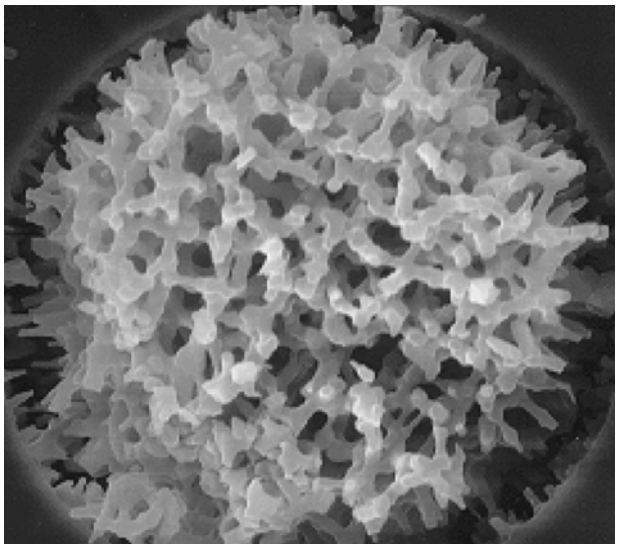
School of Chemistry



Unit Description, 2009

for

KRA332 Physical and Analytical Chemistry

Unit Coordinator: Dr Greg Dicinoski
(Room 403, Ph: (03) 6226-2166; Greg.Dicinoski@utas.edu.au)

This unit description is available on the web at
http://www.chem.utas.edu.au/teaching/units.html and through MyLO:
http://www.utas.edu.au/coursesonline
Updated: 18/02/09

Unit Summary

Unit code	**KRA332**
Unit title	**Physical and Analytical Chemistry**
Unit description	This unit intended to round out your training in physical and analytical chemistry with an emphasis on modern techniques as applied to the characterization of a range of chemical systems. This unit includes: spectroscopic, diffraction, electrochemical and surface analysis methods, and includes many industrially relevant areas which complements KRA336 Separation Science and Related Techniques.
Special notes	This unit is designed for all students of science, and includes content of relevance to science majors, along with those from other disciplines.
Teaching staff	Dr Greg Dicinoski, Dr Karen Stack, Dr Emily Hilder, Dr Trevor Lewis and the Nyrstar/AJ Parker Centre visiting lecturers (Prof Kate Wright and Prof Julian Gale).
Campus & mode	Hobart, internal, semester 1
Unit weight	12.5%
Teaching pattern	28 lectures, 7 tutorials, 13 x 4 hours (as 6 x 9 hour) laboratory sessions
Prerequisites	(KRA223 or KRA225) and (KRA224 or KRA211) or (KRA213 or KRA217) and (KRA216 or KRA211)
Corequisites	None
Mutual exclusions	KRA306
Assessment	Exams 65%, assignments 5%, laboratory 30%
Required texts, etc	Harris, Quantitative Chemical Analysis, 7th ed, Freeman, 0716770415 Atkins, Elements of Physical Chemistry, 5th ed, Oxford, 9780199226726; KRA332 Lecture Notes (available from UniPrint) KRA332 Laboratory Manual. Available for printing through MyLO: http://www.utas.edu.au/coursesonline/ Extra material. Available through MyLO: http://www.utas.edu.au/coursesonline/.
Recommended texts	Atkins, Physical Chemistry, 8th ed, Oxford, 0198700725 Brown, Molecular Spectroscopy, Oxford, 019855785X Others as specified by topic lecturers

Introduction:

As the name suggests this unit concentrates on physical and analytical chemistry topics with the material designed to appeal to the modern scientist. The material presented concentrates on giving a sound foundation to the theory and application of modern physical and instrumental techniques and industrial chemistry. Analytical chemistry topics are selected from: electroanalytical methods -- voltammetry and amperometry; spectroscopy -- atomic absorption/emission, and flameless techniques including ICP-MS; surface and mineral analysis techniques; and the application of quality assurance principles in an analytical laboratory. Physical chemistry topics are typically selected from surface chemistry, pulp and paper chemistry, molecular thermodynamics, non-electrolyte mixtures, molecular spectroscopy, and polymer chemistry. The laboratory program reinforces concepts introduced in lectures and gives students experience in good laboratory practice and hands-on usage of modern research level analytical and physical chemistry instrumentation.

