Syllabus

<table>
<thead>
<tr>
<th>Instructor: Jeffrey D. Newman</th>
<th>Instructor: Chriss McDonald</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room: Heim 107</td>
<td>Room: Heim 233</td>
</tr>
<tr>
<td>Phone: 570-321-4386</td>
<td>Phone: 570-321-4186</td>
</tr>
<tr>
<td>email: <a href="mailto:newman@lycoming.edu">newman@lycoming.edu</a></td>
<td>email: <a href="mailto:mcdonald@lycoming.edu">mcdonald@lycoming.edu</a></td>
</tr>
<tr>
<td>office hours: Mon. 3:30-4:30 PM</td>
<td>office hours: I'm almost always around from 8:15 – 5:00</td>
</tr>
</tbody>
</table>

Lecture meets MF 2:00 – 3:15 PM in Heim G-40
Lab meets W 2:00 – 4:50 PM in Heim 106
Moodle Enrollment key = biochemical


Catalog Description of Course: Emphasis is given to the metabolism of carbohydrates, lipids, amino acids, proteins, and nucleic acids; integration of metabolism; and biochemical control mechanisms, including allosteric control, induction, repression, signal transduction as well as the various types of inhibitive control mechanisms.

Course Learning Objectives as related to Biology and Chemistry Departmental Learning Objectives

1. Exhibit proficiency in Biochemistry
2. Perform laboratory techniques as appropriate to Biochemistry
3. Understand and use modern biological instrumentation
4. Exhibit ability to work as an individual and in groups
5. Exhibit integrative, problem-solving skills, such as experimental design, quality assurance/quality control in data collection, data manipulation, and data interpretation.
6. Communicate the results of Biochemical investigation effectively in written form.
7. Search the Biochemical literature and/or databases, evaluate the results of the search, access desired research materials, and perform critical analysis of the data therein.
8. Demonstrate responsible conduct in the laboratory, including laboratory safety and ethical research practices.

Contribution to the Mission of Lycoming College:

This course provides opportunities for students to “develop communication and critical thinking skills”, “increase receptivity to new concepts and perspectives” and “explore … scientific traditions”
Grades will be determined based on the following assessments:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>3 x 100 pts = 300 pts</td>
</tr>
<tr>
<td>Final Exam</td>
<td>150 pts</td>
</tr>
<tr>
<td>Prep Papers</td>
<td>24 x 3 pts = 72 pts</td>
</tr>
<tr>
<td>Lipid Analysis Lab Report</td>
<td>50 pts</td>
</tr>
<tr>
<td>Esterase Lab Report</td>
<td>50 pts</td>
</tr>
<tr>
<td>Metabolic Reconstruction</td>
<td>50 pts</td>
</tr>
<tr>
<td>Homework</td>
<td>up to 68 pts</td>
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<tr>
<td>Quizzes</td>
<td>3 x 20 pts = 60 pts</td>
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<tr>
<td><strong>Total possible</strong></td>
<td>800 pts</td>
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</tbody>
</table>

Attending Chemistry colloquium will earn 3 bonus points, with a maximum of 12 bonus points permitted.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>B+</td>
<td>86.7 - 89.9%</td>
</tr>
<tr>
<td>C+</td>
<td>76.7 – 79.9%</td>
</tr>
<tr>
<td>D+</td>
<td>66.7 - 69.9%</td>
</tr>
<tr>
<td>A</td>
<td>93.3 – 100%</td>
</tr>
<tr>
<td>B-</td>
<td>80.0 – 83.2%</td>
</tr>
<tr>
<td>C-</td>
<td>70.0 – 73.2%</td>
</tr>
<tr>
<td>D-</td>
<td>60.0 – 63.2%</td>
</tr>
<tr>
<td>F</td>
<td>below 60%</td>
</tr>
<tr>
<td>A-</td>
<td>90.0 – 93.2%</td>
</tr>
<tr>
<td>B-</td>
<td>80.0 – 83.2%</td>
</tr>
<tr>
<td>C-</td>
<td>70.0 – 73.2%</td>
</tr>
<tr>
<td>D-</td>
<td>60.0 – 63.2%</td>
</tr>
</tbody>
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**Attendance Policy**: Attendance of all lectures and laboratories is expected. Absences will be noted by the instructor, and if excessive (more than 1 lab or 4 lectures), may result in a reduction of the course grade. Absences and participation will be used to determine borderline (within 0.5%) grades. Documentation (note from school nurse, physician, documentation of job interview, etc.) for excused absences must be provided to the instructor as soon as possible.

