SUBJECT REVIEW REPORT

DEPARTMENT OF CHEMISTRY

FACULTY OF SCIENCE
UNIVERSITY OF COLOMBO

14th to 16th August 2006

Review Team :

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1. SUBJECT REVIEW PROCESS

1.1. Introduction

Universities are public institutions. They must conscientiously exercise their responsibility for quality and standards. Higher education is a 'public good' and is of crucial importance to health, wealth and well being of the society and the economy of the country. University accountability for quality and standards is a key factor in promoting and safeguarding public confidence in Sri Lankan higher education.

Subject Review evaluates the quality of education within a specific subject or discipline. It is focused on the quality of student learning experience and on student achievement and is designed to evaluate the quality of both undergraduate and postgraduate programmes.

The Subject Review process is introduced by the committee of Vice-chancellors and Directors (CVCD) and the University Grant Commission (UGC). The Quality Assurance and Accreditation Council (QAAC) of the UGC is now conducting Subject Reviews and Intuitional Reviews in Sri Lankan Universities. Prof. Colin Peiris, Quality Assurance Specialist of the QAAC by a letter dated 21st July 2006 notified that the following team has been appointed to perform the Subject Review of the Department of Chemistry, University of Colombo from 14th to 16th August 2006.

Prof. W. D. W. Jayatilake, Department of Chemistry, University of Sri Jayawardenepura
Prof. S. Mohandas, Department of Agricultural Chemistry, University of Jaffna and
Prof. R.N. Pathirana, Department of Chemistry, University of Ruhuna.

Key features of the Subject Review (SR) process are preparation of a Self Evaluation Report (SER) by the department on the disciplines they teach, and evaluation of the students learning experience in the subject as claimed by the report.

SER of the Department of Chemistry, University of Colombo prepared in March 2006 was submitted to the members of the Team with a letter dated 21st July 2006 requesting the team to perform the SR. It contained 8 pages of Overview of Provision, 21 pages of eight aspects of Evaluation and Conclusion. There were 15 pages of appendix and therefore the total pages are 44. The SER layout, its contents and the number of pages confined very well to its requirement.

1.2 Review Visit

The Team evaluated the quality of education in the Department of Chemistry according to the Aims and Learning Outcomes stated in their SER. The purpose of the review visit was to review, consider and test the evidence provided by the Department.

On 10th August 2006 the Review Team met the Consultant on QA of the Improving Relevance and Quality in Undergraduate Education (IRQUE) Project to be familiarized with the SR process. At 9.00 a.m. on the 14th August 2006 the Team arrived at the University and it was invited for a welcome meeting by the Dean of the Faculty of Science for which Head Department of Chemistry, QA Specialist and QA Consultant of IRQUE project were also invited. Thereafter**,** the Review Team met the Head of the Department of Chemistry and senior staff of the Department. The agenda for the review process was finalized with the Head, Department of Chemistry. During the morning session, Head of the Department of Chemistry gave a presentation which comprehensively covered the progress made by the Department on all aspects included in the SER for the benefit of the SR Team in the presence of all members of the academic and nonacademic staff of the Department. The Subject Review process was progressed by the team according to the agenda.

The Review Team held meetings with the following individuals and groups.

- Head, Department of Chemistry
- Academic Staff of the Department of Chemistry
- Non-academic Staff of the Department of Chemistry
- Undergraduate Students
- Postgraduate Students
- Student Counselors, Academic Advisor and Coordinator of Enhancement Courses

The Team visited the following places of the Chemistry Department for observation.

- Special and Postgraduate Students' Research Laboratories
- Instrument Rooms
- Computer Laboratory
- Departmental Library
- Lecture Halls when 1st, 2nd, 3rd and final year students were following lectures
- Laboratories when 1st, 2nd, 3rd and final year students were involved in practicals

The Review Team studied the following documents.

- Faculty Handbook 2006/2007
- Lecture and practical timetable for the Department of Chemistry
- Details about the visiting staff and the course units taught by them
- Examination papers sent to foreign examiners and their comments
- A set of answer scripts marked by a foreign examiner as a second examiner
- Copies of laboratory handouts given to students in all four years
- Copies of lecture handouts given to students in the 1st year and the Chemistry Special 3rd year
- Copies of the tutorials given to students
- Marking scheme of one course unit from each of the following years: 1st year-2nd year, General - 3rd year, Chemistry Special - 3rd year, Chemistry Special – 4th year, and Biochemistry - 4th year
- Grades and relevant Grade Points used in the examinations
- The list of chemistry books introduced to the Library in and after 2003
- Set of Course Evaluation Forms filled by the students

1.3 Review Judgments and Outcomes

The Review Team at the end of the 3-day visit made judgments on each of the Eight Aspects stating good or satisfactory or unsatisfactory.

If any Review Aspect is found to be unsatisfactory, action should be taken by the department within six months. If the department wishes it may request clarifications from the Review Team or make any comment on the report within a month of receiving the report. The department is required to send a report on the action taken in response to review recommendations within one year**.** Finally, the Review Report will be published and a certificate will be issued.

2. BRIEF HISTORY OF THE UNIVERSITY, FACULTY AND THE DEPARTMENT

2.1 The University

The University of Colombo is the oldest university in Sri Lanka spreading over fifty acres of land in the heart of the city of Colombo. The history of Higher Education in Sri

Lanka is closely linked with that of the University of Colombo which traces its beginnings to the establishment of Ceylon Medical School in 1870. Although there was well developed system of primary and secondary education in Sri Lanka at the end of the 19th century, there were hardly any opportunities available for the study of Arts and Sciences beyond the secondary school level. As a result of persistent demands, the University College was established in 1913 and was formally declared open in January 1921. The University was established in July 1942. Mr. Robert Marrs who was the Principal of the University College was succeeded by Sir Ivor Jennings in 1940 who also became the Vice Chancellor of the new University. He was involved with the establishment of a second University in Peradeniya. Accordingly, the Faculty of Agriculture and Veterinary Science was moved to Peradeniya in 1949 followed by the Department of Law in 1950 and the Faculty of Arts and Oriental Studies in 1952. Free education introduced in 1945 and the use of national languages as media of instruction in secondary schools from about 1950 accelerated the demand for higher education and consequently, the shift to Peradeniya was halted on the way. Instead of shifting the Faculty of Science to Peradeniya, a new Faculty was established there in 1961 followed by a new Medical School in 1962 whereas the original faculties remained in Colombo. An additional Faculty of Arts was established in Colombo in 1963 making use of the abandoned "Race Course" premises to cater for large number of Arts students who could not be accommodated at Peradeniya. The Department of Law was then brought back to Colombo in 1965 and in this year the Colombo section of the University admitted nearly five thousand students following courses in Arts. Law, Science and Medicine.

