DEPARTMENT OF CHEMISTRY & BIOMOLECULAR SCIENCES

UNIT OUTLINE - GUIDE, SYLLABUS AND TIMETABLE

CBMS234 – ALCHEMY, DRUGS AND THE QUEST FOR IMMORTALITY

THREE (3) CREDIT POINTS

SEMESTER 2 2014

First lecture Tuesday August 5, 1 pm W5AT2 but the rest of the lectures are web based except for lecture 23, which is on Tuesday November 4, 1 pm W5AT2

UNIT CONVENORS – PROF PETER KARUSO/DR CHRIS McRAE

URL  http://ilearn.mq.edu.au
CBMS234 UNIT GUIDE

Year and Semester: Semester 2, 2014
Unit convenor: Prof Peter Karuso
Prerequisite: 15 cp
Corequisite: none
NCCW: CBMS123
Assumed Knowledge: none

ABOUT THIS UNIT
Credit Points: 3 (equivalent to 9 hours/week of contact and self-study over 15 weeks)
Contact Hours: none outside the orientation lecture on August 5th and the 2014 Nobel Prize Lecture on November 4th.
When Offered: D2/X2 – Day/External; Second Half-Year
Staff Contact: Prof Peter Karuso
Department of Chemistry and Biomolecular Sciences
Phone: 9850 8290
Fax: 9850 8313
E-mail: peter.karuso@mq.edu.au
http://www.chem.mq.edu.au/~vislab/
http://www.facebook.com/chemistry.mq

Welcome to CBMS234 – Alchemy, Drugs and the Quest for Immortality. This unique unit of study is worth 3 credit points and is designed to be useful to a wide range of students, with or without a scientific background. The unit is offered in the second half of 2014, by the Faculty of Science, in several ways: at 100 level as CBMS123; at 200 level as CBMS234; and in either day (D2) or external (X2) mode as well as in Session 3 (S3).

Chemistry is the art and science of converting one substance into another and it has been an important factor in shaping our society. Metals, ceramics and plastics have changed and enhanced our lifestyle. Drugs, fertilisers and pesticides have saved millions of lives, but not without some unforeseen environmental or social problems. When this happens, decisions need to be made in an informed, balanced fashion. An appreciation of such issues is necessary for better understanding of important problems that face society, both today and in the years ahead.

This unit explores the way chemistry affects our lives, and the way chemists solve problems and perceive the world. Designed for students from all backgrounds, with or without previous chemical experience, the unit does not aim to teach chemistry but an appreciation of the world of chemistry and chemists. The unit looks at the impact that chemistry has had on civilisation and where the latest chemical innovations are likely to lead us. The commercial significance of some chemical processes and industries is addressed, emphasising the Australian context. The unit also examines connections between chemistry and other scientific fields as diverse as medicine, art and astronomy (to name a few), as well as revealing aesthetic and philosophical aspects of chemistry and of science in general.

The unit is taught through a combination of topical e-lectures and multimedia material. The unit is assessed by computer-based essays plus workshops. All aspects of the unit are accessible via the Internet, which facilitates external-mode studies. There is no laboratory component or final examination.
TEACHING STAFF

Academic staff of CBMS involved in presenting units CBMS234 are:

<table>
<thead>
<tr>
<th>Academic staff name</th>
<th>Role in unit</th>
<th>Contact details (e-mail; phone; office room no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/Prof Joanne Jamie</td>
<td>Lecturer</td>
<td>Contact Peter Karuso</td>
</tr>
<tr>
<td>Prof Peter Karuso</td>
<td>Lecturer-in-charge</td>
<td><a href="mailto:peter.karuso@mq.edu.au">peter.karuso@mq.edu.au</a>; 02 9850 8290; F7B232</td>
</tr>
<tr>
<td>Prof Brian Orr</td>
<td>Lecturer</td>
<td>Contact Chris McRae</td>
</tr>
<tr>
<td>Dr Chris McRae</td>
<td>Internet services, etc.</td>
<td><a href="mailto:christopher.mcrae@mq.edu.au">christopher.mcrae@mq.edu.au</a>; 02 9850 8288 F7B328</td>
</tr>
<tr>
<td>Ms Maree Nelson</td>
<td>Lecturer</td>
<td><a href="mailto:maree.nelson@mq.edu.au">maree.nelson@mq.edu.au</a>; 02 9850 8295; F7B333</td>
</tr>
</tbody>
</table>

The teaching staff will not have set office hours for this course. Rather, you are expected to use the e-mail facility and Bulletin Board on the CBMS234 web pages to send questions and contribute to the on-line discussion (Q&A forum). We will, of course, also be available for consultations on topics best dealt with in person. Please make an appointment first to see us by e-mail or telephone.

