Welcome to CHEM 341: Biochemistry II!

You did it! You successfully completed the first semester of Biochemistry and you laid the foundation for a more in-depth understanding of the molecular basis of life. In Biochemistry II, we will pick up where we left off in Biochemistry I: Metabolism. We’re going to look at different metabolic pathways as examples of how enzymes work together to keep living things living. Once you start understanding it, I hope you will have a greater appreciation for how fascinating life actually is. I think that studying metabolism helps you appreciate the miracles in the mundane. Awesome stuff! This course syllabus outlines what you can expect from the course and what I expect from you. My name is Teaster Baird, Jr. and I am looking forward to being your guide on this journey!

Metabolism is the collection of all the chemical reactions in a living thing. The elucidate and study of them are key to understanding many aspects of health.
Learning Facilitator Information

Your education is yours and the knowledge you gain and retain will be largely predicated on what you do to gain and retain it. With that in mind, I prefer to describe myself as your “Learning Facilitator.” My goal is not to just tell you what I know or what I think you should know. My role in your education is to help you get the information you need and provide you with the tools to use that information effectively and appropriately. Should you need to get in touch with me, my contact information is below:

**Learning Facilitator:** Teaster Baird, Jr. PhD

I prefer to be addressed as “Dr. Baird,” “Professor Baird” or “Professor.”

**Office and Office Hours:** TH 806, Tuesdays 2:00 - 4:00, Fridays 10:00 - 12:00 and by appointment.

*If my standing office hours are inconvenient for you, contact me to see if we can make an appointment at a time that works for both of us.*

**Email:** tbaird(at)sfsu.edu.

Email is the best way to contact me. However, if I do not respond immediately, don’t take it personally. Sometimes it takes a while for me to get through all the messages I receive.

**Phone:** 415.338.1288

Class Time and Required Materials

This semester, we will be meeting twice weekly on Mondays and Wednesdays in HH 113 from 9:30 a.m. - 10:45 a.m.:

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 - 10:45</td>
<td>9:30 - 10:45</td>
<td>HH 113</td>
<td>HH 113</td>
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</tbody>
</table>

The only required material for the semester is the iClicker 2 in-class response remote. I use them frequently in our class meetings to assess your learning, my facilitation and to give you credit for participating in class. They are available at the SFSU Bookstore ($42 used, rental for $28) if you don’t already have one.

Optional Items

To reduce your costs, I’m not requiring a specific textbook for this semester. The course content will be driven by the in-class activities, discussions, group work and homework. However, you should consider procuring a textbook to assist your work flow and understanding. I have suggested some textbooks below. Both are available from a number of sources. The publishers offer more economical e-text options.
Recommended Texts

Lehninger: Principles of Biochemistry, 6th or 7th Editions, by Nelson and Cox (7th edition shown)
- Amazon.com (6th and 7th Editions)
- Textbooks.com (6th and 7th Editions)

Fundamentals of Biochemistry: Life at the Molecular Level, 4th and 5th Editions, by Voet, Voet and Pratt (5th Edition shown)
- Amazon.com (4th and 5th Editions)
- Textbooks.com (4th and 5th Editions)

Course Organization

The focus of this course will entirely be on the metabolism and metabolic pathways of the building blocks of the 4 classes of biochemical molecules; carbohydrates, lipids, proteins and nucleotides. We will work to understand the organization and purpose of the chemistry involved. We will also go from “micro to macro.” What I mean by that is that we will use our understanding of the pathways to predict how changes in them may manifest in an organism, such as a human being. The planned content of each module is outlined below. Please note that this is a plan and we may not cover every topic in each module. I tend to be somewhat fluid when it comes to course content.