In October 1967, the Colombo section of the University of Ceylon was promoted to a separate university which had initial population of about 5000 reading for degrees in Arts, Law, Science and Medicine with a teaching staff around 300. With the establishment of a single University in 1972, Colombo became one of the five campuses of the University of Sri Lanka which in 1978, was renamed, the University of Colombo, Sri Lanka and regained the autonomous university status. Since then the University has developed extensively to achieve the present state having seven faculties namely, Arts, Graduate Studies, Law, Education, Management and Finance, Medicine and Science which include over 50 departments of study.

2.2. **The Faculty of Science**

The Faculty of Science consists of the following departments and has been in existence since the establishment of the University of Ceylon in 1942 and is the oldest faculty among other Science Faculties in Sri Lanka.

1. Department of Chemistry
2. Department of Mathematics
3. Department of Nuclear Science
4. Department of Physics
5. Department of Plant Sciences
6. Department of Statistics
7. Department of Zoology

Presently the number of undergraduates in the faculty is 1569 whereas the number of postgraduate students is 144. The strengths of academic and non-academic staff are 88 and 144 respectively. The Faculty conducts degree programmes leading to the B.Sc. General Degree (03 years duration) and B.Sc. Special Degree (04 years duration). Various subject combinations are available for the General Degree while Special Degree programmes are available in several areas. In addition, the Faculty in collaboration with the School of Computing offers computer science as a subject to all students.

The Faculty of Science also conducts several postgraduate courses leading to the Master of Science degree and Postgraduate Diplomas as well as research degrees leading to M.Phil. and Ph.D.

2.3. The Department of Chemistry

The Department of Chemistry is one of the founder departments and has been in existence from the inception of the University in 1942, and started offering chemistry as a subject to the B.Sc. General Degree programme and also commenced its B.Sc. Special Degree programme in the same year. At present the Department caters for Special Degree programmes in the following areas.

1. Chemistry
2. Biochemistry and Molecular Biology (in Collaboration with the Faculty of Medicine)
3. Pharmacy (in collaboration with the Faculty of Medicine)
4. Computational Chemistry in collaboration with School of Computing.

Students following the General Degree programmes are allowed to select the chemistry based courses they wish to follow in their third year, from ten course units offered by the Department of Chemistry and from 2005 they have been given the opportunity to select two course units (CH 3024 and CH 3027) available for the special degree students. The undergraduate programmes conducted by the Department are given in Table 1 and they were reviewed during the Subject Review process.

Table 1: Undergraduate programmes conducted by the Department

Programme	Duration	Current Enrolment		Year & Implementation
		3rd year	4th year	
B.Sc. General Degree	3 years	55	-	1942
B.Sc. Special Degree in Chemistry	4 years	24	24	1942
B.Sc. Special Degree in Biochemistry and Molecular Biology	4 years	06	06	1998
B.Sc. Special Degree in Pharmacy	4 years	08	12	2000
B.Sc. Special Degree in Computational Chemistry	4 years	06	-	2005
Faculty Biochemistry Course	3 years	28	-	2002
Molecular Biology and Biochemistry (*Direct Intake by the Faculty)*	3 years	60	-	31st July 2006

The approximate student intake at the Faculty of Science each year is 480. About 50% of these students opt to follow chemistry courses in their first and second year undergraduate degree programme. The subject combinations where chemistry is offered as a subject are given in Table 2.

It was learnt that the combinations B4 and B5 which include Environmental Science are not popular and hence will not be available from this year. The number of Physical Science students offering chemistry is noticed to be low and it is around 25%.

Students are screened for their eligibility to follow a 4-year degree programme depending on their performance at the first and second year examination. Only 25% of the students offering chemistry as a subject in their first two years are selected to follow the Special Degree programmes conducted by the Department of Chemistry.

The number of students who were eligible to follow the Special Degree chemistry based 4-year degree programmes offered by the Department is given in Table 3.

Table 2: Subject combinations involving chemistry as a subject

Abbreviation	Subject Combination
B1	Plant Sciences, **Chemistry**, Zoology, Computer Science
B4	Plant Sciences, **Chemistry**, Environment Science, Computer Science
B5	Zoology, **Chemistry**, Environment Science, Computer Science
B6	Plant Sciences, **Chemistry**, Biochemistry, Computer Science
B7	Zoology, **Chemistry**, Biochemistry, Computer Science
P1	Applied Mathematics, Physics, **Chemistry**, Computer Science
P4	Applied Mathematics, **Chemistry**, Statistics, Computer Science
P5	Applied Mathematics, Pure Mathematics, **Chemistry**, Computer Science

Table 3: Number of students eligible to follow the Special Degree programmes

Year	Chemistry (20)*	Biochemistry & Molecular Biology (06)*	Pharmacy (10)*	Computational Chemistry (10)*
2005	51	16	19	25
2004	94	58	59	-
2003	67	43	35	-

*Number of students selected for chemistry Special Degree programme.

Details of the course units offered by the Department of Chemistry for the available combinations of Physical Science and Biological Science are given in Annex A1 and A2 respectively and the details of the course units offered during the third and fourth years of Special Degree courses are given in Annex A3.

The courses offered by the Department are credit based. The academic year consists of two semesters, each of 15 weeks duration. For theory courses the credit content may vary from 1 credit (15 hours) to 3 credits (45 hours). A practical course may vary from 1 credit (30 hours) to 3 credits (90 hours).

