**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 1,2You 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 hydrocarbonPrac: 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, 4Prac: Molar volume of hydrogenDemo: 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 reactionPrac: 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**
 | 45 | 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, 10Prac: Half-cells and the electrochemical series Prac: Order of half-equations in the electrochemical seriesPrac: 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 11Prac: Fuel cellsPrac old 3rd Ed TRB: Car battery and fuel cellsYou 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, 13Prac: Measuring the rate of reactionPrac: Factors affecting the rate of reactionDemo: Foam column + other favouritese.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, 17Prac: Discovering the equilibrium lawPrac: Effect of concentration changes on equilibrium yieldsDemo: 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 15Prac: Effect of temperature on equilibrium yieldsYou 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, 19Demo: ElectrolysisPrac: Electrolysis of aqueous solutionsDemo: 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, 21Prac: Faraday’s first law of electrolysisPrac: Determination of Faraday’s constant and Avogadro’s numberExercise: Determining Faraday’s first law using second-hand dataPrac: 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 15Semester 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, 24Prac/Demo: Model building of enantiomers and cis-trans geometric isomers |  |
| Semester 1 Week 16Semester 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 reactionsYou 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 17Semester 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 compoundsYou 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 appExercise: Data analysis of organic compounds by IR SW worksheets 28, 29You 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 analysisExercise: Interpretation of a number of mass spectra of organic compounds – data analysisSW worksheets 30You 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 31Prac: Chromatography of a vegetable extractYou 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 32Prac: Analysis of aspirin tabletsPrac: Analysis of ascorbic acid in vitamin C tabletsPrac: 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 carbohydratesPrac: Testing for proteinsPrac: Breaking down the starch polymerPrac: Reactions of carbohydratesPrac: Tests for fatty acids and glycerolPrac: Measuring Vit C in foodsDemo: Detection of unsaturated fatsYou 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, 41Prac: Action of enzymesYou 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, 42Prac: Calibration of a calorimeterPrac: Heat of solution of the dissolution of potassium nitratePrac: 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 1Week 15 | **Practical investigation – if *Energy* is the topic***(could be moved according to your program)* | In Chem 1 Ch 21andproduct link for Chem 2and Student Workbook notes and pracs  |  | SW Worksheets 43, 44If 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 seriesPrac: Fuel cellsPrac: Electrolysis of aqueous solutionsPrac: Faraday’s first law of electrolysisPrac: Determination of Faraday’s constant and Avogadro’s numberDemo: Determining Faraday’s first law of electrolysis using second-hand dataPrac: FermentationYou tube: Measuring vitamin C in foods (RSC) <https://www.youtube.com/watch?v=1P3W9DykGBg> |  |
| Semester 1Week 16 | Practical investigation |  |  |  |
| Semester 1Week 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 2Week 12 | **Practical investigation – if *Food* is the topic***(could be moved according to your program)* | In Chem 1 Ch 21andproduct link for Chem 2and Student Workbook notes and pracs  |  | SW Worksheets 43, 44If choosing ***Aspects of Food*** the following pracs might provide ideas for investigation (as well as others in the Student Workbook):Prac: Making protein modelsPrac: Testing for proteinsPrac: Action of enzymesPrac: Breaking down the starch polymerPrac: Reactions of carbohydratesPrac: Tests for fatty acids and glycerol |  |
| Semester 2Week 13 | **Practical investigation** |  |  |  |
| Semester 2Week 14 | **Practical investigation** |  |  | **Outcome 3: Present as digital scientific poster** |