Learning Outcomes:

When you have completed this unit you should be able to:

- understand and appreciate the use of emission spectroscopy with both optical and mass spectroscopic detection for the analysis of many different samples. This topic also focuses on the construction and operation of the instrumentation.
- understand the fundamental concepts behind a series of molecular spectroscopy techniques and apply these this knowledge to explain and predict experimental observations.
- use lecture knowledge of space group symmetry, the solid state structure of crystalline materials, their diffraction of X-rays and neutrons and the applications of these to the analysis of solids and structure determination.
- understand the interactions and factors affecting adsorption at liquid-air interface, liquid-liquid interface, solid-gas interface and solid-liquid interface and be able to apply this knowledge to some industrial applications such as mineral flotation, water treatment and papermaking.
- understand the physical chemistry aspects of a range of different electrochemical techniques and then use these various methods for the analytical determination of analytes in a variety of different sample matrices.
- understand and apply a range of surface analysis techniques to the determination of chemical structure and reactivity.
- understand and demonstrate knowledge of both synthesis and structure of both synthetic and natural polymers.
- apply previously learned fundamental concepts obtained in the lectures and laboratory exercises to a range of analytical and physical chemistry problems.
- demonstrate experimental skills allowing the application of many of the topics listed above to structure determination and other chemical analyses. In addition, some experience in experimental and interpretive skills not covered in lecture topics will be obtained through the laboratory course.
- critically appraise both your own work along with that of your peers
- identify the appropriate technique required to solve a specific problem and implement a correct experimental design to achieve the desired result.

Details of Teaching Arrangements

Lectures

Topics:	Emission Spectroscopy	Dr GW Dicinoski	3L
	Molecular Spectroscopy	Dr GW Dicinoski	6L
	Electrochemical Methods	Dr TW Lewis	6L
	Surface Chemistry	Dr KR Stack	5L
	Physical Polymer Chemistry	Dr EF Hilder	3L
	Nyrstar/AJ Parker Centre Lectureship: Mineral and Surface Analysis Techniques	Prof Kate Wright and Dr Bill Richmond	6L

Times: Tuesday 12:00-12:50, Thursday 08:00-08:50, Friday 08:00-08:50 (weeks 25 and 26)

Location: Lecture Theatre Chem328

Tutorials

Although it is not compulsory to attend the tutorials, it is however strongly recommended that you attend to obtain feedback on your assignments and other aspects of the course

Times: Tuesday 11:00-11:50

Location: Lecture Theatre Chem328

Schedule: 7 tutorials throughout the year. See timetable on Page 15.

The Chem Club Room (room 104) can be used as a study room. There are numerous chemistry texts (donated by staff) available for your use. Please do not remove these books from the room.

Seminars

Attendance at the School of Chemistry seminars (Wednesday 12:00-12:50, Lecture Theatre Chem329 is expected. These are normally visitor and research staff and student talks. The topics are advertised on various notice boards around the Chemistry Building.

Study Day

During the study week at the end of the semester a study day will be held in the Chemistry Building. This will include a BBQ and tutorials to focus on past examination papers for the unit.

Laboratory Course

Aims: The laboratory course includes experiments designed to illustrate specific lecture material, and also the use of various analytical techniques and instruments.

Times: Wednesdays and Thursdays 9:00-18:00, commencing week 7, which is Wednesday and Thursday, the 8th and 16th of April 2009

Unless advised otherwise, the last week for practical work will be week 12, which is Wednesday, the 20th and Thursday the 21st of May 2009. The final deadline for submission of reports for the last experiment is Friday the 29th of May 2009.

Location: Level 3 teaching laboratories (rooms 309 and 310)

Schedule: 9 hrs/week for 6 weeks. See timetable on last page.

OH&S: The University is committed to providing a safe and secure teaching and learning environment. In addition to specific requirements of this unit you should refer to the University's policy at:
http://www.admin.utas.edu.au/hr/ohs/pol_proc/ohs.pdf.

Occupational health and safety is emphasised as part of the laboratory course. Before attending the first session, students are expected to have a laboratory coat, safety glasses or goggles (available from the union shop) (note that: normal spectacles are not acceptable and safety glasses which fully cover these are required; and contact lenses pose an additional risk in the chemical laboratory and if worn you should wear a pair of safety goggles which fully enclose your eyes), footwear which fully encloses the feet must also be worn, a laboratory record book (*Collins 3880 Account Book* is suitable), the Laboratory Manual (available from within MyLO) and the downloaded printout of the current experiment (web address in laboratory manual).