In the first two years the students offering chemistry are required to follow all the core chemistry units, amounting to 6 credits (core) per academic year. Out of these 6 credits, 2 credits are from the practical course. The core chemistry units are designed to cover the fundamentals in chemistry on which the future courses are based. In addition to the core course units, students have choice of selecting 2 credits per year from optional (elective) chemistry units. The optional units have been designed to cover industrially, environmentally and practically important areas in chemistry. Based on the Grade Point Average (GPA) and other selection criteria, students are selected to follow Special Degree courses conducted by the Department of Chemistry. A student who is following a General Degree course with chemistry as a subject should follow 6 credits of core chemistry units at the third year (level 3).The student therefore should complete altogether a minimum of 18 credits in chemistry in the three years to qualify for the General Degree with chemistry as subject out of 90 credits (plus enhancement credits) required for a General Degree. Annex A1 and A2 show that the Department of Chemistry offers 19 credits of elective courses over the three years for the benefit for those who are interested in these courses. Special Degree students must complete 120 credits (30 credits per year) and 4 enhancement credits for graduation. Those who do not fulfill the above criterion but satisfy the requirements for the General Degree (90 credits and 4 enhancement credits) can opt for a General Degree.

Table 4: Teaching Staff of the Department

Name of the staff member	Educational qualifications	Designation
Prof. H.D. Gunawardhana	B.Sc, Ph.D	Senior Professor
Prof. E.D. De Silva	B.Sc, Ph.D	Professor
Prof. S.A. Deraniyagala	B.Sc, Ph.D	Professor
Prof. M.D.P. De Costa	B.Sc, Ph.D	Professor
Dr. S. Hewage	B.Sc, Ph.D	Senior Lecturer Grade I
Dr. R.D. Wijesekera	B.Sc, Ph.D	Senior Lecturer Grade I
Dr. D.T.U. Abeytunga	B.Sc, Ph.D	Senior Lecturer Grade I
Dr. D.P. Dissanayaka	B.Sc, M.Phil, Ph.D	Senior Lecturer Grade I
Dr. K.R.R. Mahanama	B.Sc, M.A, M.Phil, Ph.D	Senior Lecturer Grade I
Dr. R.D. Gunaratna	B.Sc, Ph.D	Senior Lecturer Grade I
Dr. M.S.S. Weerasinghe	B.Sc, Ph.D	Senior Lecturer Grade I
Dr. V. Chandrasekaran	B.Sc, M.Sc, Ph.D	Senior Lecturer Grade I(Temp)
Dr. S.A. Fernando	B.Sc, M.Phil, Ph.D	Senior Lecturer Grade II
Dr. K.M.N. de Silva	B.Sc, Ph.D	Senior Lecturer Grade II
Dr. W.R.M. de Silva	B.Sc, Ph.D	Senior Lecturer Grade II
Dr. C.D. Wijeyaratna	B.Sc, M.Eng, Dr. Eng.	Senior Lecturer Grade II
Dr. R.P. Perera	B.Sc, M.Sc, Ph.D	Senior Lecturer Grade II
Dr. R.S. Dassanayaka	B.Sc, Ph.D	Senior Lecturer Grade II
Mr. M.N. Kaumal	B.Sc.	Lecturer Probationary

The teaching staff of the Department of Chemistry consists of one Senior Professor, three Professors, seven Senior Lecturers grade I, six Senior Lecturers grade II, one Temporary Senior Lecturer grade I and one Probationary Lecturer (Table 4).

The Department of Chemistry gets the services of several categories of support staff. Academic support staff consists of Assistant Lecturers(5), Demonstrators(14), Analytical Chemists(1), Temporary Research Assistants(2), Engineering Teaching Assistants(1), Computer Application Assistants(2). Non-academic support staff consists of Staff Technical Officers (Super Grade)(3), Technical Officers(1), Probationary Technical Officers(2), Laboratory Attendants(14), Labourers (2), and Clerks(1). On the second day of the review process we had an opportunity of meeting most of the members of the non-academic staff (22 attended). It was noticed that the non-academic staff work in harmony with all academic staff of the Department as one team. They also mentioned that their relations with students are good. All Senior Technical Officers have received training abroad.

Observation of department facilities was done on the first day of the review process. Department currently possesses two-storied historical building known as the Old Chemistry Building and five-storied building known as the New Chemistry Building. The old building is shared by the Department of Chemistry and Zoology. The main Chemistry Lecture Theatre which can accommodate about 200 students and Pharmacy Laboratory are located in the Old Chemistry Building. The administrative office, all the other lecture rooms, laboratories, all the staff rooms and the Student Common Room are located in the New Chemistry Building.

The lecture rooms are equipped with black and white boards. One of the lecture rooms is equipped with in-house multimedia facilities and the other two multimedia projectors available in the Department are moved around whenever a necessity arises. The oldest and the largest laboratory is located in the Old Chemistry Building and can accommodate up to 60 students and is used 4 days a week for practical classes. The new Pharmacy Laboratory which can accommodate up to 30 students is also located in the same

building. Altogether seven laboratories are located in the new building, six of which are for undergraduate training and one is for postgraduate research. It was mentioned that some of these laboratories are used for practical classes for the M.Sc. programme in analytical chemistry during Saturdays.

The Department possesses an instrument centre and a NMR/GC-MS room. It was noticed that the NMR and the GC-MS machines are out of order at the moment and the measures are being taken to repair them. The researchers face difficulties as a result and it was learnt that they go to University of Peradeniya to run their samples. The instrument centre is equipped with UV/Visible spectrophotometers, High Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC) instruments, Fluorimeter, Polarimeter, Fluorescence Microscope, Atomic Absorption Spectrophotometer and a Modular Fermentor.

The Department provides services to industry and research institutions and to its research activities through the Centre for Analytical Research and Development (CARD).

The department has its own mini-library which possesses a collection of about 650 books and at present it is used only by the academic staff and Special Degree students. It was said that these books have been donated to the department by its Alumni. It was noticed that this library is popular among the Special Degree students and they are of the view that more books be provided to it.

