and molecular biology and to aid them in selecting an advisor. Normally, the number of rotations is three. However, if a student has a Masters degree, this may be reduced to two rotations. The rotations are registered as CMB 701, 702, and 703.

b. Before the third semester of residence in the CMB program, each student must select, in consultation with the CMB program director and the desired faculty member, a research/thesis advisor from among the CMB faculty. Selection depends on a mutual agreement between the student and the desired advisor, and the program can not guarantee the availability of any particular advisor. This advisor will serve as chair of the student's advisory/examination committee.

c. After having selected a research advisor, the student will arrange for two additional CMB group faculty to serve as an advisory/examination committee. At least two additional faculty will be appointed to meet Graduate School requirements, one from a related field and one from the University at large. The committee will be approved by the student's chosen advisor with the approval of the CMB director. The examination committee should be chosen and hold an initial meeting prior to or early in Semester III. The committee will approve the comprehensive examination, the program of study, the final doctoral dissertation, conduct the formal oral part of the doctoral thesis defense, and serve in an advisory capacity to the student during his/her tenure in the CMB program. The student and committee should meet biannually to advise the student on his/her progress. The student should prepare a written progress report, as defined by the committee, for each of these meetings.

3. Comprehensive Examination Requirements

a. The comprehensive examination will be a written and orally defended research proposal.

b. The Comprehensive Examination Committee (CEC) may be the same committee as the student's graduate committee.

c. The topic of the independent research proposal may or may not be related to the student's thesis research proposal. When the topic is related to the thesis proposal, the thesis advisor will ensure the independent nature of the proposal. The student's committee will give the final approval to the grant topic.

d. The student will write a research grant proposal in the form of an extramural grant application to an agency currently funding such research (e.g. NIH, NSF). The research proposal is designed to test the student's ability to think creatively in the field of Cell and Molecular Biology and propose research projects which are logical extensions of current knowledge. The proposal should contain innovative ideas so the faculty can evaluate the student's potential as a creative investigator. The research proposition will provide the framework for the faculty to test the student's ability to solve problems, and to test his/her overall knowledge in the field of Cell and Molecular Biology.

4. Nature of the Comprehensive Examination Proposal

The Comprehensive Examination consists of the student independently proposing a research project on a topic which can not be a project conducted in a faculty member's laboratory or proposed in a grant application by any faculty member. The preparation for this exam may be done as an independent study course. Following approval of the project, by the student's advisory committee, the student will write a research grant proposal in the form of an extramural grant application to an agency currently funding such research (e.g. NIH, NSF, etc.) The application will consist of three sections: i) BACKGROUND, a literature review of the project (limited to 3 single spaced typewritten pages); ii) SPECIFIC AIMS, a succinct summary of the project goals (one page); iii) EXPERIMENTAL DESIGN, a description of experiments to be performed, including rationale, materials and methods, and a brief discussion of expected results (no limit, but to the point). The entire proposal must be well referenced and include a bibliography. When the proposal is completed the student will submit it to his or her advisory-examining committee. Each committee member must approve the written proposal. Within two weeks of approval of the proposal, the student will defend it before the CEC members and faculty sponsor. The student must demonstrate in the oral exam a clear outline of experiments to investigate the chosen topic, and must thoroughly understand all techniques and concepts directly or indirectly associated with this proposal. The oral examination will normally take no more than two hours, and the student must be notified that day as to his or her proficiency.

Any student not passing this examination may revise and resubmit the proposal or select a new topic at the discretion of the committee. A student must pass this second exam within an additional period determined by the CEC. Any student failing this revised comprehensive exam may not continue in the CMB Ph.D. program.

5. Comprehensive Examination Schedule

a. Each matriculated CMB student must submit to his or her committee a written proposal (section C.4. above) before the student can register for Semester IV (exclusive of summer sessions).

b. The Comprehensive Examination must be successfully completed and written notice of such, signed by each member of the CEC, must be submitted to the CMB office prior to registration for Semester V. Registration and stipends (both research and teaching assistantships) will be blocked until written notice is provided.

c. The fulfillment of this requirement is strictly the students responsibility. The CMB Program will ensure that administrative measures are taken to monitor and facilitate compliance with this requirement.

6. Dissertation and Final Examination Requirements

If a student has first author publications accepted in refereed journals at the time he/she has completed work, he/she may submit the publications to his/her thesis committee and petition to write an introduction to the work and have the dissertation consist of this introduction and the papers. The committee may decide that additional chapters be required along with the published papers.