CLASSES

Two e-lectures are scheduled each week. There are two live lectures on August 5 and November 4, 2014 in W5AT2 1 PM with an audio recording (including administrative announcements, instructions concerning Workshop and/or Essay assignments, tips on study methods and/or assessment, etc.) mounted on the Web soon after the end of each live lecture. For every other e-lecture, the lecturer responsible will be available in their office for consultation (in person or by phone) at a prearranged time. Each e-lecture has Web-based material, comprising downloadable lecture notes (for printing) and an audiovisual presentation (for viewing, with active links). Students are expected to study the lecture notes and audiovisual presentations before the nominal time of each e-lecture. CBMS234 has no final examination. Therefore the timetable for preparing and submitting assignments must be strictly observed. The Department reserves the right to vary details of this schedule if necessary, with an undertaking that adequate notice of any such variations will be given to enrolled students. The Web-based version of this schedule has links to Lecture (L#), Workshop (W#) and Essay (E#) sites, etc. It is each student's responsibility to keep in regular touch with the Web-based information.

http://ilearn.mq.edu.au
## 2014 Schedule for CBMS234 Alchemy, Drugs and the Quest for Immortality

**Lecturers:** PK = Prof. Peter Karuso; JJ = Dr Joanne Jamie*; MN = Ms Maree Nelson; BO = Prof. Brian Orr*

<table>
<thead>
<tr>
<th>Week # commencing</th>
<th>e-lecture Office hours: Tuesday 1–2</th>
<th>e-lecture Office hours: Friday 10–11</th>
<th>Assignment / activities scheduled this week</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 29 Jul</td>
<td>Read Unit Guide and familiarise yourself with the iLearn resources</td>
<td>Read Unit Guide and familiarise yourself with the iLearn resources</td>
<td></td>
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</tbody>
</table>
| 1 4 Aug          | **LIVE LECTURE L0** Introductory Remarks and navigating this unit | **L1:** Chemistry through the Ages BO  
**L2:** Elements of Chemistry BO | |
| 2 11 Aug        | **L3:** Aluminium from Ore to Oven BO plus Preview of **L4, L5 & E1**  
**L4:** Bridges for Civilisation BO | Prepare for Workshop W1 | |
| 3 18 Aug        | **L5:** Chemistry – Creative, Useful BO and Central  
**L6:** Health, Life & Natural Products PK – Shipworm to Carbolic Acid | **W1** Pick A Pair of Elements  
*Prepare for Workshop W1 and Essay E1* | |
| 4 25 Aug        | **L7:** Health, Life & Natural Products PK – Salvarsan to Penicillin; The quest for immortality  
**L8:** Health, Life & Natural Products - PK What Do Molecules Look Like? | Prepare for Essay E1 | |
| 5 1 Sept        | **L9:** Health, Life & Natural Products JJ – Chemicals from Nature  
**L10:** Biochemical Catalysts PK – Enzymes at Work | **E1** Pick either a Book Chapter or a Chemical Industry | |
| 6 8 Sept        | **L11:** Industrial Catalysts – The Legacy of Fritz Haber  
**L12:** Molecules Everywhere BO Space, Primordial Slime | Prepare for Workshop 2 | |
| 7 15 Sept       | **L13:** Is Chemistry Art or Science? PK  
**L14:** New Materials – Modern Alchemy JJ | **W2** Pick A Pair of either Drugs or Biomolecules | |
| **RECESS (22 Sept – 7 Oct)** | | **E2** Write a Poem! On Chemistry, chemical philosophy or the lectures so far  
*Prepare for Workshop 3* | |
| 8 7 Oct         | **L15:** Chemistry in and for the Environment #1 MN  
**L16:** Chemistry in and for the Environment #2 MN | **W3** Catalysts - Biological and Industrial | |
| 9 13 Oct        | **L17:** Chemical Identity PK – What are you?  
**L18:** Chemical Identity JJ – How much of you is there? | | |