The computer unit of the Department is equipped with 20 computers, 2 printers and one scanner. Only two of the computers are connected to internet. This unit is mainly used by the Special Degree students of the department. It was learnt that the facilities here are not adequate and as such it is recommended that more internet facilities be provided. The Department has three chemical stores in three locations whereas laboratories have their own mini- chemical stores. During the discussion with the laboratory staff, it was learnt that the cadre position for the storekeeper has not been filled as yet. It was also learnt that the floor space for the stores is inadequate and the technical staff is of the view that department activities will be easier if a vehicle is provided to the department.

3. AIMS AND LEARNING OUTCOMES

3.1. Aims

The Department of Chemistry of the University of Colombo conducts the following courses and the degree programmes.

1. B. Sc. General Degree Chemistry course, Chemistry as a subject for the B.Sc. General Degree programme.
2. B. Sc. Special Degree programme in Chemistry.
3. B. Sc. Special Degree programme in Biochemistry and Molecular Biology.
4. B.Sc. Special Degree programme in Pharmacy (in collaboration with the Faculty of Medicine).
5. B.Sc. Special Degree in Computational Chemistry (in collaboration with the School of Computing).
6. Molecular Biology and Biochemistry Course (Direct intake by the Faculty and coordinated by the Department of Chemistry)
7. M. Sc. programme in Analytical Chemistry.
8. M. Sc. in Applied Organic Chemistry
9. Post-graduate diploma in Toxicology (in collaboration with the Department of Forensic Medicine and Toxicology).

10. Research based M.Phil. and Ph. D. Degree programmes.

The Department conducts the above programmes with the following Aims.

3.1.1. to provide students with an excellent and supportive learning environment, within which they can explore their interests in the chemical sciences and related fields.

3.1.2. to impart to students understanding of the fundamental principles of chemistry, problem solving skills, research and practical skills and a strong foundation of knowledge in the chemical sciences.

3.1.3. to give students and junior staff members an opportunity to acquire transferable skills, such as presentation and communication skills, organizational skills, independent learning skills, computer-usage skills and to prepare them for future carriers in research, academic, industry, management etc.

3.1.4. to foster an environment and develop an infrastructure, within which both undergraduate and post-graduate students can carry out high quality research

3.1.5. to be an educational and technological resource for the industrial, scientific and educational community in Sri Lanka.

3.2 Learning Outcomes

Based on the performance in the first two years, students are selected to follow the Special Degree courses. Others have to continue their studies leading to the General Degree, chemistry as a subject.

As stated in the SER,

Upon successful completion of core Chemistry courses in the first two years a student should have

- acquired a knowledge of the fundamental principles of chemical bonding, thermodynamics, kinetics, equilibria, elementary quantum mechanics, electrochemistry, spectroscopy, organic chemistry (including stereochemistry, nomenclature, and chemical properties of reactions of the major functional groups), radiochemistry, coordination chemistry, and analytical and separational methods
- become familiar with basic laboratory techniques, safety aspects, qualitative tests and the chemical principles associated with them in organic and inorganic chemistry and the proper use of glassware and instrumentation.
- developed basic problem-solving skills in chemistry, including logical and quantitative problems.

Upon successful completion of core Biochemistry courses in the first two years a student should have

- acquired an understanding of the applications of fundamental principles of chemistry of biological systems
- acquired knowledge of the structure and the function of major classes of biological molecules (proteins, carbohydrates, lipids, nucleic acids), enzyme catalysis, membranes and metabolic pathways
- become familiar with basic laboratory techniques in biochemistry, including qualitative and quantitative tests, supranational methods and safety aspects

Upon successful completion of the Special Degree in Chemistry, a student should have

- acquired in-depth knowledge and understanding of underlying principles in all the major sub-disciplines of chemistry: analytical chemistry, organic chemistry,

spectroscopy, bioorganic chemistry, coordination and organometallic chemistry, pharmaceutical chemistry, molecular biology, physical and theoretical chemistry, biochemistry, industrial chemistry and chemistry technology
- developed advanced problem-solving and laboratory skills in chemistry
- developed the ability to work independently on research project, searching the literature and on-line sources of information and writing reports, presentation skills, as well as ability to use computers at an appropriate level.

Upon successful completion of the Special Degree in Biochemistry and Molecular Biology a student should have

- acquired in-depth knowledge and understanding of underlying principles in molecular biology, protein structure and chemistry of metabolic pathways, nucleic acid technology, nutritional and clinical biology, applications in biotechnology, advanced topics in gene expressions and cell regulations, advanced immunology and immunochemistry, microbial biochemistry, biophysical chemistry, bioorganic chemistry, spectroscopy, analytical chemistry, laboratory and quality management.
- developed advanced problem-solving and laboratory skills in Biochemistry and Molecular Biology
- developed the ability to work independently on research projects, searching the literature and on line sources of information and writing reports
- acquired significant transferable skills, such as communication and presentation skills, as well as ability to use computers at an appropriate level.

Upon successful completion of the Special Degree in Pharmacy, a student should have

- acquired in-depth knowledge and understanding of underlying principles in pharmacy and its sub- disciplines: pharmaceuticals, pharmaceutical microbiology, pharmaceutical chemistry, pharmacology, pharmacognosis, pharmaceutical law and ethics, pharmaceutical management and administration, pharmacy practice, quality control, statistics and computer applications, anatomy and physiology, nutritional and clinical biochemistry, nucleic acid technology, coordination and organometallic chemistry, analytical chemistry, spectroscopy, laboratory and quality management
- acquired a knowledge of the practical aspects of pharmacy
- developed the ability to work independently on research projects, searching the literature and on line sources of information and writing reports
- acquired significant transferable skills, such as communication and presentation skills, as well as ability to use computers at an appropriate level

Upon successful completion of the Computational Chemistry, a student should have

- acquired in-depth knowledge and understanding of underlying principles in physical and theoretical chemistry, computer graphics and image processing, data structure and algorithms, database management systems, neural computing, logic programming and prolog, intelligent systems, advanced molecular modeling, information and coding theory, evolutionary computing, spectroscopy, coordination and organometallic chemistry and organic chemistry
- developed advanced problem-solving and computer-usage skills in chemistry
- developed the ability to work independently on research projects, searching the literature and online sources of information, and writing reports

- acquired significant transferable skills, such as communication and presentation skills, significant computer programming skills, and the ability to use the advanced computer applications.

