

# SUBJECT OUTLINE



Subject Name:

**Biochemistry for Complementary Therapists**

Subject Code:

**BIO0211**

## SECTION 1 – GENERAL INFORMATION

<b>Award/s:</b>	<b>Total course credit points:</b>	<b>Level:</b>
Bachelor of Health Science (Acupuncture)	128	Core 2 <sup>nd</sup> Year
Bachelor of Complementary Medicine	48	Elective 3 <sup>rd</sup> Year
<b>Duration:</b> 1 Semester		
<b>Subject Coordinator:</b> Dr Vishnu Bhat (Melbourne campus)		
<b>Subject is:</b> Core or Elective as indicated	<b>Subject Credit Points:</b> 2	

### Student Workload:

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

### Delivery Mode:

Face to face	Details:	2 hour lecture	1 hour tutorial
E-Learning	Details:	Narrated Powerpoint presentations Student handouts and web resources	
Intensive delivery	Details:	Summer School – offered over 5 weeks with 2 x 4 hour days delivered per week. Quiz offered in Week 3, Project due in Week 5, and Final exam conducted in Week 6.	
Full Time			
Part Time			

**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				
Type	Learning Outcomes Assessed	Week Content Delivered	Week Due	Weighting
<b>Quiz 1</b> Multiple choice and definitions (40 minutes)	1	1-4	Sunday following week 5	20%
<b>Quiz 2</b> Multiple choice and definitions (40 minutes)	2-3	5-9	Sunday following week 10	20%
<b>Assignment</b> (carbohydrate metabolism) (1000 words or multimedia)	4-6	6, 10-11	Sunday following week 12	20%
<b>Concept map</b>	4-6	9, 13	Week 13	20%
<b>Written assignment</b> (lipid metabolism) (1000 words)	4-6	7, 12	Sunday following week 14	20%

#### Prescribed readings:

1. Stoker, H. S. (2016). *General, organic, and biological chemistry* (7th ed.). Boston, MA: Cengage Learning.
2. Summers, J., & Smith, B. (2014). *Communication skills handbook* (4th ed.). Milton, QLD: Wiley.

#### Recommended readings:

1. Timberlake, K. C. (2015). *General, organic, and biological chemistry: structures of life* (5th ed.). Harlow, England: Pearson.
2. Batmanian, L., Ridge, J., & Worrall, S. (2011). *Biochemistry for health professionals*. Chatswood, NSW: Mosby Elsevier. [ebook available]
3. Bettelheim, F. A., Brown, W. H., Campbell, M. K., Farrell, S. O., & Torres, O. J. (2016). *Introduction to general, organic and biochemistry* (11th ed.). Boston, MA: Cengage Learning.
4. Dominiczak, M. H. (2007). *Flesh and bones of metabolism*. Edinburgh, Scotland: Elsevier Mosby.
5. O'Toole, M. T. (Eds.). (2013). *Mosby's dictionary of medicine, nursing and health professions* (9th ed.). St. Louis, MO: Elsevier. [ebook available]
6. Tortora, G. J., & Derrickson, B. (2014). *Principles of anatomy and physiology* (14th ed.). Danvers, MA: Wiley.

Subject Content		
Week	Lecture	Tutorial
1.	Introduction: (Subject outline and aims / Assessment / Teaching resources) Chemistry: the study of matter <ul style="list-style-type: none"> <li>• How matter is organised               <ul style="list-style-type: none"> <li>○ Elements, compounds</li> <li>○ Periodic Table</li> </ul> </li> </ul>	Review of the Periodic table and elements, octet rule and chemical bonds