You will also be required to conduct risk assessments on each and every experiment you are to perform in this laboratory course, via the Undergraduate Experimental Hazard Identification Sheets located after each experiment in your laboratory manuals. These assessments and experimental flowcharts must be carried out before you arrive for the laboratory session, and must be signed by a demonstrator before the experiment is commenced, or chemicals etc. are collected from the store. Your assessment must be discussed with and signed by your demonstrator/supervisor before you commence. These assessments MUST be completed before you come to the practical, so that no time is lost. The forms and instructions for these risk assessments are included in your Laboratory Manual. Your demonstrators are also available to help you conduct and prepare your risk assessments. The Material Safety Data Sheets are available as hard copies in the laboratory and from the computer programs, *Infosafe 2000* and/or *ChemWatch*, which are loaded on the computers in the School of Chemistry computer laboratory. . ***Also, a series of questions will be put to you by your demonstrator before you start each experiment to make sure you understand the concepts and procedures of the experiment. It is imperative that you have studied the experiment before coming to the laboratory session. Failure to provide satisfactory answers to the pre-lab questions may require you to research the questions before you commence the session***.

Exemption: Students who are repeating the unit may be eligible for a full or partial laboratory course exemption. A necessary condition is that you have already obtained a mark of 60% or greater in the laboratory course. Any student seeking an exemption will need to make a written application to the Unit Coordinator.

Laboratory Manual: The laboratory manual and associated documents, including the weekly experiment assignment, for this unit are available for download as individual experiments and papers from within WebCT via the *Chemistry_3_Units_for_2008* course, the KRA332 link, and then the Laboratory Manual link. You must ensure you have a hard copy of the relevant experiment prior to the laboratory session. The laboratory manuals describe in detail the laboratory course and the requirements for the presentation of the laboratory records and reports. It is possible that not all these experiments will be completed in the semester, but this is the complete list of possible experiments for 2009. It is also possible that additional experiments will be added before the semester commences. You will be allocated four (4) experiments – that is one from each section (see Page 7 for details) - that must be completed during the six (6) week period.

Laboratory Expts: The list of experiments potentially available in 2009 (along with an approximate time required to complete the experiment) are:

Section 1. Absorption, Emission, and Molecular Spectroscopy.

1.1. Atomic Absorption Spectrophotometry
   i. Basic +Operation and Optimisation of an Atomic Absorption Spectrophotometer, 4 hours
   ii. Flame Atomic Absorption Spectroscopy (FAAS) for the Determination of Mo in Steel, 4 hours
1.2. The Visible Absorption Spectrum of Iodine Vapour, Potential Energy Curves and Vibronic Spectra, 3 hours
1.3. Analysis of the Infrared Vibration-Rotation Spectrum of HCl Gas, 3 hours
1.4. An IR Investigation of the CO Dipole Direction and other Properties, 3 hours
1.5. Analysis of the Infra-Red Vibration-Rotation Spectrum of Trans-Dichloroethene, 4 hours

Section 2. Physical Chemistry and Surface Techniques and Analysis.

2.1. Surface Areas of a Water Gas Shift Reagent, 12 hours
2.3. Surface Tension and Absorption of Aliphatic Alcohols, 4 hours
2.3. Inversion of Sucrose, 12 hours
2.4. Thermodynamics of Micellisation, 9 hours
2.5. Flame Temperature Calculations and the CSIRO Thermodata System, CHEMIX, 4 hours

Section 3. Electrochemistry.

3.1. Determination of Metal Ions using Anodic Stripping Voltammetry, 8 hours
3.2. Polarographic Measurement of an Equilibrium Constant, 4 hours
3.3. Hydrogen Electrode: Activity Coefficient Determinations and the Determination of pK_w, 6 hours
3.4. Determination of the Molar Conductivity of Acetic Acid over a Range of Concentrations, 6 hours
3.5. Reversible Addition Fragmentation Chain Transfer (RAFT) Polymerization for an Undergraduate Polymer Science Laboratory, 4-6 hours – To Be Confirmed