*Please note, the e-lectures given by Prof. Brian Orr are administered by Dr Chris McRae and those delivered by Joanne Jamie are administered by Prof Peter Karuso*
<table>
<thead>
<tr>
<th>10</th>
<th>... 20 Oct</th>
<th>L.19: Chemical Identity – What is going on?</th>
<th>L.20: Chemical identity – The same ... but different</th>
<th>Prepare for Workshop 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>... 3 Nov</td>
<td>L.23: Stop Press – The 2014 Nobel Prize in Chemistry, PK LIVE LECTURE 1 PM # LECTURE IN W5AT2#</td>
<td>L.24: Chemical Issues MN</td>
<td>Prepare for Workshop W5</td>
</tr>
<tr>
<td>13</td>
<td>... 10 Nov</td>
<td>L.25: no lectures this week</td>
<td></td>
<td>W5 Identity, Structure, Composition &amp; Change</td>
</tr>
</tbody>
</table>

**Note:** CBMS reserves the right to vary details of this schedule if necessary.

**Recommended Texts and/or Materials**

There is no textbook for CBMS234, however, the following books are highly recommended reading:

**Strongly recommended reading**

** Roald Hoffmann, *The Same and Not The Same* (Columbia UP, N.Y., 1995; ISBN 0 231 10138 4 or 0 231 10139 2)

** Recommended reading**

* Alan Chalmers, *What is this thing called science?* (U of Queensland Press, St Lucia, 1999; ISBN 0 7022 3093 6)
* Simon Garfield, *Mauve: How one man invented a colour that changed the world* (Faber & Faber, London, 2000; ISBN 0 571 20197 0)

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Selected book extracts will occasionally be reproduced (to the extent permissible by copyright law) on the CBMS234 Website. One copy of each may then be downloaded by each student for private use. It may also be useful on occasions to consult a general chemistry textbook (e.g., Silberberg, Smith, or Aylward & Findlay) that some students already know of. The Library has many possibilities at call number QD33. The University Library also has a good collection of chemistry-related videos available for viewing. There are many useful resources on the Web. Access to some that are highly recommended can be gained via the CBMS234 Website links, or by keying in known URLs, or by using your favourite search engine.

UNIT WEB PAGE

The web page for this unit can be found at: http://ilearn.mq.edu.au/. Please note that CBMS234 shares an iLearn site with CBMS123. You are expected to access the web pages regularly, where you may find announcements, links to interesting internet facilities and sites of interest to the course, downloadable software, and lots of other interesting stuff. In addition all the lectures and printed notes for the lectures will be found only on the unit web page and it is up to you to keep up with the lectures and assessments.

TECHNOLOGY USED

You are expected to have access to the internet and access the unit iLearn site on a regular basis. Please note information may also be sent by e-mail to your student e-mail account so please look at your e-mail account on a regular basis.

All lectures are on-line via the Echo360 EchoCenter page in iLearn. If you are unfamiliar with the Echo360 EchoCenter then refer to the "Student Guide to Echo360 Lecture Recordings" available from: http://www.mq.edu.au/iLearn/student_info/lecture_recordings.htm.

All unit notes are presented as PDF files that require acrobat reader (http://get.acrobat.com/reader/).

EXPECTED LEARNING OUTCOMES

Aims:
- To appreciate the role of chemistry in the history of the universe, world and society
- Integrate your previous experiences and knowledge into a chemical framework
- Appreciate the role of the chemist in human history and modern society, now and into the future

Objectives:

CBMS234 is designed to provide:
o A basic understanding of the role of chemistry in modern life
o An appreciation of the role of chemistry in history, art and science
o A basic understanding of how chemistry works and is different to other sciences
o Appreciate the complexity and metaphors used by chemists to understand chemistry
o An insight into the work of chemists and why they find the subject so fascinating
o Appreciate what it takes to get a Nobel Prize.