Prior to formally choosing a date for the final oral examination, graduate students must submit a copy of their final dissertation for review by their examining committee. The dissertation does not have to be in its final form, e.g. thoroughly referenced, perfect grammar, etc., but must contain sufficient information to allow their committee to make an informed decision about the state of completion of their studies. The purpose of the review is to discern whether a student has sufficiently completed their studies to announce a date for their final examination.

Following acceptance of the dissertation by the advisory/examination committee, all doctoral candidates in the CMB program will schedule and present a research seminar on their dissertation research, which will be open to the general public. This seminar will constitute part of the final examination and must be presented while the candidate is still in residence. This seminar requirement is in addition to the final examination requirement of the Graduate School. Following the public portion of this seminar, the advisory/examination committee, expanded to include all appointed Graduate School representatives, will conduct a final oral examination in closed session.

This oral examination will be so conducted as to meet all relevant examination requirements of the Graduate School. Doctoral candidates may register for one credit of Graduate Seminar during the semester in which this seminar is presented.

D. Graduate Student Performance Standards.

All graduate students in the CMB program are considered full-time scientists, and as such are expected to adhere to high standards of professional and personal behavior. Following are standards that are required of students, and disciplinary actions that may be taken if a student fails to measure up to these standards.

1. Performance and Effort.

a. All CMB students are required to adhere to the scientific misconduct policy of the University of Nevada, Reno (Ethical Standards in the Conduct of Research). Failure to adhere to these standards may be grounds for removal from the CMB graduate program, at the discretion of the Program Director.

b. Time commitment. Vacation time will be limited to 3 weeks per year. Students are required to complete a leave of absence form and submit this form to the CMB program each period that they do not report to work. Approval by the student's thesis advisor is required.

c. Outside employment. Graduate students are considered full-time professionals, and as such may not simultaneously hold outside employment while registered in the program.

2. Disciplinary Actions.

a. Evaluation of a student's performance will be determined by the Student Advisory Committee (SAC). The SAC may receive input from individual faculty and students. After preliminary considerations, the committee will inform the student of areas of concern, and may suggest disciplinary action.

b. Specific disciplinary actions include the following: i) probationary status, which may include loss of financial support and/or non-registration; ii) permanent expulsion from the program, which may be implemented without a probation period.

3. Attendance

a. The CMB Program schedules an annual research retreat for graduate students, faculty, and research fellows. All graduate students are required to attend. Furthermore, students are required to present their research findings at this conference. Graduate students who have completed their first or second year of studies may present their findings by either the poster or oral presentation method, while all senior graduate students are required to give only oral presentations. Graduate students who have been in the CMB Program for less than one year are required to attend but not required to present research findings.

b. All graduate students are required to attend Colloquium (Journal club) even though they may have satisfied the core credit requirement by formally enrolling in CMB/B CH/BIOL/CMPP 794.

Cell and Molecular Biology Graduate Program

MASTER OF SCIENCE DEGREE

A. Program Entrance Requirements

An applicant to the program at the M.S. level must meet all requirements established by the Graduate School. Although students will be evaluated on an individual basis, they will be expected to submit Graduate Record Examination (GRE) scores as well as a complete transcript to the director of the CMB program.

B. Program of Study

1. Completion Requirements

CMB core curriculum	14
CMB research and thesis	9
Electives	7
30 credits	

2. Core Curriculum Courses (14 credits required)

a. Biochemistry (B CH) 613, Molecular Biophysics, 3 credits OR
Cell and Molecular Biology (CMB) 710, Cell Biology, 4 credits

b. B CH 705, Molecular Genetics, 4 credits

c. CMB 701, Laboratory Practicum I, 3 credits

d. CMB 790, Graduate Seminar, 2 credits

e. CMB/B CH/BIOL/CMPP 794, Colloquium, 2 credits

3. An Example Plan of Study

(Elective courses can be found in section B.3. of Ph.D. requirements, page 1)

Semester I (Fall):

B CH 705 Molecular Genetics	4
CMB 701 Laboratory Practicum I	3
CMB 790 Graduate Seminar	1
8 credits	

Semester II (Spring):

Thesis	3

CMB/B CH/BIOL/CMPP 794 Colloquium	1
CMB 710 Cell Biology	4
8 credits	

<<SELECT ADVISER AND DEFINE RESEARCH PROJECT>>

Semester III (Fall):

Electives	4
CMB/B CH/BIOL/CMPP 794 Colloquium	1
Thesis	2
7 credits	

Semester IV (Spring):

CMB 790 Graduate Seminar	1
CMB/B CH/BIOL/CMPP 793 Independent Study	3
Thesis	3
7 credits	
Grand Total	30 credits

C. Program Completion Requirements

It is the student's responsibility to fulfill all requirements in a timely manner.