Section 4. Fluorescence and Other Spectroscopy Techniques

4.1. Analysis of Quinine in Tonic Water and the Fluorometric Determination of Riboflavin, 6 hours
4.2. Molecular Fluorimetry, and the Analysis of Polycyclic Aromatic Hydrocarbons (PAH's) in Cigarette Smoke, 6 hours
4.3. Simultaneous Analysis of a Two-Component Mixture, 4 hours
4.4. Determination of the Acid Dissociation Constants for Glycine and an Unknown Weak Acid, 4 hours
4.5. Spectrophotometric Determination of a Dissociation Constant, 4 hours

Laboratory Reports: Laboratory reports are due a *maximum* of two (2) weeks after the completion of an experiment. A mixture of full and partial experimental reports are required, as outlined in your experimental allocation sheet, and should preferably be typed on a word processor. Computers are available in the School of Chemistry computer laboratory between the hours of 09:00 and 17:00 daily. The list below summarises the requirements for each experiment. Make sure at all times a photocopy of the relevant pages of the laboratory diary, as well as a copy of the completed and signed Undergraduate Experimental Hazard Sheet and experimental flowchart, accompanies the report.

Hand in all reports to Dr Greg Dicinoski or delegate. See the KRA332 Laboratory Manual for further information.

Keep all marked reports in a suitable folder, since these may be required to be handed in with the last report to ensure that our records are completed.

Of allocated experiments you will be required to submit full reports on your second and fourth experiments as per the laboratory allocation. For the remaining two (2) experiments (the first and third on your allocation) all you will be required to do is hand in your results (copies of your laboratory diary, hazard sheets, raw data, instrument printouts, any graphs required, and the calculation of analyte concentration/amount, etc) as a short report. The two experiments requiring full reports will contribute 60% of your laboratory mark, while the short reports will constitute 40% of the laboratory mark, as indicated in the table below. In order to pass the laboratory program you will need to complete all the allocated experiments satisfactorily and hand in the results as an indication of completion. Since certain experiments take varying amounts of time, you will typically be allocated 2 longer and 2 shorter experiments.

The two experiments requiring full reports will be marked out of 20 (see below), while the short reports will graded on a 10 point scale (see below). The full and partial reports will be graded according the marking scheme presented below:

- Laboratory Full Report 10
  - Presentation
  - Introduction
  - Discussion
  - Elucidation of Results
  - Conclusions

This section applies **ONLY** to Full Reports

- Laboratory Activities 4
  - Preparation
  - Performance
  - Hazard Identification Form
- Experimental Components 6
  - Laboratory Results
  - Calculations
  - Laboratory Record Book

Assessment Details

Exams

Weighting: 3 hours, 180 marks – that is 1 mark/minutes, 65%

Emission Spectroscopic Methods	11% of exam
Molecular Spectroscopy	18% of exam
Electrochemical Methods	21% of exam
Surface Chemistry	18% of exam
Physical Polymer Chemistry	11% of exam
Nyrstar/AJ Parker Lectureship	21% of exam

Dates: The end of semester examinations are conducted by the University Registrar in the formal examination period. See the *Current Students* homepage on the University's website.

Question Options: If you are offered a choice of questions (say, requiring only 4 answers out of 5 possible questions), if you answer all the questions then only the first required number of answers (in the order they are presented by the student) will be marked. Answers to multipart questions will be dealt with the same way.

Question Answers: Questions are to be answered in the supplied examination booklets (and graph paper if required). No other written material will be assessed. If multiple sections exist on the paper, then separate examination booklets must be used for each new section.

Laboratory

Experiment options, completion requirements, assessment details and marking criteria are provided in the laboratory manual.

Weighting: 30% (18 % for full reports and 12 % for the short reports).

Due dates: Refer above and to the information in the Laboratory Manual.

Assignments

In order to provide opportunity for continuous assessment and feedback to students, one short assignment will be handed out per topic by each lecturer. These will be handed out at lectures and are to be returned by the same time the following week, or as specified by the lecturer concerned. You are encouraged to discuss amongst yourselves the best way to answer these assignments, however direct copying of answers from other students is considered in the same light as cheating in the examination and will be treated as such.

Weighting: 5% in total. The marks divided equally between topics, regardless of the number of lectures for each topic. There will not be an assignment from the Nyrstar/AJ Parker visiting lecturer.

Due Dates: Set by topic lecturers during the topics.

Graduate Attributes:

The University has defined a set of generic graduate attributes that can be expected of all graduates. The policy document can be found at:

Http://www.utas.edu.au/tl/supporting/ga/.

