**Possible UNIT 3 TIMETABLE**

* **The chapter numbers refer to the new 5th Edition Pearson *Heinemann Chemistry 2* – both in the print version and the fully electronic and interactive *Pearson Lightbook Chemistry Victoria 12*.**
* **The pracs, exercises and demonstrations are all found in old editions of Pearson Heinemann *TRAB* or in the Student Workbook. For the present Study Design they are provided as pdfs with support materials etc for Lab technicians at pearsonplaces.com.au**
* **SW refer to the *Heinemann* *Student Workbook 2* – the worksheets listed are useful homework and revision. Fully worked solutions are available at peardonplaces.com.au**
* **The Research and Practical investigations are fully explained in the 5th Edition Pearson *Heinemann Chemistry 1*. (Some resources provided at Developmental Workshops, in the Minutes from these Developmental Workshops and in the VCAA Advice to teachers)**
* **Any prac could be used as the assessment task called *A report of a practical activity* and so can be done at any stage throughout the semester.**
* **I have listed several pracs and there are more in the 3rd Ed of the Student Workbook, the 4th Ed Heinemann *TRAB* and in the 3rd Ed Heinemann *TRB*. You could possibly select one each week according to your program.**
* ***You tube* and similar clips can be used throughout for interest, variation and clarification.**

**Penny Commons**

**\*Review questions throughout each chapter are most helpful as checkpoint questions. I have only listed end of Chapter Review questions here.**