Upon successful completion of Chemistry courses of the General Degree programme a student should

- have in-depth knowledge in the relevant subject area: analytical chemistry, computational chemistry, industrial chemistry, chemical technology, environment chemistry, molecular biology, laboratory management and quality management as optional units
- be able to apply their knowledge in a "real world" situation.

4. FINDINGS OF THE REVIEW TEAM

4.1 Curriculum Design, Content and Review

The academic year consists of two semesters, each of 15 weeks. The capacity of a study course is determined by the credit value assign to it. Fifteen-hour theory course is equivalent to1credit and the credit weight of courses varies from 1 credit (15 hours) to 3 credits (45 hours). For practical courses, 30- hour course is equivalent to1 credit and the credit value for practical courses also varies from 1 credit to 3 credits.

During first and second years, for each year, students have to follow the courses to cover the required 6 credit units as follows.

core chemistry theory courses - 4 credits
core chemistry practical courses - 2 credits

Based on the performance in the first two years, students are selected to follow the Special Degree courses conducted by the Department of Chemistry. Others have to continue for the General Degree with chemistry as a subject. For them the total number of credits for the third year remains the same as in the first and the second years.

The details of the undergraduate programmes conducted by the Department are given in Table 1 and the subject combinations where chemistry is offered as a subject are given in Table 2.

For a Special Degree, students must complete total 120 credits and 4 enhancement credits for graduation. For that, special students must complete 65 credits in Chemistry during their 3rd year and 4th year study period.

Those who are unable to fulfill this requirement for a Special Degree can opt for a General Degree if they satisfy the condition for the General Degree (90 credits and 4 enhancement credits).

The course units and their credit values for 3rd and 4th year special courses conducted by the Department are given in the annex A3

The Faculty Student Handbook is published every year and copies are given to students at the beginning of the first year. More details of the contents of each course unit are given in the website of the University. In addition to that, in most cases lecturers give details and relevant list of references at the beginning of their lecture series.

It was observed by the Review Team that the basic courses are designed to cover all fundamentals in the subject areas. Elective courses are mainly applied in nature and cover practically important areas of the subject including industrial chemistry.

Seminar topics and research projects of the Special Degree students were also subjected to evaluation by the Review Team. The topics cover several areas of modern aspects of chemistry and applied chemistry. It was also observed that the selection of topics for research projects are done by students themselves, on their interest on the subject area. A

list of research topics are given to them by the Department. Each academic staff member contributes to the list by giving several topics in his/her area of research interest. At the discussion with the students the Team observed that the students appreciated the freedom given to them in this respect as it will be useful for their future career.

In addition to the major curriculum revision done at faculty level, the revision of syllabi has been done by the Department at regular intervals. All these revisions were based on experience form previous years. This topic was discussed at length at the self-evaluation presentation done by the Head of the Department for the Review Team and also at the meeting with the academic staff. Head and the members of the academic staff believe that the revision of syllabi meets with the global needs.

It is the view of the Review Team that the present state of curriculum design, content and review adopted by the Department can be judged as ***Good.***

4.2 Teaching, Learning and Assessment methods

The common method of imparting knowledge is through the delivery of lectures. It was observed that all lectures in the General Degree as well as in the Special Degree are conducted only by the senior academics in the department. In most cases multi-media facilities are used. In addition, printed lecture materials are provided to the students in certain lectures. The Review Team observed delivery of certain lectures and found the speed and the style of presentations to be reasonable. At the discussions with students, it was evident that they appreciated the use of multimedia and printed lecture materials at lectures.

Demonstrations at the practical classes are done by the Demonstrators who are appointed from the most recently passed-out special batch. They work under the supervision of a senior member of the academic staff who is in-charge of the practical class. The Review Team appreciates their active participation as Demonstrators towards the smooth running of the practical classes.

Students of the first two years are given tutorials for which written answers have to be submitted before a given date. These tutorials are marked by Demonstrators and the discussion classes for tutorials are held for groups of 20 students. The Team appreciated this arrangement as small groups provide a good environment for active learning.

As far as learning environment is concerned no criticisms came form students. Except some “antique items” which reduced the working space of the first year laboratory, all the laboratories and the lecture theaters are in good conditions required to create a proper learning environment.

The supporting staff was highly motivated and devoted to their services. The meeting held with the supporting non-academic staff (technicians, laboratory attendants, clerical staff and labourers) was also very satisfactory. It is the opinion of the Review Team that the supporting staff in the Department of Chemistry is setting an example for the staff of similar grades in other Universities!

The examinations are carried out according to the semester course unit examination system. Grade Point Average (GPA) system has been adapted for evaluation. At the end of each semester students have to sit for the examinations based on the course units relevant to that semester. Papers are set and moderated by the academic staff in the department, appointed by the Head of the Department. In addition to that papers are sent to the other universities for moderation. Furthermore, Special Degree papers are also sent to moderators appointed in foreign universities. The Team noted the comments made by external examiners and found that those comments have been considered in the moderation process.

It is the view of the Review Team that the present state of teaching, learning and evaluation adopted by the Department can be judged as ***Good.***

4.3 Quality of students including Student Progress and Achievement

The student enrolment in the Faculty of Science is around 480 per year of which 33% is for Biological Science and 67% for Physical Science. The documents provided to the Review Team by the department revealed that the Z-score of the students following Chemistry is 1.8-2.0 for the Biological Science and 1.6-1.8 for the Physical Science students of the 2003/2004 batch. At the meeting the Review Team had with the 2nd year students it was revealed that there were two students who got admission for the Faculty of Medicine and Faculty of Engineering have opted to pursue the B.Sc. Degree programme with the intention of following B.Sc Special Degree in Chemistry. The documents supplied by the Department revealed that the performance of the students is monitored at all levels by way of tutorials, assignments, continuous assessments, questionnaires and practical examinations at laboratory classes and formal end of semester examinations. The marks of formal end of semester examinations and final practical marks of students are available with the Head of the Department of Chemistry. The results of each course are analyzed by the respective Coordinators prior to submission to Head of the Department. We observed that the above activities are carried out satisfactorily by the Department and it was noticed that the performance of the students is good. The attendance of the students at practical classes is monitored well and only students with an 80% attendance are allowed to sit the practical examinations. They are allowed to attend the practical classes that they missed due to unavoidable circumstances to maintain the average and we notice this as a rare concession that these students get compared to other universities.