Penalty for Late Work

A penalty of 10% of the actual mark will be imposed for each **working day** that an assignment or laboratory report is late. For example, if a student submits an assignment or laboratory report 3 days late and the work is assessed at 70% (without penalty), the mark would then be adjusted to 70 - (3 x 0.1 x 70) = 49%.

Submission of Assignments

Lecturers and laboratory coordinators will provide details of when and where assignments and laboratory reports are due to be submitted. A signed cover sheet is required for every assignment and practical report - please see the statement on plagiarism later in this handout. The cover sheets will be available from the lecturer or outside the laboratory, respectively, or from www.utas.edu.au/plagiarism.

Requests for Extensions

Applications for extensions due to extenuating circumstances (such as a medical condition) are required **before the due date of the work** and should be made known to the topic lecturer (for assignments) or the laboratory coordinator (for laboratory reports) as soon as practicable. Students without a medical certificate for absence will be assumed to have scored zero for the experiments/assignments not submitted.

How your Final Result is Determined

From time to time, it may be necessary to re-scale marks to allow for what is determined to be either a relatively tough or easy assessment task compared with previous years. The procedure for this is governed by the Faculty policy available on the web at http://fcms.its.utas.edu.au/files/policies/Operational_guide4.pdf. Final grades are determined in accordance with Faculty policy which is also available on the web at http://fcms.its.utas.edu.au/files/policies/Operational_guide5.pdf.

Specific attendance/performance requirements

In order to pass this unit, students must achieve a minimum of 45% in both the examination and laboratory components. In addition, to obtain a pass in the laboratory course, you must have attended and submitted reports for at least 70% of the scheduled experiments.

Review of results and appeals

All students may have their results reviewed in accordance with the Faculty policy available on the web at http://fcms.its.utas.edu.au/files/policies/Operational_guide6.pdf.

Academic referencing

In your written work you will need to support your ideas by referring to scholarly literature, works of art and/or inventions. It is important that you understand how to correctly refer to the work of others and maintain academic integrity.

Failure to appropriately acknowledge the ideas of others constitutes academic dishonesty (plagiarism), a matter considered by the University of Tasmania as a serious offence.

The appropriate referencing style for this unit is that used by either *Analytical Chemistry*, *Analitica Chimica Acta,* the *Journal of Chromatography A*, or the *Australian Journal of Chemistry*.

For information on presentation of assignments, including referencing styles see http://www.utas.edu.au/library/assist/gpoa/gpoa.html.

Please read the following statement on plagiarism. Should you require clarification please see your unit coordinator or lecturer

Other Materials Required

A calculator of any design which can perform basic scientific calculations (such as the Casio fx-82AU or equivalent that is available for purchase from the Co-Op Bookshop for ~$35) may be used during this unit and in the examination. It is assumed that students are facile with the use of this scientific calculator and the questions will be set accordingly.

Plagiarism

Plagiarism is a form of cheating. It is taking and using someone else's thoughts, writings or inventions and representing them as your own; for example, using an author's words without putting them in quotation marks and citing the source, using an author's ideas without proper acknowledgment and citation or copying another student's work. In fact the intentional copying and submission of someone else's work as one's own is a serious offense tantamount to academic fraud. It is a University offense punishable by a range of penalties that may range from a fine or deduction/cancellation of marks and, in the most serious of cases, exclusion from a unit, a course, or the University. **When in doubt consult your lecturer or tutor**. Details of penalties that can be imposed are available in the Ordinance of Student Discipline or at www.utas.edu.au/plagiarism.

Nexus Journal

Nexus: *journal of undergraduate science, engineering, and technology* is published annually and contains the work of undergraduates. This unit contains assignments that are suitable for submission to the journal. For more information, ask your lecturer, and see http://www.utas.edu.au/scieng/nexus.

Course Evaluation:

The School of Chemistry is an active participant in the Student Evaluation of Teaching and Learning (SETL) Program. The aim of the evaluation is to obtain constructive feedback on our teaching program and the services that we provide so that we can improve the content and presentation of our courses. Towards the end of each lecture block you will be asked to complete several teaching and a unit SETL. Many changes to this unit from 2007 and to previous units (KRA303 and KRA301) have been made as a result of student feedback and this process will continue as part of this new unit. As well as SETLs, you should not hesitate to approach the Unit Coordinator or lecturer concerned if you have any problems during the year. Any difficulties may also be raised with the Chemistry Club (or the postgraduate representative), which arranges regular meetings between student representatives and the Head of the School.