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| **Week** | **Concepts** | | **Text Ch** | | **Minimum set text questions**  **(to be added Sept 2106)** | | **VCAA require about 3.5-5 hours for pracs and investigations testing outcomes.**  **Possible practical work – maybe 4-5 class pracs plus demos**  **Worksheets from Student Workbook (SW)**  ***You tube* clips for interest and clarification SAC Dates and details** | | | |
| **Semester 1: Unit 3: How can chemical processes be designed to optimise efficiency?**  **Area of Study 1: What are the options for energy production?** | | | | | | | | | | |
| 1 | Fuel choices   * Types of fuels * Fossil fuels and biofuels   Compared in terms of energy content, energy transformations and efficiencies, renewability and environmental impact. | | 1 | | 3, 4, 5, 9, 11, 12, | | SW Worksheets 1,2  You tube:  biodiesel production (Discovery Channel)  <https://www.youtube.com/watch?v=GWWqSX3cE7o>  biodiesel vs petrol (BBC)  <https://www.youtube.com/watch?v=Zph5usgWkN0> | | | **Outcome 1:**   * **8% on total marks for the year** * **VCAA offers range of possibilities** * **Suggestions**    + **A report of lab investigation (any listed – maybe the student investigation of half -equations.**   + **or A comparison of two electricity-generating cells (The dry cell vs fuel cells or car battery vs fuel cells)** |
| 2 | * **Comparison of 2 transport fuels: petrodiesel and biodiesel**   + **Structure and bonding important**   + **Suitability in different climates** | | 1 | | 16, 18, 19 | | SW Worksheets 5, 6 | | |
| 3 | * Exothermic and endothermic reactions * Energy profile diagrams | | 2 | | 1, 2, 4, 5, 6, 7, 8 | | Demos: Endothermic reaction between two solids and Chemical oven | | |
| 4 | Heat capacity and heat of combustion | | 2 | | 9, 10, 11, 12, 13, 14, 15, 18, 19 | | Demos: Products of combustion of a hydrocarbon  Prac: Molar heats of solutions (if calorimetry is done here; otherwise do it at the end of Unit 4 aos 2.) | | |
| 5 | Gases   * The universal gas equation | | 3 | | 1, 6 - 15 | | SW Worksheets 3, 4  Prac: Molar volume of hydrogen  Demo: Balloon in a flask and the expanding marshmallow | | |
| 6 | Stoichiometry   * Calculations involving gases and combustion of fuels * Calculations involving energy changes | | 3 | | 16, 18, 19, 20, 23, 24, 25, 27, 29, 31, 33, 34 | | Prac: Products of a decomposition reaction  Prac: Energy from different fuels (earlier(?) but requires knowledge of calculations; can use specific heat capacity or leave till end of Food and use calibrated calorimeter). | | |
| 7 | Redox reactions   * Revision Year 11 including definitions, balancing half-equations, oxidation nos * Galvanic cells and electrochemical series * **Comparison with test tube reaction where there is direct contact** * Secondary cells including recharging and **battery life** | | 4  5 | | Ch 4:  2, 4, 6, 7, 10, 12, 13, 15, 17, 18, 19, 21, 23,  Ch 5:  1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 18, 19, 24, 25, 26 | | SW Worksheets 7, 8, 9, 10  Prac: Half-cells and the electrochemical series  Prac: Order of half-equations in the electrochemical series  Prac: The dry cell | | |
| 8 | Fuel cells   * Design features * Comparison with combustion and greenhouse production * **Storage of hydrogen** * **Comparison of fuel cells and galvanic cells** | | 6 | | 3, 4, 5, 6, 7, 8, 9, 10, 13 | | SW Worksheets 11  Prac: Fuel cells  Prac old 3rd Ed TRB: Car battery and fuel cells  You tube: Fuel cells  <https://www.youtube.com/watch?v=LDwS31OE7akP>  Plus others on hydrogen economy | | |
| **Area of Study 1 Review questions do all as revision of the whole area of study** | | | | | | | | | | |
| **Area of Study 2: How can the yield of a chemical product be optimised?** | | | | | | | | | | |
| 9 | | Rates of chemical reactions   * Rates of reaction * Collision theory * Catalysts | | 7 | | 2, 3, 4, 5, 8, 10, 12, 13, 15, 16, 17, 19, 20 | | SW Worksheets 12, 13  Prac: Measuring the rate of reaction  Prac: Factors affecting the rate of reaction  Demo: Foam column + other favourites  e.g. exploding can, catalytic oxidation of NH3 |  | |
| **Term 1 holidays – adjust timetable as needed** | | | | | | | | | | |
| 10 | | Equilibrium   * Dynamic equilibrium * The equilibrium law – homogeneous systems only * Calculations involving equilibrium constants *K*c **no** acid- base equilibrium or *K*a; pH in Y11 | | 8 | | 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, | | SW Worksheets 14, 16, 17  Prac: Discovering the equilibrium law  Prac: Effect of concentration changes on equilibrium yields  Demo: Effect of changes in volume on equilibrium yields | **Outcome 2:**   * **8% on total marks for the year** * **VCAA offers range of possibilities** * **Suggestions**    + **Annotations of at least 2 practical activities e.g. rate or equilibrium**   + **OR Response to a set of structured questions (test)** | |
| 11 | | Le Chatelier’s Principle   * Factors favouring yield * Conc-time graphs as a means of representation * **Competing equilibrium including CO/O2** | | 8 | | 17, 19, 20, 21, 24, 25, 26, 28, 29, 30 | | SW Worksheets 15  Prac: Effect of temperature on equilibrium yields  You tube: Carbon monoxide poisoning  <https://www.youtube.com/watch?v=wKIrbq2pWvw> |
| 12 | | Electrolysis   * Electrolytic cells * Use of electrochemical series to predict electrode reactions * Commercial electrolytic cells general operating principles – molten and aqueous electrolytes using different electrodes * Comparison with galvanic cells | | 9 | | 1, 3, 4, 5, 6, 7, 8, 9 | | SW Worksheets 18, 19  Demo: Electrolysis  Prac: Electrolysis of aqueous solutions  Demo: Tin crystals by electrolysis |
| 13 | | Faraday’s Laws   * Laws * Combination with stoichiometry to determine current, time, amount of products at electrodes. | | 9 | | 11, 12, 13, 14, 1517, 19, 20, 22, 25 | | SW Worksheets 20, 21  Prac: Faraday’s first law of electrolysis  Prac: Determination of Faraday’s constant and Avogadro’s number  Exercise: Determining Faraday’s first law using second-hand data  Prac: Optimum conditions for electroplating |
| 14 | | Revision/Catch up | |  | |  | |  |
| **Area of Study 2 Review questions do all as revision of the whole area of study** | | | | | | | | | | |