1. Academic Requirements

Academic requirements as determined by the Graduate School and the Program will be met by all CMB students. Required courses will be chosen from core courses as outlined in section (**B**) above.

2. General Procedures and Examination Requirements

a. During the second semester of residence in the CMB program, each student must select, in consultation with the CMB program director and the desired faculty member, a research/thesis advisor from among the CMB faculty. Selection depends on a mutual agreement between the student and the desired advisor, and the program can not guarantee the availability of any particular advisor. This advisor will serve as chair of the student's advisory/examination committee.

b. After having selected a research advisor, the student will arrange for two additional CMB group faculty to serve as an advisory/examination committee. At least one additional faculty will be appointed, representing the University at large, to meet Graduate School requirements. These additional appointments will be subject to approval of the committee chairperson (research/thesis advisor). Permanent constitution of the committee will be subject to the approval of the CMB Director. This committee will approve the final thesis, conduct the formal oral part of the thesis defense, and serve in an advisory capacity to the student during his or her tenure in the CMB

program.

3. Thesis Examination Requirements

Prior to formally choosing a date for the final oral examination, graduate students must submit a copy of their final thesis for review by their examining committee. The thesis does not need to be in its final form, e.g. thoroughly referenced, perfect grammar, etc., but must contain sufficient information to allow their committee to make an informed decision about the state of completion of their studies. The purpose of the review is to discern whether a student has sufficiently completed their studies to announce a date for their final examination.

After acceptance of the thesis (see Doctoral section C.6., p.5, above for nature of thesis) by the advisory/examination committee, all M.S. candidates will schedule and present a research seminar on their thesis research which will be open to the public. This seminar will constitute part of the final examination and must be presented while the candidate is still in residence. Following the public portion of this seminar, the advisory/examination committee, expanded to include all appointed Graduate School representatives, will conduct, in closed session, a final oral examination, which will be so conducted as to meet all relevant examination requirements of the Graduate School.

D. Graduate Student Performance Standards.

All graduate students in the CMB Masters program are considered professional scientists, and as such are expected to adhere to high standards of professional and personal behavior. Following are standards that are required of students, and disciplinary actions that may be taken if a student fails to measure up to these standards.

1. Performance and Effort.

a. All CMB students are required to adhere to the scientific misconduct policy of the University of Nevada, Reno (Ethical Standards in the Conduct of Research). Failure to adhere to these standards may be grounds for removal from the CMB graduate program, at the discretion of the Program Director.

2. Disciplinary Actions.

a. Evaluation of a student's performance will be determined by the Student Advisory Committee (SAC). The SAC may receive input from individual faculty and students. After preliminary considerations, the committee will inform the student of areas of concern, and may suggest disciplinary action.

b. Specific disciplinary actions include the following: i) probationary status, which may include loss of financial support and/or non-registration; ii) permanent expulsion from the program, which may be implemented without a probation period.

3. Attendance

a. The CMB Program schedules an annual research retreat for graduate students, faculty, and

research fellows. All graduate students are required to attend. Furthermore, students are required to present their research findings at this conference. Graduate students who have completed their first or second year of studies may present their findings by either the poster or oral presentation method, while all senior graduate students are required to give only oral presentations. Graduate students who have been in the CMB Program for less than one year are required to attend but not required to present research findings.

b. All graduate students are required to attend Colloquium (Journal club) even though they may have satisfied the core credit requirement by formally enrolling in CMB/B CH/BIOL/CMPP 794.

Cell and Molecular Biology Program

DOCTOR OF PHILOSOPHY DEGREE FOR MD/PhD STUDENTS

A. Program Entrance Requirements

An applicant to the program at the doctoral level must meet all requirements established by the Graduate School. Although students will be evaluated on an individual basis, they will be expected to submit Graduate Record Examination (GRE) scores as well as a complete transcript to the CMB program. Students admitted to the program will be expected to have obtained at least a 3.0 undergraduate grade point average (4 point system). In addition, all students admitted to the program in good standing will be expected to have completed the following courses:

Calculus, 5 semester hours (or equivalent)	Physics, 6 semester hours
Organic Chemistry, 8 semester hours	Biology, 8 semester hours

B. Program of Study

1. Degree Requirements

CMB core curriculum	16 credits
CMB research and dissertation	24 credits
Electives	32 credits
Total credits required	72 credits