Learning Expectations and Strategies

Expectations

The University is committed to high standards of professional conduct in all activities, and holds its commitment and responsibilities to its students as being of paramount importance. Likewise, it holds expectations about the responsibilities students have as they pursue their studies within the special environment the University offers.

The University's Code of Conduct for Teaching and Learning states:

> *Students are expected to participate actively and positively in the teaching/learning environment. They must attend classes when and as required, strive to maintain steady progress within the subject or unit framework, comply with workload expectations, and submit required work on time.*

Learning strategies

If you need assistance in preparing for study please refer to your tutor or lecturer. For additional information refer to the Learning Development website: http://www.utas.edu.au/learndev/

If you will be using MyLO (formally known as WebCT Vista) for the first time and would like some information on how to use this teaching tool please refer to the following guide: http://www.utas.edu.au/coursesonline/MyLO-Support.htm

Further Information and Assistance

If you are experiencing difficulties with your studies or assignments, have personal or life planning issues, disability or illness which may affect your course of study, you are advised to raise these with your lecturer in the first instance.

There is a range of University-wide support services available to you including Student Services, International Services and Learning Development. Please refer to the *Current Students* homepage at: http://www.utas.edu.au/students/.

Should you require assistance in accessing the Library visit their website for more information at http://www.utas.edu.au/library/.

The University aims to ensure that your time here is enjoyable and rewarding. However if you have a concern or complaint that is affecting your study, the University has created a web page (http://www.utas.edu.au/tl/students/) to offer you guidance on solving these problems. Most issues can be resolved informally and therefore you are encouraged to discuss the matter with the person involved as a first step. The web page deals primarily with complaints concerning assessment and academic progress; however advice on who to contact concerning complaints about non-academic issues is also included.

Additional Help:

If you experiencing difficulties with your studies or assignments, have personal or life planning issues, disability or illness which may affect your course of study, you should raise these with your lecturer and/or one or more of the following Student Services staff.

- Learning Skills Advisor on 6226-2781
- Student Counsellor on 6226-2099/2104
- Careers Advisor on 6226-2098/2263
- Disability Officer on 6226-2381
- Child Care on 6226-2088
- University Chaplains on 6226-2385
- Student Employment Service on 6226-2511
- University Doctors' Surgery on 6226-2102/7461
- English Language Centre on 6226-2706
- International Student Office on 6226-7836

Electronic Resources

1. School of Chemistry home page:
   http://www.scieng.utas.edu.au/chem/
2. School of Chemistry safety page:
   http://www.chem.utas.edu.au/chemresources/chemsafety.htm
3. School of Chemistry student resources page:
   http://www.chem.utas.edu.au/chemresources/reshome.htm
4. University's MyLO site:
   http://www.utas.edu.au/coursesonline
5. University Handbook entry for KRA332 – Physical and Analytical Chemistry:
   http://www.utas.edu.au/units/KRA332
6. University's Student Complaints website:
   http://www.admin.utas.edu.au/ac_serv/complaints_info.html

Staff Contacts and Responsibilities

General enquiries should be directed to the unit coordinator (Dr GW Dicinoski). Ask individual lecturers for questions relating directly to their lecture topic. Students are welcome to discuss particular problems with the Head of School, Prof Brian Yates. There is also a "suggestion box" in the foyer of the chemistry building for constructive, confidential comments. Students are also able to contact the student representative on the School of Chemistry Staff Meetings – Mr Sam Poynter (Rm 413) regarding specific issues.

The following is a listing of all staff members associated with KRA332 – Physical and Analytical Chemistry showing their contact details and any specific responsibilities for KRA332 – Physical and Analytical Chemistry:

Staff Member	Room	Telephone*	Responsibility
Dr Greg Dicinoski Greg.Dicinoski@utas.edu.au	403	6226-**2166**	**Unit Coordinator** "Emission and Molecular Spectroscopy"
Dr Trevor Lewis Trevor.Lewis@utas.edu.au	325 (Hbt) 27-336 (Ltn)	6226-**2169** 6324-**3826**	"Electrochemistry"
Norske Skog Lecutreship Dr Karen Stack Karen.Stack@utas.edu.au	325	6226-**2169**	"Surface Science and Analysis"
Dr Emily Hilder Emily.Hilder@utas.edu.au	410	6226-**7670**	"Physical Polymer Chemistry"
Nyrstar/AJ Parker Centre Lectureship Prof Kate Wright kate@ivec.org Prof Julian Gale julian@ivec.org	105	6226-**2529**	"Mineral and Surface Analysis"
Mr Graham Meredith Graham.Meredith@utas.edu.au	313	6226-**2168**	Level 3 Store and Analytical/Physical Chemistry Laboratory

Essential Texts:

1. Harris, D.C., *Quantitative Chemical Analysis*, 7th Edition, **2006**, Freeman, ISBN: 0-7167-4464-3.
2. Aktins, P.A., *The Elements of Physical Chemistry*, 5th Edition, **2009**, Oxford, ISBN: 9780199226726.

Reference Texts:

1. Atkins, P.A., *Physical Chemistry*, 8th Edition, **2006**, Oxford, ISBN: 0198700725.
2. Brown, Molecular Spectroscopy, Oxford, 019855785X.
3. Other as specified by the topic lecturers.

Unit Schedule

<table>
<tr><th rowspan="2">Week</th><th rowspan="2">Week Beginning</th><th colspan="3">Lectures</th><th>Tutorials</th></tr>
<tr><th>Tuesday 12:00-12:50</th><th>Thursday 08:00-08:50</th><th>Friday 08:00-08:50</th><th>Tuesday 11:00-11:50</th></tr>
<tr><td>1</td><td>23 February</td><td colspan="3">TOPIC 1
Dr GW Dicinoski
Emission Spectroscopy
3 Lectures</td><td>Library Tut*</td></tr>
<tr><td>2</td><td>02 March</td><td colspan="3" rowspan="2">TOPIC 2
Dr KR Stack
Surface Chemistry
5 Lectures</td><td>Tut 1 GWD</td></tr>
<tr><td>3</td><td>0+ March</td><td>No Lecture</td><td>No Tut</td></tr>
<tr><td>4</td><td>16 March</td><td colspan="3" rowspan="2">TOPIC 3
Dr GW Dicinoski
Molecular Spectroscopy
6 Lectures</td><td>Tut 2 KRS</td></tr>
<tr><td>5</td><td>23 March</td><td>No Tut</td></tr>
<tr><td>6</td><td>30 March</td><td rowspan="2">TOPIC 4
Dr T Lewis</td><td>No Lectures</td><td rowspan="5">No Lectures</td><td>Tut 3 GWD</td></tr>
<tr><td>7</td><td>09 April</td><td>Easter</td><td>No Tut</td></tr>
<tr><td>7</td><td>13 April</td><td>Easter</td><td rowspan="4">No Lectures</td><td>Easter</td></tr>
<tr><td>8</td><td>20 April</td><td rowspan="3">Electro-chemistry

6 Lectures</td><td>Tut 4 GWD</td></tr>
<tr><td>9</td><td>27 April</td><td>No Tut</td></tr>
<tr><td>10</td><td>04 May</td><td rowspan="2">Physical Polymer Chemistry, 3 Lectures</td><td>Tut 5 TWL</td></tr>
<tr><td>11</td><td>11 May</td><td>TOPIC 5
Dr EF Hilder</td><td>No Tut</td></tr>
<tr><td>12</td><td>18 May</td><td colspan="3" rowspan="2">TOPIC 6
Surface and Mineral Characterisation Techniques
Nyrstar/AJ Parker Lectureships - Prof Kate Wright and Prof Julian Gale
6 Lectures</td><td>Tut 6 EFH</td></tr>
<tr><td>13</td><td>25 May</td><td>Tut 7 KW/JG (Friday 10:00-10:50)</td></tr>
<tr><td>Study Week</td><td>01 June</td><td colspan="4">A study Day During This Week (TBA)</td></tr>
</table>

* Venue: Morris-Miller Library eLearning Lab 2.

Final Comments:

As the course coordinator for this subject, I hope that you enjoy KRA332 – Physical and Analytical Chemistry. Remember that if you have any problems, difficulties or queries what so ever, do not hesitate to contact me to sort them out as soon as possible.

Good luck and study hard.

GW Dicinoski

University of Tasmania, School of Chemistry, Summer, 2009.