**Possible UNIT 4 TIMETABLE**

* **The chapter numbers refer to the new 5th Edition Pearson *Heinemann Chemistry 2* – both in the print version and the fully electronic and interactive *Pearson Lightbook Chemistry Victoria 21*.**
* **The pracs, exercises and demonstrations are all found in old editions of Pearson Heinemann *TRAB* or in the Student Workbook. For the present Study Design they are provided as pdfs with support materials etc for Lab technicians at pearsonplaces.com.au**
* **SW refer to the *Heinemann* *Student Workbook 2* – the worksheets listed are useful homework and revision. Fully worked solutions are available at peardonplaces.com.au**
* **The Research and Practical investigations are fully explained in the 5th Edition Pearson *Heinemann Chemistry 1*. (Some resources provided at Developmental Workshops, in the Minutes from these Developmental Workshops and in the VCAA Advice to teachers)**
* **Any prac could be used as the assessment task called *A report of a practical activity* and so can be done at any stage throughout the semester.**
* **I have listed several pracs and there are more in the 3rd Ed of the Student Workbook, the 4th Ed Heinemann *TRAB* and in the 3rd Ed Heinemann *TRB*. You could possibly select one each week according to your program.**
* ***You tube* and similar clips can be used throughout for interest, variation and clarification.**

**Penny Commons**

**\*Review questions throughout each chapter are most helpful as checkpoint questions. I have only listed end of Chapter Review questions here.**

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| **Week** | **Concepts** | **Text Ch** | **Minimum set text questions**  **(+ Sept ‘16)** | **VCAA require about 3.5-5 hours for pracs and investigations testing outcomes.**  **Possible practical work – maybe 4-5 class pracs plus demos**  **Worksheets from Student Workbook (SW)**  ***You tube* clips for interest and clarification SAC Dates and details** | |
| **Semester 2: Unit 4: How are organic compounds categorised, analysed and used?**  **Area of Study 1: How can the diversity of carbon compounds be explained and categorised?** | | | | | |
| Semester 1  Week 15  Semester 2  Week 1 | Structure and nomenclature of organic compounds (Revision Y11 – except stereoisomers)   * Carbon compounds and structural isomers * **Stereoisomers: optical isomers and geometric isomers** * Types of hydrocarbons: alkanes (including cyclohexane), alkenes, **alkynes, benzene** | 10 | 1, 4, 5, 6, 7, 8 | SW worksheets 22, 23, 24  Prac/Demo: Model building of enantiomers and cis-trans geometric isomers |  |
| Semester 1  Week 16  Semester 2  Week 2 | Functional groups: structures and naming (Revision Y11):   * Alkanes (including cycloalkanes) * Alkenes, alkynes, benzene * haloalkanes, * primary amines * **primary amides** (no naming) * alcohols (primary, secondary, tertiary) * **aldehydes, ketones,** * carboxylic acids and * non-branched esters * **(Note: Naming limited up to C8: noncyclic hydrocarbons, haloalkanes, 1oamines, alcohols (1o, 2o, 3o), carboxylic acids and non-branched esters. Up to 2 functional groups)** | 10 | 10, 11, 12, 13, 14, 15, 16, 17, 18 | SW Worksheets 25  Prac: Modelling functional groups and organic reactions  You tube:  Silver mirror test for aldehydes: RSC  <http://www.rsc.org/Education/EiC/issues/2007Jan/ExhibitionChemistry.asp>  Video  <https://www.youtube.com/watch?v=y-4qqcCxD6g> |  |
| **Term 2 holidays – adjust timetable as needed** | | | | | |
| Semester 1  Week 17  Semester 2  Week 3 | Properties of organic compounds   * Physical properties * trends of properties including boiling point, **viscosity) and flashpoint with reference to structure and bonding**   Reactions of alkenes, haloalkanes and alcohols   * oxidation of 1o and 2o alcohols * substitution reactions of haloalkanes * addition reactions of alkenes | 11 | 1 - 8 | SW Worksheets 26, 27  Prac: Reactions and properties of some organic compounds  You tube: Flashpoint testing (dangerous!)  <https://www.youtube.com/watch?v=w_nVhkvPEpI> |  |

