Subject Name: Biochemistry for Complementary Therapists
Subject Code: BIOO211

SECTION 1 - GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Award/s:</th>
<th>Total Course Credit Points:</th>
<th>Level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Health Science (Acupuncture)</td>
<td>128</td>
<td>Core</td>
</tr>
<tr>
<td>Bachelor of Complementary Medicine</td>
<td>48</td>
<td>Elective</td>
</tr>
</tbody>
</table>

| Duration: | 1 Semester |
| Subject Coordinator: | Dr Vishnu Bhat (Melbourne campus) |
| Subject is: | Core or Elective as noted |
| Subject Credit Points: | 2 |

| No. timetabled hours per week: | 3 |
| No. personal study hours per week: | 2 |
| Total hours per week: | 5 |

Delivery Mode:
- **Face to Face (On campus)**: 1 x 2 hour lecture, 1 x 1 hour tutorial
- **e-Learning (Online)**: Narrated PowerPoint presentations, Tutorials: Asynchronous tutor moderated discussion forum and activities, Student handouts, web-based resources
- **Intensive Delivery (Summer School)**: Contact hours are delivered over 5 weeks with 2 x 4 hour days delivered per week, Content: Combination lecture and tutorial activities, Assessment: Quiz 1 - Week 2; Quiz 2 - Week 3; Assignment - Week 4; Concept Map - Week 5; Written Assignment - Week 6

Pre-requisites: Nil
Co-requisites: Nil

SECTION 2 – ACADEMIC DETAILS

Subject Rationale
This subject introduces students to the concepts of general and organic chemistry, helping them prepare for further studies in human biology, nutrition and human clinical sciences. The subject also provides basic concepts in DNA structure, function and replication and covers foundational knowledge of the major biochemical pathways. The overall objective of the subject is to assist in understanding the chemical workings of the human body at the cellular, tissue and systemic levels.

Learning Outcomes
1. Explain elements, atoms, ions, chemical bonding, states of matter, gas behaviour, chemical reactions and equilibrium, the importance of energy transfer, catalysts, and identify applications in biological systems.
2. Identify functional groups and analyse chemical nature of all organic molecules, including carbohydrates, lipids, proteins and nucleic acids.
3. Explain common chemical reactions and properties associated with organic functional groups and state their applications in biological systems.
4. Describe the function and main biochemical pathways for each major biochemical group.
5. Apply the knowledge of the major biochemical pathways and how they relate to health and disease states.
6. Illustrate regulation and integration within the main biochemical pathways and explain how this contributes to normal homeostasis in the body.

### Assessment Tasks

<table>
<thead>
<tr>
<th>Type</th>
<th>Learning Outcomes Assessed</th>
<th>Session Content Delivered</th>
<th>Due</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>multiple choice and definitions (40 minutes)</td>
<td>1</td>
<td>1-4</td>
<td>Week 5</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>multiple choice and definitions (40 minutes)</td>
<td>2-3</td>
<td>5-9</td>
<td>Week 10</td>
</tr>
<tr>
<td>Assignment</td>
<td>carbohydrate metabolism (1000 words or multimedia)</td>
<td>4-6</td>
<td>6, 10-11</td>
<td>Week 12</td>
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<tr>
<td>Concept Map</td>
<td></td>
<td>4-6</td>
<td>9, 13</td>
<td>Week 13</td>
</tr>
<tr>
<td>Written Assignment</td>
<td>lipid metabolism (1000 words)</td>
<td>4-6</td>
<td>7, 12</td>
<td>Week 14</td>
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</tbody>
</table>

All written assessments and online quizzes are due at 11:55 p.m. and submitted through the LMS