**Goals:**

By the end of CBMS234 you should be able to:

o Identify issues facing humanity that are caused by chemicals or have have their solution in chemistry
o Be able to discuss important issues that have a chemical basis from a rational perspective
o Be able to critically evaluate non-specialist literature (e.g. Newspapers) that discuss chemical and biochemical issues
o Understand the role of chemistry and the molecular sciences in drug discovery and medicine
o Understand the role of chemistry as the source and solution of environmental issues
o Understand the role of chemistry in industry
o Understand how chemists approach scientific and seek to solve chemical questions
o Identify chemical issues facing humanity

In addition to the unit-based learning outcomes above, this unit will also help develop the **graduate capabilities** that “University’s graduates need to develop to address the challenges, and to be effective, engaged participants in their world”. Graduate capabilities are viewed as essential for all graduates, irrespective of their course of study. Graduate capabilities are the building blocks for developing the attributes valued in a university graduate. Some of the attributes and skills that CBMS234 can help you develop are:

- **Problem Solving and Research Capability, Critical, Analytical and Integrative Thinking and being Creative and Innovative:** Within this unit you will have the opportunity to develop your problem solving and research skills and show your creativity and innovation through written assignments and on-line workshops. The problem solving will include situations where there are clear solutions as well as situations demanding critical, analytical and integrative thinking. In some cases you will be using specialised technology for the discovery of information, the analysis of data and the presentation of results.

- **Effective Communication:** CBMS234 will help equip you with written communication skills, through essays and workshops. Part of your assessment will be concerned with your ability to communicate in clear, very concise and appropriate, context-dependent modes (workshops). You will also be assessed on your ability to use different communication modes, for example the use of poetry to describe chemistry, chemists or chemical concepts.

- **Socially and Environmentally Active and Responsible:** Much of the content of CBMS234 deals with environmental and social issues pertaining to chemistry and chemicals from Bhopal to thalidomide, swine flu and global warming to destruction of the ozone layer and rising salinity, giving you the opportunity to develop a sense of responsibility and mutual obligation to use chemistry and chemical inventions wisely.

- **Engaged and Ethical Local and Global citizens:** Engaged and ethical behaviour will be addressed through the compelling stories, interesting dualities and surprising connections of
chemistry to advances in civilization, global crises, human dramas and the fascinating way chemistry has impacted all our lives for millennia.

- **Commitment to Continuous Learning**: The coursework is specifically designed to stimulate curiosity, interest and the desire to seek more information. This will lead you to a continual pursuit of knowledge for its own sake.

### Teaching and Learning Strategy

#### Electronic / Internet Services

We provide extensive Web-based resources to facilitate students' communications and access to information. At the same time, academic staff place a high value on 'live' e-lectures and personal contact with students.

The CBMS123 Website, at [http://ilearn.mq.edu.au](http://ilearn.mq.edu.au), gives password-protected access to student notes and other resources. **To log in, use your Student OneID plus your regular password.** Lecture notes are put on the Web in advance with the audio/visual recordings (L1-L24). L0 is the orientation lecture given on the first day of semester and L23 is the Nobel Prize lecture. Each assignment – Workshops (W1 – W5) & Essays (E1 – E2) – has its own iLearn page, including a FAQ, Lots-O-Links and Discussion Forum to encourage students to share ideas and information with each other and academic staff.

#### Certainty-Based Marking

Certainty-based marking (CBM) is used for multiple choice questions and is many decades old. It has been shown to stimulate more careful thinking and learning than simple (right/wrong) marking, and to provide more reliable assessments. We use CBM on all five of the workshop quizzes (W1-W5).

Below each question's there are three additional options allowing you to indicate your degree of certainty that your answer will be marked as correct. For CBMS123/234 Workshops, this certainty is expressed as a 3-point scale: "not very" certain (less than 67%), “fairly” certain (more than 67%) and “very” certain (more than 80%).