**Daily “Prep Papers”** are due at the beginning of each class to encourage the use of writing to organize your thoughts about the course material.

**Guidelines:**
- Name and date should be indicated on top of page
- 0.5 page summarizing key points from previous class and *asking questions in bold.*
- 0.5 page summarizing key points from reading assignment and *asking questions in bold.*
- Each paper that meets guidelines earns 3 points
- 72 points are built into the grading scale
  - If you do 24 prep papers, you score 100% on 72 point part of your grade
  - If you do 26 prep papers, you score 100% on 72 point part of your grade and get 6 bonus points
  - If you do 20 prep papers, you score 83% on 72 point part of your grade
- Prep papers may be submitted for missed classes only when accompanied by a documented excuse (Note from Health Care Provider or coach).
- If a class is missed, the prep paper that is submitted upon return to class should summarize the last class attended and the reading assignment given on that day.
Guidelines for Attending Chemistry Colloquium:

i. Be on time.

ii. The speaker has expended a lot of effort to prepare for the talk. Be attentive and polite.

iii. If you can’t stay for 45 minutes for an internal speaker or 60 minutes for an external speaker, don’t come (please do not ask the speaker how long the talk will last).

iv. Realize that questions for the speaker at the end is part of the talk and you will be expected to stay for that as well.

A Few Words about Learning Biochemistry. Studying biochemistry is hard work for most people (this is certainly true for us). We would recommend that you work on the lecture material outside of class for at least one hour per day, 7 days/week. Once you see how things are going this amount can be adjusted as needed (We suggest a significant increase in study time prior to an exam). If you are having trouble, make sure and come and talk to us. You will be responsible for all of the material listed on the following schedule for the indicated exams and quizzes. It is not sufficient to learn the material from the lecture alone. You are expected to read and think about the material prior to the lecture. We must necessarily cover a large amount of material so our pace must be geared towards those who are ready to learn. The exams will be somewhat cumulative in the sense that we need to know the earlier material to comprehend the latter.

We will spend a great deal of effort studying biochemical pathways in this course. Your understanding of these pathways will be substantially enhanced by becoming familiar with the structures of important biomolecules. Throughout the course of the semester you should strive to learn the following structures.

General structures: amino acids, monosaccharides, fatty acids, sphingomyelin, phosphatidylcholine, polypeptide structure (1°, 2°, 3°)