2. Core Curriculum (28 credits required)

a. Biochemistry (B CH) 613, Molecular Biophysics, 3 credits. **Satisfied by B Ch 601, 602**.
b. B CH 705, Molecular Genetics, 4 credits.
c. Cell and Molecular Biology (CMB) 701, Laboratory Practicum I (0+3) 3 credits.
CMB 702 and 703 **waived** (see Appendix A).
d. CMB 710, Cell Biology, 4 credits
e. CMB 730, Classroom/Laboratory Teaching, **waived**
f. CMB 790, Graduate Seminar (1+0), 2 credits.
g. CMB/B CH/BIOL/CMPP 794, Colloquium (1+0) 1 credit each
to a maximum of 3 credits total.

3. Some Representative Electives

The following courses in years 1 and 2 of medical school will satisfy the elective course requirements for the Program.

B CH 601, 602	Biochemistry	9 credits
PCB 601	Gross Anatomy/Embryology	4 credits
PCB 602	Histology	3 credits
PCB 603	Neuroanatomy	3 credits
PCB 610	Physiology and Cell Biology	5 credits
PCB 611	Systems Physiology	6 credits
PCHY 601, 602	Human Behavior I, II	7 credits
MICR 601	Microbiology	9 credits
PHAR 601	Pharmacology	9 credits
PATH 601	General Pathology	6 credits
PATH 602	System Pathology	6 credits

C.-D. Program Completion Requirements; Graduate Student Performance Standards.

Sections C and D (p. 5-7) are required and identical for students pursuing the MD/PhD.

Cell and Molecular Biology Program

Molecular Virology

Pari
St. Jeor

Immunology & Microbial Pathogenesis

Courchesne
Hudig
Hunter
Kozel
Lupan

Receptors & Intracellular Communication

Courchesne
Kenyon
Sanders

Lipids and Membrane Biology

Blomquist
Pritsos
Mastick, C

Structural Biology and Molecular Modeling

Welch
Lightner

Nucleic Acids and Genetics

Baker Condit Kozel
Pai Pari Pardini
St. Jeor

Cellular and Developmental Biology

Baker
Bernisone
Condit
Clark
Kidd
Mastick, G
Pai
Zanjani

APPENDIX B

CMB 730, Teaching Component for Cell and Molecular Biology Graduate Program

All graduate students in the PhD program will be required to take CMB 730.

CMB 730

Classroom/Laboratory teaching, no credits. Formal classroom teaching and associated duties including two three-hour laboratory sections, TA meetings with the course coordinator, and office hours. Students with inadequate prior teaching experience (determined by the Director) will be required to take BIO 702 and the GSID program. Completion of these courses is required prior to enrollment in CMB 730.

BIO 702

Supervised teaching, one credit. One hour per week instruction and practice in lecturing, exam composition, computer and video disc applications in teaching.

GSID Program

Three and one-half day teaching workshop, offered by the graduate school prior to the beginning of fall semester.

Students will be under contract to the Graduate School and Biology Department during the semester enrolled in CMB 730. The TA stipend for a 3rd year PhD student is presently $5,000 for one semester, which includes in-state tuition or $95.25 of the $107.50 per credit fee for an out-of-state student. The difference between the TA stipend and the appropriate graduate research assistant stipend amount will be paid to the student by a contract with the CMB graduate program supported by funds from the student's research advisor/principal investigator. The amount of stipend savings to the PI will be paid into the CMB general student fund to support first year students and/or students with gaps in stipend support.

Qualifications for a TA contract with the Graduate School/Biology Department require that the student: 1) be a full time graduate student enrolled in 6 or more credits during the contract semester; 2) complete a graduate teaching application form with the Biology Department; and 3) have the CMB program director and/or the student's major professor submit a letter of recommendation to the Biology coordinator of graduate teaching assistants.

The Biology Department will allot one TA position each semester to the CMB program. Delegation of students to fill these positions will be the responsibility of the CMB program director in conjunction with the CMB student advisory committee. Appropriate courses which will be assigned to the CMB students include the following:

1. BIO 191, General Biology Laboratory, or as of Fall 1994,
   BIO 192, Introductory Biology Laboratory, for majors.

2. BIO 100, Principles of Biology, for non-scientists (laboratory).

3. BIOL 393, Cell and Genetics Laboratory.

4. BIOL 223, Human Anatomy and Physiology.

5. BIOL/B CH 4xx/6xx, Molecular Genetics Laboratory (to be arranged).

6. EECB 734, Molecular Techniques and Evolution.

7. MICR 711, Recombinant DNA Techniques.