Since my goal is for you to learn and establish a strong foundational knowledge, I will not let time dictate the topics we cover and the pace at which we cover them.
### Module 1. Carbohydrate Metabolism

<table>
<thead>
<tr>
<th>Segment</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Overview, Metabolic Principles, Central Metabolism</td>
</tr>
<tr>
<td>2</td>
<td>Carbohydrate Metabolism, Concluded (Gluconeogenesis, Glycogen Metabolism, Fermentation and the Pentose Phosphate Pathway)</td>
</tr>
<tr>
<td>3</td>
<td>The Citric Acid Cycle</td>
</tr>
<tr>
<td>4</td>
<td>Electron Transport and Oxidative Phosphorylation</td>
</tr>
</tbody>
</table>

### Module 2. Membranes and Lipid Metabolism

<table>
<thead>
<tr>
<th>Segment</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Fatty Acids and Triacylglycerols</td>
</tr>
<tr>
<td>6</td>
<td>β-oxidation</td>
</tr>
<tr>
<td>7</td>
<td>Ketone Bodies</td>
</tr>
<tr>
<td>8</td>
<td>Membrane Composition/Architecture</td>
</tr>
<tr>
<td>9</td>
<td>Membrane Dynamics/Transporters</td>
</tr>
<tr>
<td>10</td>
<td>Cholesterol and Lipoproteins</td>
</tr>
</tbody>
</table>

### Module 3. Amino Acid Metabolism

<table>
<thead>
<tr>
<th>Segment</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Nitrogen Metabolism</td>
</tr>
<tr>
<td>12</td>
<td>Fates of Amino Groups/Glutamine Synthesis</td>
</tr>
<tr>
<td>13</td>
<td>The Urea Cycle</td>
</tr>
<tr>
<td>14</td>
<td>Protein Degradation</td>
</tr>
<tr>
<td>15</td>
<td>Amino Acid Catabolism</td>
</tr>
<tr>
<td>16</td>
<td>Amino Acid Biosynthesis</td>
</tr>
<tr>
<td>17</td>
<td>Amino Acid Derivatives</td>
</tr>
</tbody>
</table>

### Module 4. Nucleotide Metabolism

<table>
<thead>
<tr>
<th>Segment</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Nucleotides</td>
</tr>
<tr>
<td>19</td>
<td>Nucleotide Degradation</td>
</tr>
<tr>
<td>20</td>
<td>Nucleotide Biosynthesis</td>
</tr>
<tr>
<td>21</td>
<td>Deoxyribonucleotide Biosynthesis</td>
</tr>
</tbody>
</table>
Course Objectives and Learning Goals

Metabolism is a broad topic that encompasses many aspects of biochemistry. Consequently, how it is taught can vary widely depending on the instructor's goals. My goals are for you, at the end of the semester, to be able to leave the course with:

1. an appreciation of how chemistry at the cellular level relates to health, disease and other macro level phenomena.

2. a level of understanding such that you feel confident in explaining similar things to a general audience that may have very little science background.

3. a fundamental understanding of metabolism that allows you to make reasonable predictions about other metabolic pathways.

Therefore, my approach in teaching metabolism will be largely on metabolic regulation, integration, and how the chemistry that occurs in the cell (micro level) leads to physiological observations (macro level). In short, the overall goal of the course is for you to understand how metabolic pathways and processes are organized, regulated and integrated in order to maintain cellular and organismal life.

Your focus should not be on memorizing pathways per se, but understanding and appreciating how each metabolic pathway contributes to homeostasis and how each may be affected by local and distal perturbations in the cell and organism. For each metabolic pathway or process, you should:

1. be able to explain why the pathway or process exists at all;

2. describe the regulatory mechanisms of the pathway;

3. infer why those particular regulatory mechanisms may have evolved for that pathway as opposed to other regulatory mechanisms;

4. be able to predict how certain perturbations will affect the pathway and how those perturbations may affect the cell and organism;

5. be able to make logical predictions about how perturbations that directly affect one pathway may directly or indirectly affect other pathways because of how the pathways are integrated;

6. be able to correlate certain metabolic malfunctions to health and disease.

Learning Resources

I may not hand out other learning aids and materials in class, but I will be posting them on the web through iLearn. If you are registered for the class, you already have access to the iLearn website for this course. I will also use the iLearn site to post announcements for the course. You should check the announcements regularly to ensure that you are up to date on postings of lecture notes and other materials.

iLearn

I will post course materials and announcements on the
University's iLearn site at http://ilearn.sfsu.edu (details are below)

2. Login.
3. Select CHEM 0341-01 BIOCHEMISTRY II Fall 2019 from your course list.

**Podcasts**

To help you focus in class, I will record the video and audio from our class meetings and then post them on my website, which is different from the iLearn site. The link is chemistry.sfsu.edu/~tbaird. I will also post the link on the iLearn site for easy access. The recordings may be from previous iterations of the class, but the content will be consistent with the topics that we cover this semester.