Specific structures: the 20 most important amino acids, glucose (acyclic, cyclic), amylose, amylopectin, glycogen, starting compounds, intermediates, and products of the following pathways – glycolysis, gluconeogenesis, β oxidation, and fatty acid synthesis
<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lecture Topics</th>
<th>Lab Activities (Wed.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>1/11 – 1/15</td>
<td>M – Introduction, Concept Reviews (JN &amp; CM)</td>
<td>Breaking Down a Cell – What is in there and how is it purified and studied?</td>
</tr>
<tr>
<td></td>
<td>1/15 – 1/19</td>
<td>F – Amino Acids, Peptide Bonds (CM)</td>
<td></td>
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<tr>
<td>Week 2</td>
<td>1/18 – 1/22</td>
<td>M – Protein Structure (JN)</td>
<td>Protein structure and sequence analysis with Chime/Protein Explorer. (computer lab) (text ch 3.5)</td>
</tr>
<tr>
<td></td>
<td>1/22 – 1/26</td>
<td>F – Protein Sequences &amp; Evolution (JN)</td>
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<tr>
<td>Week 3</td>
<td>1/25 – 1/29</td>
<td>M - Quiz 1 (1/25)</td>
<td>Selective Hydrolysis with Pig Liver Esterase</td>
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<tr>
<td></td>
<td>1/29 – 2/2</td>
<td>M – Hemoglobin (JN)</td>
<td></td>
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<td></td>
<td>2/2 – 2/8</td>
<td>F – Enzyme Kinetics (JN)</td>
<td></td>
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<tr>
<td>Week 4</td>
<td>2/1 – 2/5</td>
<td>M – Enzyme Catalysis (CM)</td>
<td>Selective Hydrolysis with Pig Liver Esterase</td>
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<tr>
<td></td>
<td>2/5 – 2/11</td>
<td>F – Enzyme Regulation (JN)</td>
<td></td>
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<tr>
<td>Week 5</td>
<td>2/8 – 2/12</td>
<td>M – Catch-up, review for exam</td>
<td>Exam 1 (2/10)</td>
</tr>
<tr>
<td></td>
<td>2/12 – 2/18</td>
<td>F - Lipids (CM)</td>
<td>Esterase Lab report due 2/12</td>
</tr>
<tr>
<td>Week 6</td>
<td>2/15 – 2/19</td>
<td>M – Membranes (JN)</td>
<td>Fatty Acid Methyl Ester (FAME) Extraction and Gas Chromatography</td>
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<tr>
<td></td>
<td>2/19 – 2/25</td>
<td>F – Membrane Transport (JN)</td>
<td></td>
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<tr>
<td>Week 7</td>
<td>2/22 – 2/26</td>
<td>M - Signal Transduction (JN)</td>
<td>Quiz 2 (2/24)</td>
</tr>
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<td></td>
<td>2/26 – 3/1</td>
<td>F – Signal Transduction (JN)</td>
<td>FAME Data Analysis</td>
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<tr>
<td>Week 8</td>
<td>2/29 – 3/4</td>
<td>M - Carbohydrates (CM)</td>
<td>Exam 2 (3/2)</td>
</tr>
<tr>
<td></td>
<td>3/4 – 3/10</td>
<td>F – Metabolic Concepts (CM)</td>
<td>FAME lab report due 3/4</td>
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<tr>
<td>Week 9</td>
<td>3/10 – 3/16</td>
<td>M – Glycolysis (CM)</td>
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<td></td>
<td>4/4 – 4/10</td>
<td>M - Glycogen Metabolism (JN)</td>
<td>2. Metabolic Reconstruction from Genome Sequences</td>
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<td></td>
<td>4/10 – 4/16</td>
<td>F – Good Friday</td>
<td>Exam 3 (3/30)</td>
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<tr>
<td>Week 11</td>
<td>4/16 – 4/22</td>
<td>M – Calvin Cycle &amp; Pentose Phosphate pathway (JN)</td>
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<td></td>
<td>4/22 – 5/8</td>
<td>F - Citric Acid Cycle (JN)</td>
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<td></td>
<td>5/14 – 5/20</td>
<td>F - Lipid Catabolism (CM)</td>
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<tr>
<td>Week 13</td>
<td>5/20 – 5/26</td>
<td>M – Lipid Synthesis (CM)</td>
<td>Analysis of lipophilic pigments and quinones by HPLC</td>
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<tr>
<td></td>
<td>5/26 – 6/1</td>
<td>F – Amino Acid Metabolism (JN)</td>
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<tr>
<td>Week 14</td>
<td>6/1 – 6/7</td>
<td>M – Integration of Metabolism (JN)</td>
<td>Analysis of lipophilic pigments and quinones by HPLC</td>
</tr>
<tr>
<td></td>
<td>6/7 – 6/13</td>
<td>F – Catch up, review</td>
<td>代谢重建报告截止日期4/22</td>
</tr>
</tbody>
</table>

**Week 1: 1/11 – 1/15**

- **Lecture Topics:**
  - M – Introduction, Concept Reviews (JN & CM)
  - F – Amino Acids, Peptide Bonds (CM)

- **Lab Activities (Wed.):**
  - Breaking Down a Cell – What is in there and how is it purified and studied?