### Prescribed Readings:

### Recommended Readings:
<table>
<thead>
<tr>
<th>Week</th>
<th>Lectures</th>
<th>Tutorials / Practicals</th>
</tr>
</thead>
</table>
| 1.   | **Introduction (Subject Outline / Subject Aims / Assessment / Teaching Resources)**  
**Chemistry: The Study of Matter**  
- How matter is organised  
  - Elements, compounds  
  - Periodic Table  
  - Atoms, structure of atoms  
  - Atomic number and mass number  
  - Valence electron, octet rule  
- Chemical bonds  
  - Ionic, covalent  
- Naming compounds  
  - Ionic and covalent compounds | Activities are developed to allow the students to explore relevant concepts, expand on ideas and have peer and lecturer interaction. Activities also allow for formative assessment and feedback  
- Review of the Periodic Table and elements, octet rule and chemical bonds |
| 2.   | **Chemical Reactions**  
- Chemical equation and balancing  
- Redox reaction – oxidation and reduction reaction  
- Reversible reaction and equilibrium |  
- Review of chemical formulae and naming compounds |
| 3.   | **Introduction to Reaction Rates and States of Matter**  
- Reactions and rates  
  - Factors affecting reaction rate, activation energy, catalysts (enzymes), exothermic and endothermic reaction  
- States of matter  
  - Strength of attractive forces  
  - Attractive forces between particles and hydrogen bonding  
- Gases  
  - Gas laws (Boyle’s and Dalton’s law)  
  - Breathing  
  - Solutions |  
- Review of chemical reactions and Le Châtelier’s principle |
| 4.   | **Acids and Bases**  
- Acidic and basic solutions  
  - Concept of pH  
  - Strong and weak acids and bases  
  - Conjugate acid–base pairs  
- Biological buffers (e.g., bicarbonate, phosphate in the blood) |  
- Review of acids, bases and buffers |
5. **Introduction to Organic Chemistry**
- Organic compounds
  - Organic molecules and their properties
  - Bonding with carbon
  - Functional groups
- Formulas
  - Molecular, structural
- Naming of organic compounds
  - Overview – IUPAC system basics
- Functional groups (overview)

6. **Carbohydrates**
- Introduction to the structure and function of carbohydrates
  - Simple and complex carbohydrates
  - Monosaccharides
  - Disaccharides
  - Polysaccharides
  - Dietary considerations & carbohydrates

7. **Lipids**
- Introduction to lipids
- Classification of lipids
- Structure and function
- Types of fatty acids
- Triacylglycerols
- Phospholipids

8. **Introduction to Nucleic Acids, DNA and Replication**
- Types of nucleic acids
- Nucleosides and nucleotides
- Primary structure of nucleic acids
- DNA double helix
- DNA replication

9. **Amino Acid, Proteins and Enzymes**
- Characteristics of proteins
- Amino acids: Building blocks for proteins
- Primary, secondary, tertiary & quaternary structure of proteins
- General characteristics of enzymes
- Enzyme structure
- Enzyme function and inhibition

10. **Carbohydrate Metabolism**
- Digestion of carbohydrates
- Glycolysis
- Glycogen metabolism
- Pyruvate pathways

**NON-TEACHING WEEK** (note that make-up classes may be scheduled in this week)
Semester 1 - This aligns with the week after Easter so it may fall between Weeks 6 to 8
Semester 2 & Online students - The non-teaching week falls between Weeks 7 and 8

- Review of functional groups using molecular models
- Review of carbohydrates
- Concept map on carbohydrates
- Review of DNA structure and function
- Virtual laboratory exercise on DNA extraction
- Review of amino acids, protein and enzymes
- Animations on the structure and level of organisation of protein, mechanism of enzyme action
- Review of carbohydrate metabolism
<table>
<thead>
<tr>
<th></th>
<th>Carbohydrate Metabolism (Continued)</th>
<th></th>
<th>Review of carbohydrate metabolism, Krebs cycle and energy production</th>
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<tbody>
<tr>
<td>11.</td>
<td>• Krebs cycle</td>
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<td></td>
<td>• Electron transport chain</td>
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<td>• Energy from glucose</td>
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<td>12.</td>
<td>Lipid Metabolism</td>
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<td>Review of lipid metabolism, concept map of lipid metabolism</td>
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<td></td>
<td>• Digestion of lipids</td>
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<td></td>
<td>• Lipolysis and beta oxidation, energy yield</td>
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<td></td>
<td>• Ketogenesis</td>
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<td></td>
<td>• Lipogenesis</td>
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<td>13.</td>
<td>Protein Catabolism</td>
<td></td>
<td>Review of protein catabolism and concepts map on protein catabolism, integration of metabolic pathways</td>
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<td></td>
<td>• Digestion of protein</td>
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<td>• Oxidative deamination</td>
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<td>• Urea cycle</td>
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<td>• Metabolic outcome of amino acids</td>
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<td>Integration of Metabolic Pathways</td>
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<td>14.</td>
<td>Non-Teaching Week/Practical Examination Week 1</td>
<td></td>
<td>Note that make-up classes may be scheduled in this week</td>
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<tr>
<td>15.</td>
<td>Non-Teaching Week/Practical Examination Week 2</td>
<td></td>
<td>Note that make-up classes may be scheduled in this week</td>
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<td>16.</td>
<td>Final Examination Week 1</td>
<td></td>
<td>There is no final exam for this subject</td>
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<tr>
<td>17.</td>
<td>Final Examination Week 2</td>
<td></td>
<td>There is no final exam for this subject</td>
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