Students are selected for 4 year Special Degree programmes based on their preference and performance. During the discussions with students it was observed that about 80% of the students selected to Special Degree programme in chemistry are from the Colombo district. The department is of the opinion that this is due to the fact that the most students from Colombo who get high Z-scores apply for Science Degree programmes at the University of Colombo.

Generally the performance of students at the Special Degree programmes offered by the Department during last two years (2003 and 2004) is satisfactory and their performance has been evaluated using the Average Student Performance (ASP). It was also noticed that this performance of Special Degree students is better than that of the General Degree students who offer chemistry. ASP level achieved by the General Degree students during the years 2003 and 2004 too can be reported as satisfactory and the level reached is 2.6. The analysis provided by the Department showed that the waiting time of all Special Degree graduates for their first job is less than one year as in 2003 and 2004 where as 80% of General Degree graduates found their first job within a period of one year. The efforts made by the department in carrying out the above analyses are admirable.

It is the view of the Review Team that the quality of students, student progress and achievements of the Department can be judged as ***good.***

4.4 The Extent and Use of Student Feedback, Qualitative and Quantitative

It was revealed at the discussion held with the academic staff and also at the presentation made by the Head of the Department that the Department acquires students' feedback qualitatively by holding discussions with small groups of students at the laboratory sessions where one-to-one interaction between the academic staff and the students is practiced. This is also achieved during the tutorial discussions conducted by the Department

for small groups of students. This was evident from the copies of the tutorials provided to the reviewers by the Department. Therefore, this can be considered as a good opportunity for the Department to get students' feedback about the quality of academic programmes, teaching methods and the quality of other facilities.

The Department has also adopted a method to get the students' feedback quantitatively by using an evaluation form (questionnaire) recommended by the Faculty. It was revealed that, this questionnaire is given to students at the end of each lecture series comprising more than ten lectures where major criteria used for evaluation are (i) Learning (ii) Teaching (iii) Facilities. The reviewers had the opportunity to inspect the questionnaires and the responses received and it was noticed that the comments/ suggestions by the students had been grouped into three categories, namely positive points, negative points and students' requests. These responses had been analyzed and the results were provided to the reviewers. A majority of students have expressed their satisfaction (good) on the quality of lecturers in all aspects.

The reviewers observed that the feedback obtained from the students has been discussed by the staff at the department level and the steps have been taken to improve the quality of teaching. The evaluation has revealed that the students requested more multimedia facilities for lectures and also the improvement of the facilities and the standard of the mini-library. In order to fulfill these requests the Department has purchased two multimedia projectors and is awaiting a lap-top computer and also the library was upgraded and formalized. This library which was formerly housed in departmental office is now located in a separate area within the Department.

It is the view of the Review Team that the extent and use of student feedback by the members of the staff of the Department can be judged as ***good****.*

4.5 Postgraduate Studies

The Department of Chemistry has been conducting a postgraduate programme in Analytical Chemistry since 1975. This includes one year diploma (22 credits) and 20 months i.e. diploma plus 08 month research component for M. Sc. (30 credits) degree. In addition there are graduates doing research degrees, M. Phil. and Ph.D. All (05) M. Phil student programmes are funded by research grants. M.Sc. programme on Applied Organic Chemistry commenced in April 2006. The Postgraduate studies have been further strengthened by the addition of two more M. Sc. programmes; one on Industrial Chemistry and another on Toxicology, the latter with the collaboration of Department of Forensic Medicine.

The research facilities and arrangement for supervision are good except the NMR and few other instruments need to the repaired soon. The Team also felt that more postgraduate students for degrees by research (M. Phil, Ph.D.) could be accommodated as there is a good team of senior academics in the Department.

Publications out of postgraduate work rae also good. However, there is not much interaction between the postgraduate students within the Department, Faculty, and University or outside the University. This could be promoted by conducting more presentations possibly at the beginning of the research programme and before writing the thesis.

It is the view of the Review Team that the postgraduate studies of the Department can be judged as ***good.***

4.6 Peer Observation

Although the importance of peer observation had been identified by the Department, it is yet to be implemented for lectures and practical classes. Members of the staff have understood the value of it. The practices such as moderation of question papers, second marking of the answer scripts by another academic internally or externally are carried out. For third and final year special students external examiners are from foreign universities. Evaluation of the presentation of a topic or seminar is also done by a group of academic staff.

It is the view of the Review Team that the present status of the Peer Observation adopted by the members of the staff is considered as ***Satisfactory.***

4.7 Skills Development

Skills development is an integral component of the curriculum of the Department and it has adopted various methods to improve the skills of the students through communication and presentation skills, scientific investigation, report writing, development of IT skills and through introduction of the enhancement courses, not aggregated for overall GPA but compulsory to pass the degree, the students talents and leadership quality are developed. In addition, industrial placement of the Special Degree students provides them in-service-training and enhances their job opportunities.

With the clearance of the backlog, there are two batches coming every 06 months and as such there are times when there are two batches in the final year. Due to this, final year students getting involved in Chemical Society of the Department got disturbed. It is advised to re-activate the society to enhance the organizational skills of the students.

It is the view of the Review Team that the Skills Development of the Department can be judged as ***good.***

4.8 Academic Guidance and Counseling

Senior Academic staff of the Department have been engaged as Academic Advisor(01), Student Counselors(02), and Coordinators for various programmes of studies. The Faculty handbook is made available and is updated annually. A website provides detailed information in addition to the handbook on academic matters of the Department. The academic staff members recommend relevant text books and other learning aids to the students. The Department has a computer laboratory with 20 computers out of which 02 are connected to internet. The Department also possesses a library within the premises. The departmental Computer Laboratory and Library are restricted to the Special Degree students.