So, if you have less than 67% confidence that the answer you've given is correct, then you would select "not very". Similarly, if you were more than 80% confident that the answer you've given is correct, then you would select "very". The marking scheme that is used by Moodle (iLearn) cannot be changed and is:

<table>
<thead>
<tr>
<th>Confidence level :</th>
<th>Not very (less than 67%)</th>
<th>Fairly (more than 67%)</th>
<th>Very (more than 80%)</th>
<th>No Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark if correct :</td>
<td>0.3</td>
<td>0.7</td>
<td>1</td>
<td>(0)</td>
</tr>
<tr>
<td>Penalty if wrong :</td>
<td>0</td>
<td>-1</td>
<td>-2</td>
<td>(0)</td>
</tr>
</tbody>
</table>

As you can see, each question can score from -2 to +1, giving a 20 question quiz a 60 mark range from -40 to +20. Marks at the end of the semester are normalised and can move either up or down depending on the distribution of marks so simply adding up you marks does not equal your SNG (see grading section below).

Why are we using CBM?

- To make you think about how reliable your answer is
- To encourage you to try to understand the issues, not just to react immediately to a question.
- To encourage you to think laterally: other pieces of knowledge may help to validate or question your answer.
• To challenge you - if you won't risk losing marks if wrong, then you don't really know the answer.
• If you are a careful thinker, but not very confident, you will gain in confidence
• It is fairer - a thoughtful and confident correct answer deserves more marks than a lucky hunch/guess.
• You need to pay attention if you make confident wrong answers - to think, reflect and learn!
• Efficient study requires that you constantly question how your ideas arise, and how reliable they are.

How Does It Work?

The mark you get for each question in the workshop will depend on your confidence (or 'degree of
Hence, those of you that reflect on your answers to the point where you can either :-

a. justify high confidence so that you are prepared to risk a penalty if wrong; or
b. identify reasons for reservation so that you can lower your confidence and eliminate risk.
will be rewarded accordingly. You will gain by thinking more deeply and by correctly judging reliability. A student who distinguishes reliable from uncertain areas of knowledge does better than one with the same number of correct answers who cannot judge this correctly.

The answers to all the workshop questions are in the lectures. **Irrespective of what it says on the Internet or anywhere else the answer provided in the lectures/lecture notes is the ONLY correct answer.**

**Students must submit each of their Workshops and Essay assignments in electronic form.**

All students should regularly access the current CBMS234 Web page, which contains important information. This is a vital requirement for this unit, with its progressive assessment and no final examination. **Regular study of the e-lectures is also expected.**

The university has computers for student use in two places: C5C ground floor (rooms 218 and 219) for general use, study, and printing (appr. 160 computers. The HelpDesk is close by for assistance) and in the Library on L1 and L2 (appr. 200 computers. Log in with your OneID). Help can be obtained at: [http://mq.edu.au/about_us/offices_and_units/informatics/help/](http://mq.edu.au/about_us/offices_and_units/informatics/help/)


**Note in particular:**

<table>
<thead>
<tr>
<th>Library Skills Training (Library, Level 1)</th>
<th>face-to-face training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding Library Materials</td>
<td>Legal Information Skills</td>
</tr>
<tr>
<td>Developing a Search Strategy</td>
<td>Developing a Search Strategy</td>
</tr>
<tr>
<td>Basic Database Searching</td>
<td>Basic Database Searching</td>
</tr>
<tr>
<td>Advanced Database Searching</td>
<td>Advanced Database Searching*</td>
</tr>
</tbody>
</table>

CBMS234 students needing enhanced library/Internet capability can either take face-to-face courses in the Library (bookings not required; schedules on the Web) or do it yourself via [http://infoskills.mq.edu.au/](http://infoskills.mq.edu.au/).

**Essay Writing Skills**

Please also look at the Macquarie StudyWISE web site [http://www.students.mq.edu.au/support/learning_skills/undergraduate/studywise/](http://www.students.mq.edu.au/support/learning_skills/undergraduate/studywise/) for information on managing your studies and writing effectively. Science students in particular may need some extra training when it comes to writing essays.
This unit is assessed through workshops and essays and it would be a pity if you were marked down for not properly referencing work or poor essay writing style.

**Relationship Between Assessment and Learning Outcomes**

There is no final examination for CBMS234. Assessment will be based entirely on Workshops (W1-W5) and Essays (E1-E3), with maximum available marks distributed as follows:

- For each Workshop (W1 – W5): = 8% (40%)
- For each Essay (E1 – E3): = 20% (60% total)

The expected length of each CBMS234 Essay is to be 2000 words (excluding figures, title page and references) and the workshops consist of 20 random multiple choice questions.