**Week 2: 1/18 – 1/22**

- **Lecture Topics:**
  - M – Protein Structure (JN)
  - F – Protein Sequences & Evolution (JN)

- **Lab Activities (Wed.):**
  - Protein structure and sequence analysis with Chime/Protein Explorer. (computer lab) (text ch 3.5)

**Week 3: 1/25 – 1/29**

- **Lecture Topics:**
  - M - Quiz 1 (1/25)
  - M – Hemoglobin (JN)
  - F – Enzyme Kinetics (JN)

- **Lab Activities (Wed.):**
  - Selective Hydrolysis with Pig Liver Esterase

**Week 4: 2/1 – 2/5**

- **Lecture Topics:**
  - M – Enzyme Catalysis (CM)
  - F – Enzyme Regulation (JN)

- **Lab Activities (Wed.):**
  - Selective Hydrolysis with Pig Liver Esterase/Kinetics Workshop

**Week 5: 2/8 – 2/12**

- **Lecture Topics:**
  - M – Catch-up, review for exam
  - F - Lipids (CM)

- **Lab Activities (Wed.):**
  - Exam 1 (2/10)
  - Esterase Lab report due 2/12

**Week 6: 2/15 – 2/19**

- **Lecture Topics:**
  - M – Membranes (JN)
  - F – Membrane Transport (JN)

- **Lab Activities (Wed.):**
  - Fatty Acid Methyl Ester (FAME) Extraction and Gas Chromatography

**Week 7: 2/22 – 2/26**

- **Lecture Topics:**
  - M - Signal Transduction (JN)
  - F – Signal Transduction (JN)

- **Lab Activities (Wed.):**
  - Quiz 2 (2/24)
  - FAME Data Analysis

**Week 8: 2/29 – 3/4**

- **Lecture Topics:**
  - M - Carbohydrates (CM)
  - F – Metabolic Concepts (CM)

- **Lab Activities (Wed.):**
  - Exam 2 (3/2)
  - FAME lab report due 3/4

**Week 9: 3/10 – 3/16**

- **Lecture Topics:**
  - M – Glycolysis (CM)
  - F – Gluconeogenesis (CM)

- **Lab Activities (Wed.):**
  - 1. Induce expression, Extract protein for His Tag purification.
  - 2. Metabolic Reconstruction from Genome Sequences

**Week 10: 3/20 – 3/26**

- **Lecture Topics:**
  - Quiz 3 (3/21)
  - M - Glycogen Metabolism (JN)
  - F – Good Friday

- **Lab Activities (Wed.):**
  - 1. Purify His tag protein, quantify.
  - 2. Metabolic Reconstruction from Genome Sequences

**Week 11: 3/28 – 4/3**

- **Lecture Topics:**
  - M – Calvin Cycle & Pentose Phosphate pathway (JN)
  - F - Citric Acid Cycle (JN)

- **Lab Activities (Wed.):**
  - Exam 3 (3/30)

**Week 12: 4/4 – 4/10**

- **Lecture Topics:**
  - M – Electron Transport (JN)
  - F - Lipid Catabolism (CM)

- **Lab Activities (Wed.):**
  - 1. SDS-PAGE of His tag protein, Beta Galactosidase assay.

**Week 13: 4/11 – 4/17**

- **Lecture Topics:**
  - M – Lipid Synthesis (CM)
  - F – Amino Acid Metabolism (JN)

- **Lab Activities (Wed.):**
  - Analysis of lipophilic pigments and quinones by HPLC

**Week 14: 4/18 – 4/24**

- **Lecture Topics:**
  - M – Integration of Metabolism (JN)
  - F – Catch up, review

- **Lab Activities (Wed.):**
  - Analysis of lipophilic pigments and quinones by HPLC
  -代谢重建报告截止日期4/22