Every student has the opportunity to meet the Academic Advisor, Student Counselors or any academic staff member of the department on matters related to the subject and personal problems. Academic guidance is definitely needed at the beginning of the first year, third year and when special students are selecting seminar and research topics. The staff student interaction and relationship are found to be satisfactory.

Although the members of the academic staff are taking efforts to provide academic counseling in an informal manner the Department has not established an organized counseling system or trained the staff in this sensitive field. This matter has to be taken into account by the top university administration to provide an organized counseling system through professional counselors. There are also no evidence to show that the counseling and guidance gave any quantitative upliftment to the academic achievement of the students-specially for General Degree students.

*It is the view of the Review Team that the present situation with regard to academic guidance and counseling adopted by the members of the staff of the Department can be considered as S**atisfactory.***

5. CONCLUSIONS

The judgments given for the Eight Aspects of the Subject Review are given below.

Aspect	Judgment
Curriculum design, content and review	Good
Teaching, learning and assessment methods	Good
Quality of students including student progress and achievement	Good
Extent of use of student feedback, qualitative and quantitative	Good
Postgraduate studies	Good
Peer observation	Satisfactory
Skills development	Good
Academic guidance and student counseling	Satisfactory

The overall judgment is suspended

The Review Team appreciates the comfortable working environment provided during the review visit. The Team is also grateful for the support given by all categories of staff in the Department. The staff had a proper understanding about the review process and had all necessary documents to assist it. It was also observed that both the academic system as well as the administrative system within the Department is well organized and this facilitated the review process, when quick access to certain data or documents was necessary. The concept of group work which is a must for the development of an institution was clearly observed by the Review Team. All employees irrespective of their designation had a common set of objective towards the development of the department.

6. RECOMMENDATIONS

The Review Team would like to make the following recommendations in order to improve the quality and the relevance of the degree programmes implemented by the Department of Chemistry, University of Colombo.

1. Need for the improvement of computer and internet facilities available for the senior members of the academic staff is strongly felt. At present only those who hold posts such as Head of the Department, Course Coordinators, Student Counselors are provided with these facilities.
2. It is recommended that the internet facilities available for Special Degree students be improved.

3. The NMR and GC-MS machines must be repaired early. The postgraduate students undergo difficulties at present due to the non-availability of services from these machines.
4. It is recommended that more text books be provided to the departmental mini-library.
5. It is desirable that the proposed introduction of "Industrial Training Programme" for General Degree students using IRQUE funds implemented early.
6. Department may consider recruiting more students for postgraduate programmes by research (M.Phil. and Ph.D.). Number at present seems to be rather low compared to the number of senior staff members in the Department. At present the department has a good strength of senior staff comprising of one Senior Professor, three Professors and fourteen Senior Lecturers. Enhancement of research activities would bring about more recognition to the Department of Chemistry at University of Colombo.
7. The postgraduate students must be encouraged to do presentations, meetings and seminars must be organized at faculty level on regular basis so that they can share ideas, knowledge etc.
8. It is recommended that the Chemical Society be made more active. The office bearers of the society must be restricted to the students except for the Patron and the Senior Treasurer.
9. It is strongly recommended that Peer Observation be extended for lectures and practical classes.

7. ANNXES

Annex A1

1st, 2nd and 3rd year Subject Combinations and Chemistry Course Units

Physical Science

(Intake – 240 students in 6 subject combinations)

Level	Semester	Course Unit	Title	Credit Value	Hours	Combinations					
						P1	P2	P3	P4	P5	P6
1	1	CH 1001	Energetics and Kinetics	2	30 L	x			x	x	
		CH 1005	Materials Chemistry	1	15 L	o			o	o	
		CH 1003	Practical Chemistry I	2	60 P	x			x	x	
	2	CH 1002	Structure and Reactivity	2	30 L	x			x	x	
		CH 1006	Impact of Chemistry on Society	2	30 L	o			o	o	
		CH 1004	Practical Chemistry II	1	30 P	o			o	o	
2	1	CH 2001	Quantum Chemistry and Spectroscopy	2	30 L	x			x	x	
		CH 2005	Concepts in Molecular Modeling	2	15 L	o			o	o	
		CH 2003	Practical Chemistry III	2	60 P	x			x	x	
	2	CH 2002	Inorganic and Analytical Chemistry	2	30 L	x			x	x	
		CH 2006	Chemistry of air, water and soil	2	30 L	o			o	o	
		CH 2004	Practical Chemistry IV	1	30 P	o			o	o	
3	1	CH 3001	Topics in Analytical Chemistry I	2	30 L	x			x	x	
		CH 3002	Practical Analytical Chemistry	1	30 P	x			x	x	
		CH 3004	Laboratory Management	1	15 L	x			x	x	
		CH 3008	Quality Management	1	15 L	o			o	o	
		CH 3006	Computational Chemistry	2	30 L	o	o	o	o	o	o
		CH 3024	Pharmaceutical Chemistry	2	30 L	o	o	o	o	o	o
	2	CH 3007	Topics in Analytical Chemistry II	1	15 L	o			o	o	
		CH 3003	Industrial Chemistry	2	30 L	x			x	x	
		CH 3005	Chemical Technology	2	30 L	o	o	o	o	o	o
		CH 3010	Environmental Chemistry	2	30 L	o			o	o	

Combinations

P! Physics, Chemistry, Applied Maths, Computer Science
P2 Physics, Applied Maths, Statistics, Computer Science
P3 Physics, Applied Maths, Pure Maths, Computer Science
P4 Chemistry, Applied Maths, Statistics, Computer Science
P5 Chemistry, Applied Maths, Pure Maths, Computer Science
P6 Applied Maths, Statistics, Pure Maths, Computer Science

X = Core courses L = Lectures P = Practical O = Elective courses

Annex A2

1st, 2nd and 3rd year Subject Combinations and Chemistry Course Units - Biological Science

(Intake – 120 students in 7 subject combinations)