**University Policy on Grading**

Academic Senate has a set of guidelines on the distribution of grades across the range from fail to high distinction based on the level of understanding and comprehension achieved. The final result will include one of these grades plus a standardised numerical grade (SNG). The raw mark for the unit (i.e., the total of marks from all assessment items) is **not** the same as the SNG. Results will be scaled to ensure that there is a degree of consistency between the final SNG and student attainment. University policy does not require that a minimum number of students are to be failed or passed in any unit. The process of scaling will never change the ranking order among students. As a rough guide, in this unit, you will need to achieve about 58 raw marks for a Pass, 72 for a Credit, 81 for a Distinction and 86 for a High Distinction. These numbers vary only slightly from year to year and will be converted to an SNG by application of a normalised distribution.

**Deadlines**

The deadline for submission of each assignment (W1-W5, E1-E3) is clearly defined on the timetable (above) and on iLearn. Marks will be deducted for late submission (at 10% per day, unless formal justification is provided through a special consideration request; ask.mq.edu.au). Students need to work steadily on each assignment, aiming to finish preparation well in advance of its submission deadline.

In each case, the assignment is due in electronic form not later than 9 am on the submission date. Marks will be deducted after that time. There are no resubmission options.

**Extension and Special Consideration Requests**

You will need to lodge your request for special consideration by doing the following:

1. Log onto Ask.MQ (http://ask.mq.edu.au/)
2. Go to "My Enquiries"
3. Login with your OneID
4. Under "Forms and Requests", select "Submit request for Special Considerations" from the drop-down menu
5. Fill in your relevant details
6. Attach supporting document by clicking "Add a reply", click "Browse" and add scanned documents
7. Take the original supporting documentation to be sighted at your faculty office.

You can refer to the Special Considerations Policy for more detailed information.

The University recognises that there may be circumstances where a student is prevented by unavoidable disruption from performing in accordance with their ability. The University has a policy on special consideration request that may be found at http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

**University Policy on Assessment and Examinations**

To articulate the principles that underpin the Macquarie University approach to assessment of student learning and feedback. These principles guide the procedures to be used in the conduct and management of assessment and feedback practices in all coursework units. http://www.mq.edu.au/policy/docs/assessment/policy.html

The examination period following week 13 (weeks 14 and 15) of every semester is part of the academic year and all students are required to make themselves available during this period. The University policy of examinations can be found at: http://www.mq.edu.au/policy/docs/examination/policy.html
**ACADEMIC HONESTY**

The University declares that it is a “fundamental principle” that “all staff and students act with integrity in the creation, development, application and use of ideas and information”. This means that:

- all academic work claimed as original is the work of the author making the claim
- all academic collaborations are acknowledged
- academic work is not falsified in any way
- when the ideas of others are used, these ideas are acknowledged appropriately

You should be familiar with the University’s Policy on Academic Honesty practices and its Statement on Ethics. These can be found in the *Handbook of Undergraduate Studies* or on the web at:


The policies and procedures explain what academic dishonesty is, how to avoid it, the procedures that will be taken in cases of suspected dishonesty, and the penalties if you are found guilty.

**FEEDBACK**

We value your feedback to improve our unit and reflect on our practices. The University policy on feedback can be found here: [http://www.mq.edu.au/policy/docs/student_feedback/policy.html](http://www.mq.edu.au/policy/docs/student_feedback/policy.html)

**OTHER UNIVERSITY POLICIES**

Macquarie University is developing a number of policies in the area of learning and teaching. Approved policies and associated guidelines can be found at Policy Central: [http://www.mq.edu.au/policy/](http://www.mq.edu.au/policy/)

**STUDENT SUPPORT SERVICES**

Macquarie University provides a range of Student Support Services. Details of these services can be obtained at:


**CHANGES TO THE UNIT SINCE LAST OFFERING**

There are no major changes since last year except Lectures start in week 1 instead of week 2 and Essay 3 is due in week 13 instead of week 14.

We hope you find this course both educational and fun!

Peter Karuso  
(Lecturer-in-charge)