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| 4 | * hydrolysis of esters * **condensation reaction between carboxylic acid and amine to form amide** * condensation reaction between carboxylic acid and alcohol to form ester * Organic pathways: the pathways used to synthesise primary haloalkanes, primary alcohols, primary amines, carboxylic acids and esters * **Calculations of atom economy and percentage yield of single-step or overall pathway reactions.** | 11 | 9 - 20 | Prac: Oxidation of alcohols  Demo: Making a condensation polymer to form the amide nylon  Prac: Preparing artificial fragrances and flavours (could be done in Year 11 as well) | **Outcome 1:**   * **8% on total marks for the year** * **VCAA offers range of possibilities** * **Suggestions**    + **Annotations of at least two practical activities from a practical logbook (could use modelling and reactions ; different food pracs)**   + **OR Response to a set of structural questions (test)** |
| 5 | Spectroscopy   * The electromagnetic spectrum * IR Spectroscopy * NMR spectroscopy – introduction * Carbon 13 NMR | 12 | 1, 2, 3 | CEA Chemical detectives app  Exercise: Data analysis of organic compounds by IR  SW worksheets 28, 29  You tube: IR (RSC)  <https://www.youtube.com/watch?v=DDTIJgIh86E>  H-NMR (RSC)  <https://www.youtube.com/watch?v=uNM801B9Y84> |
| 6 | Spectroscopy   * Proton NMR * Mass spectroscopy * Combined techniques | 12 | 5, 6, 8, 9, 11, 12, 13, 14, 15, 17 | Exercise: Interpretation of NMR spectra of a number of organic compounds – data analysis  Exercise: Interpretation of a number of mass spectra of organic compounds – data analysis  SW worksheets 30  You tube: MS (RSC)  <https://www.youtube.com/watch?v=J-wao0O0_qM> |
| 7 | Chromatography (all revision Y11)   * Principles revision * HPLC revision   Volumetric analysis   * Principles of volumetric analysis (Revision Y11) | 13 | 1, 3, 5, 6, 7, 9, 10, 11 | SW Worksheets 31  Prac: Chromatography of a vegetable extract  You tube: HPLC (RSC)  <https://www.youtube.com/watch?v=kz_egMtdnL4> |
| 8 | * Acid base titrations (Revision Y11) * Redox titrations | 14 | 3, 4, 6, 8, 9, 10, 11 – 16 | SW Worksheets 32  Prac: Analysis of aspirin tablets  Prac: Analysis of ascorbic acid in vitamin C tablets  Prac: Determination of the ethanoic acid concentration of vinegar |
| **Area of Study 1 Review questions do all as revision of the whole area of study** | | | | | |