Level	Semester	Course Unit	Title	Credit Value	Hours	Combinations						
						B1	B2	B3	B4	B5	B6	B7
1	1	CH 1001	Energetics and Kinetics	2	30 L	x			x	x	x	x
		CH 1005	Materials Chemistry	1	15 L	o	o	o	o	o	o	o
		CH 1003	Practical Chemistry I	2	60 P	x			x	x	x	x
	2	CH 1002	Structure and Reactivity	2	30 L	x			x	x	x	x
		CH 1006	Impact of Chemistry on Society	2	30 L	o	o	o	o	o	o	o
		CH 1004	Practical Chemistry II	1	30 P	o	o	o	o	o	o	o
2	1	CH 2001	Quantum Chemistry and Spectroscopy	2	30 L	x			x	x	x	x
		CH 2005	Concepts in Molecular Modeling	1	15 L	o	o	o	o	o	o	o
		CH 2003	Practical Chemistry III	2	60 P	x			x	x	x	x
	2	CH 2002	Inorganic and Analytical Chemistry	2	30 L	x			x	x	x	x
		CH 2006	Chemistry of air, water and soil	2	30 L	o	o	o	o	o	o	o
		CH 2004	Practical Chemistry IV	1	30 P	o	o	o	o	o	o	o
3	1	CH 3001	Topics in Analytical Chemistry I	2	30 L	x			x	x	x	x
		CH 3002	Practical Analytical Chemistry	1	30 P	x			x	x	x	x
		CH 3004	Laboratory Management	1	15 L	x			x	x	x	x
		CH 3008	Quality Management	1	15 L	o			o	o	o	o
		CH 3024	Pharmaceutical Chemistry *	2	30 L	o	o	o	o	o	o	o
	2	CH 3007	Topics in Analytical Chemistry II	1	15 L	o			o	o	o	o
		CH 3003	Industrial Chemistry	2	30 L	x			x	x	x	x
		CH 3005	Chemical Technology	2	30 L	o	o	o	o	o	o	o
		CH 3009	Practical Molecular Biology *	1	30 P	o			o	o	o	o
		Ch 3027	Molecular Biology	2	30 L	o			o	o	o	o
		CH 3010	Environmental Chemistry	2	30 L	o			o	o	o	o

Combinations

B1 Plant Sciences, Chemistry, Zoology, Computer Science
B2 Plant Sciences, Biochemistry, Zoology, Computer Science
B3 Plant Sciences, Environment, Zoology, Computer Science
B4 Plant Sciences, Chemistry, Environment, Computer Science
B5 Zoology, Chemistry, Environment, Computer Science
B6 Plant Sciences, Chemistry, Biochemistry, Computer Science
B7 Zoology, Chemistry, Biochemistry, Computer Science

X = Core courses O = Elective courses L = Lectures P = Practical

Annex A3

Special Degree Courses

Chemistry/ Pharmacy/ Biochemistry & Molecular Biology/ Computational Chemistry *

Level	Semester	Course Unit	Title	Credit Value	Type	Che.	Pha.	Bio. & Mol.	Com.
3	1	CH 3020	Topics in Analytical Chemistry	3	45 L	x	x	x	
		CH 3021	Spectroscopy	3	45 L	x	x	x	x
		CH 3022	Bio Organic Chemistry	3	45 L	x		x	
		CH 3023	Coordination and Organometallic Chemistry	3	45 L	x			x
		CH 3024	Pharmaceutical Chemistry	2	30 L	x	x		
		CH 3025	Laboratory and Quality Management	2	30 L	x	x	x	
		CH 3030	Advanced Practical Chemistry	8	240 L	x			
		CH 3050	Chemistry of Metabolic Pathways	2	30 L			x	
		CH 3052	Bio Physical Chemistry	3	45 L			x	
		CH 3053	Nucleic Acid Technology	3	45 L		x	x	
		CH 3055	Practical Biochemistry and Molecular Biology	8	240 L			x	
		CH 3071	Pharmaceutics I	3	45 L		x		
		Ch 3075	Practical Pharmacy	8	240 P		x		
	2	CH 3026	Industrial Chemistry & Chemical Technology	3	45 L	x			
		CH 3027	Molecular Biology	2	30 L	x			
		CH 3028	Physical & Theoretical Chemistry	3	45 L	x			x
		CH 3029	Organic Chemistry	3	45 L	x			x
		CH 3051	Advanced molecular Biology	3	45 L			x	
		CH 3054	Nutritional and Clinical Biochemistry	2	30 L		x	x	
		CH 3072	Pharmaceutical Microbiology	3	45 L		x		
		CH 3073	Anatomy and Physiology	3	45 L		x		
		CH 3074	Pharmacology I	3	45 L		x		
		CH 3090	Practical Computational Chemistry	8	240 P				x
4	1	CH 4001	Research Project	8	240P	x	x	x	x
		CH 4002	Seminar and Essays	3	90 P	x	x	x	x
		CH 4003	General Paper	3	45 L	x		x	x
		CH 4005	Advanced Organic Chemistry	3	45 L	x			
		CH 4007	Advanced Physical Chemistry	3	45 L	x			x
		CH 4050	Applications in Biotechnology	3	45 L			x	
		CH 4051	Advanced Topics in Gene expression and cell regulation	3	45 L			x	
		CH 4052	Advanced Immunology and Immunochemistry	3	45 L			x	
		CH 4070	Pharmaceutics II	3	45 L		x		
		CH 4071	Pharmacology II	3	45 L		x		
		CH 4072	Pharmacognosy	3	45 L		x		

Level	Semester	Course Unit	Title	Credit Value	Type	Che.	Pha.	Bio. & Mol.	Com.
4	2	CH 4004	Optional Topics	4	60 L	x		x	x
		CH 4006	Biochemistry	3	45 L	x			
		CH 4008	Advanced Topics in Chemistry	3	45 L	x			
		CH 4053	Microbial Biochemistry	3	45 L			x	
		CH 4073	Advanced Pharmaceutical Chemistry II	2	30 L		x		
		CH 4074	Quality Control, Statistics and Computer Applications	3	45 L		x		
		CH 4075	Pharmaceutical Law and Ethics	2	30 L		x		
		CH 4076	Pharmaceutical Management and Administration	3	45 L		x		
		CH 4077	Pharmacy Practice	2	60 P		x		
		CH 4090	Advanced Molecular Modeling	1	15 L				x
		EC 4002	Industrial Training (enhancement course)	2	60 P	o	o	o	