	<ul style="list-style-type: none"> <li>○ Atoms, structure of atoms</li> <li>○ Atomic number and mass number</li> <li>○ Valence electron, octet rule</li> <li>• Chemical bonds           <ul style="list-style-type: none"> <li>○ Ionic, covalent</li> </ul> </li> <li>• Naming compounds           <ul style="list-style-type: none"> <li>○ Ionic and covalent compounds</li> </ul> </li> </ul>	
<b>2.</b>	<b>Chemical reactions</b> <ul style="list-style-type: none"> <li>• Chemical equation and balancing</li> </ul> Redox reaction– oxidation and reduction reaction Reversible reaction and equilibrium	Review of Chemical formulae and naming compounds
<b>3.</b>	<b>Introduction to reaction rates and states of matter</b> <ul style="list-style-type: none"> <li>• Reactions and rates           <ul style="list-style-type: none"> <li>○ Factors affecting reaction rate, activation energy, catalysts (enzymes), exothermic and endothermic reaction</li> </ul> </li> <li>• States of matter           <ul style="list-style-type: none"> <li>○ Strength of attractive forces</li> <li>○ Attractive forces between particles and hydrogen bonding</li> </ul> </li> <li>• Gases           <ul style="list-style-type: none"> <li>○ Gas laws (Boyle’s and Dalton’s law)</li> <li>○ Breathing</li> <li>○ solutions</li> </ul> </li> </ul>	Review of Chemical reactions and Le Châtelier’s principle
<b>4.</b>	<b>Acids and bases</b> <ul style="list-style-type: none"> <li>• Acidic and basic solutions           <ul style="list-style-type: none"> <li>○ Concept of pH</li> <li>○ Strong and weak acids and bases</li> <li>○ Conjugate acid–base pairs</li> </ul> </li> <li>• Biological buffers (e.g. bicarbonate, phosphate in the blood)</li> </ul>	Review of acids , bases and buffers
<b>5.</b>	<b>Introduction to Organic Chemistry</b> <ul style="list-style-type: none"> <li>• Organic compounds           <ul style="list-style-type: none"> <li>○ Organic molecules and their properties</li> <li>○ Bonding with carbon</li> <li>○ Functional groups</li> </ul> </li> <li>• Formulas           <ul style="list-style-type: none"> <li>○ Molecular, structural</li> </ul> </li> <li>• Naming of organic compounds           <ul style="list-style-type: none"> <li>○ Overview – IUPAC system basics</li> </ul> </li> <li>• Functional groups (overview)</li> </ul>	Review of functional groups using molecular models
<b>6.</b>	<b>Carbohydrates</b> <ul style="list-style-type: none"> <li>• Introduction to the structure and function of carbohydrates           <ul style="list-style-type: none"> <li>○ Simple and complex carbohydrates</li> <li>○ Monosaccharides</li> <li>○ Disaccharides</li> <li>○ Polysaccharides</li> <li>○ Dietary considerations &amp; Carbohydrates</li> </ul> </li> </ul>	Review of carbohydrates Concept map on carbohydrates

<b>7.</b>	<b>Lipids</b> <ul style="list-style-type: none"> <li>• Introduction to Lipids</li> <li>• Classification of Lipids</li> <li>• Structure and Function</li> <li>• Types of Fatty Acids</li> <li>• Triacylglycerols</li> <li>• Phospholipids</li> </ul>	Review of Lipid classification, structure and function
<b>NON-TEACHING WEEK</b> (note that make-up classes may be scheduled in this week) <b>Semester 1</b> - This aligns with the week after Easter so it may fall between weeks 6 to 8. <b>Semester 2 &amp; Online students</b> - The break week falls between Weeks 7 and 8.		
<b>8.</b>	<b>Introduction to Nucleic acids, DNA and Replication</b> <ul style="list-style-type: none"> <li>• Types of Nucleic Acids</li> <li>• Nucleosides and nucleotides</li> <li>• Primary Structure of Nucleic Acids</li> <li>• DNA Double Helix</li> <li>• DNA Replication</li> </ul>	Review of DNA structure and function Virtual laboratory exercise on DNA extraction
<b>9.</b>	<b>Amino acid, proteins and enzymes</b> <ul style="list-style-type: none"> <li>• Characteristics of Proteins</li> <li>• Amino Acids: Building Blocks for Proteins</li> <li>• Primary, Secondary, Tertiary &amp; Quaternary Structure of Proteins</li> <li>• General Characteristics of Enzymes</li> <li>• Enzyme Structure</li> <li>• Enzyme Function and inhibition</li> </ul>	Review of amino acids, protein and enzymes Animations on the structure and level of organisation of protein, mechanism of enzyme action
<b>10.</b>	<b>Carbohydrate metabolism</b> <ul style="list-style-type: none"> <li>• Digestion of carbohydrates</li> <li>• Glycolysis</li> <li>• Glycogen metabolism</li> <li>• Pyruvate pathways</li> </ul>	Review of Carbohydrate metabolism
<b>11.</b>	<b>Carbohydrate metabolism</b> <ul style="list-style-type: none"> <li>• Krebs cycle</li> <li>• Electron transport chain</li> <li>• Energy from glucose</li> </ul>	Review of carbohydrate metabolism, Krebs cycle and energy production
<b>12.</b>	<b>Lipid metabolism</b> <ul style="list-style-type: none"> <li>• Digestion of lipids</li> <li>• Lipolysis and beta oxidation, energy yield</li> <li>• Ketogenesis</li> <li>• Lipogenesis</li> </ul>	Review of lipid metabolism, concept map of lipid metabolism
<b>13.</b>	<b>Protein catabolism</b> <ul style="list-style-type: none"> <li>• Digestion of protein</li> <li>• Oxidative deamination</li> <li>• Urea cycle</li> <li>• Metabolic outcome of amino acids</li> </ul> <b>Integration of Metabolic Pathways</b>	Review of protein catabolism and concepts map on protein catabolism, integration of metabolic pathways
<b>14.</b>	<b>Non-Teaching Week / Practical Exam Week 1. Note that make-up classes may be scheduled in this week.</b>	
<b>15.</b>	<b>Non-Teaching Week / Practical Exam Week 2. Note that make-up classes may be scheduled in this week.</b>	

<b>16.</b>	<b>Final Exam Week 1</b> Please refer to your Campus Timetable for the exact time and day of the final exam.
<b>17.</b>	<b>Final Exam Week 2</b> Please refer to your Campus Timetable for the exact time and day of the final exam.