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| **Semester 2: Unit 4: How are organic compounds categorised, analysed and used?**  **Area of Study 2: What is the chemistry of food?** | | | | | |
| 9 | Food molecules   * Proteins: formation, structure, essential amino acids * Carbohydrates: formation, structure, **storage of excess as glycogen, comparison of glucose, fructose, sucrose and aspartame** * Fats and oils: formation, structure, differences between sat and unsat fatty acids, **essential, omega labelling** * **Vitamins: essential, Vitamin C and D** | 15 | 3, 4, 5, 6, 9, 10, 11, 12, 14, 16, 17, 20, 21, 22, 23, 25, 26 | SW Worksheets 33, 34, 35, 36, 37  Prac: Modelling proteins, fats and fatty acids and carbohydrates  Prac: Testing for proteins  Prac: Breaking down the starch polymer  Prac: Reactions of carbohydrates  Prac: Tests for fatty acids and glycerol  Prac: Measuring Vit C in foods  Demo: Detection of unsaturated fats  You tube: Fatty acids  <https://www.youtube.com/watch?v=UnZadq2kB0g> | **Outcome 2:**   * **8% on total marks for the year** * **VCAA offers range of possibilities** * **Suggestion**    + **A report of lab investigation (any listed )** |
| 10 | Metabolism of food   * Metabolism of food * Enzymes: models, acid base properties, enzyme activity, **difference between denaturation and hydrolysis** * Carbohydrates: digestion starch compared to **cellulose, lactose intolerance, GI ranking, hydrolysis of starches (amylose and amylopectin)** * Fats and oils: hydrolysis, **oxidative rancidity, antioxidants** * **Co-enzymes: action during catalysis** | 16 | 1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 15, 16, 18, 19, 21 | SW Worksheets 38, 39, 41  Prac: Action of enzymes  You tube:  GI index (simple overview)  <https://www.youtube.com/watch?v=F1YDR2S7SPU>  Oxidative rancidity (includes ideas for prac investigation)  <https://www.youtube.com/watch?v=1jhMw7Y9DI0>  Oxidative rancidity reactions (complex)  <https://www.youtube.com/watch?v=3REr9hDZ2b4>  Coenzymes  <https://www.youtube.com/watch?v=flFtSU8E9zw> |
| 11 | The energy content of food   * **Comparison of energy content of proteins, carbohydrates and fats/oils** * **Glucose as primary energy source and cellular respiration** * Calorimetry: solution and bomb, calibration, **analysis of temperature-time graphs from solution calorimetry** | 17 | 1, 2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 18, 19, 20, 22, 24, 25 | SW Worksheets 38, 42  Prac: Calibration of a calorimeter  Prac: Heat of solution of the dissolution of potassium nitrate  Prac: Energy content of a biscuit/peanut SW Worksheets |
| **Area of Study 2 Review questions do all as revision of the whole area of study** | | | | | |
| **This following period for the Practical Investigation is moveable. Needs 7-10 hours so 2-3 weeks.** | | | | | |
| 12 |  |  |  |  |  |
| 13 |  |  |  |  |  |
| 14 |  |  |  |  |  |
| **Term 3 holidays – move as needed – may contain Trial exams in some schools** | | | | | |
| 15 | Revision |  |  |  |  |
| 16 | Revision |  |  |  | **Trial exam** |
| 17 | Revision – leaving school- a messy week! |  |  |  |  |

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| **This following period for the Practical Investigation is moveable. Needs 7-10 hours so 2-3 weeks.** | | | | | |
| **Area of Study 3: Practical investigation could be done at end of Unit 3 or during or at the end of Unit 4.** | | | | | |
| Semester 1  Week 15 | **Practical investigation – if *Energy* is the topic**  *(could be moved according to your program)* | In Chem 1 Ch 21  and  product link for Chem 2  and Student Workbook notes and pracs |  | SW Worksheets 43, 44  If choosing ***An aspect of energy***, the following pracs might provide ideas for investigation:  Prac: Energy from different fuels  Prac: Order of half-equations in the electrochemical l series  Prac: Fuel cells  Prac: Electrolysis of aqueous solutions  Prac: Faraday’s first law of electrolysis  Prac: Determination of Faraday’s constant and Avogadro’s number  Demo: Determining Faraday’s first law of electrolysis using second-hand data  Prac: Fermentation  You tube: Measuring vitamin C in foods (RSC)  <https://www.youtube.com/watch?v=1P3W9DykGBg> |  |
| Semester 1  Week 16 | Practical investigation |  |  |  |
| Semester 1  Week 17 | Complete poster (U4AoS3) |  |  | **Outcome 3: Present as digital scientific poster** |
| **This following 2 weeks are the moveable 2 weeks for the Practical Investigation.** | | | | | |
| **Area of Study 3: Practical investigation could be done at end of Unit 3 or during or at the end of Unit 4.** | | | | | |
| Semester 2  Week 12 | **Practical investigation – if *Food* is the topic**  *(could be moved according to your program)* | In Chem 1 Ch 21  and  product link for Chem 2  and Student Workbook notes and pracs |  | SW Worksheets 43, 44  If choosing ***Aspects of Food*** the following pracs might provide ideas for investigation (as well as others in the Student Workbook):  Prac: Making protein models  Prac: Testing for proteins  Prac: Action of enzymes  Prac: Breaking down the starch polymer  Prac: Reactions of carbohydrates  Prac: Tests for fatty acids and glycerol |  |
| Semester 2  Week 13 | **Practical investigation** |  |  |  |
| Semester 2  Week 14 | **Practical investigation** |  |  | **Outcome 3: Present as digital scientific poster** |