**How to Study for This Course:**

The most difficult part of biochemistry, historically, has probably the volume of information that you, the student, has to deal with. I have tried to make the course more accessible by cutting back on the volume of information and focusing on the principles that govern our understanding of the observations we make to generate that information.

Here are some tips for success:

1. **Study and review frequently!** *This is really interesting stuff, so why not spend more time understanding it?*
2. **Do your best to keep up.** If you keep up with the content, it'll be easier to identify where you may need more assistance. If you wait too long, you'll spend more time thinking about how much you need to do instead of thinking deeply about what we’re studying.
3. Work hard and diligently to thoroughly understand the core concepts and principles in each section.
4. Work to understand as opposed to memorize. Some memorization will be required, but do not to make that your primary approach to the course material. I won’t.
5. Do the assigned activities. The primary intent of the activities is to give you more practice to understand the material. They will not be graded, but they will help you increase your understanding.
6. **Look for the logic.** Everything should make sense. If it doesn’t, try to find out if you are misunderstanding a concept or if I did not explain it clearly.
7. **Use all your resources.** The things we do in class will be the primary source of information for the course, but you should find a textbook that will describe concepts in detail for you. Use the internet and other people as well, but with caution. For example, Wikipedia is an excellent starting point, but don’t let it be your sole source of information.
8. **Study with classmates.** Science is best learned through collaboration!
9. If you are having difficulty understanding some material, **seek help early.** There isn’t a TA for this course, so try come by my office or make an appointment with me if you can’t make it during the listed office hours.
10. **Do your best to keep up!**

*The most important thing to know is that I want to see you succeed. I want you to do well. I want you to learn and feel that you have a working knowledge to grow from.*
Grading Policies *(Subject to Change)*

One thing you should know about my approach to grading is that I don’t think that a grade necessarily accurately reflects your knowledge. My goal for you is to learn and develop a strong foundational knowledge of biochemistry and I have tried to develop a grading scheme that I hope aligns with my philosophy.

**In-Class Exercises**

This semester, we will be using the iClicker in-class response system (clickers). I will present clicker questions during class throughout the semester but I may not use them in every class meeting. I use the clicker sessions as a mechanism to assess your understanding of the material in real time, but I will be awarding credit for participation as well (see “Calculation of Final Grade,” below). Each clicker question will count for 1 pt. if correctly answered and 0.5 pt if answered incorrectly. Therefore, it is to your advantage to answer every clicker question, even if you are not sure of the answer. You will also receive 1 participation point for answering at least 75% of that session’s questions. Each session will be normalized to 100%, regardless of the number of questions in the session. For example, answering 3 questions correctly in a 6 question session is worth the same as answering 10 questions correctly in a 20 question session (i.e., each is 50%).

We also will be doing 7-10 small-group exercises (Biochemistry I Group Activities-BIGAs) based on the POGIL (Process Oriented Guided Inquiry Learning) process throughout the semester. The dates of the BIGA sessions will be announced beforehand. The BIGA sessions are designed to promote and develop critical and logical thinking about the subject material as well as discussion and communication skills between you and your classmates. Similar to the clicker sessions, I will use the BIGA sessions primarily as an assessment tool, but participation in the BIGA activities does count toward your final grade. To receive credit for a BIGA session, you will have to: 1) be in attendance on the date(s) of the BIGA session; 2) actively participate in the BIGA session; 3) submit an evaluation of your group members and 4) submit any other required documentation.

**Exams**

There will be four (4) semester exams. The format of each exam will generally be a combination of multiple choice, problem solving and short answer/essay questions. Each of the semester exams will primarily cover material that was presented after the previous exam, but may contain or reference to material that was on the previous exam(s) as well. I will design the exam questions to provide you opportunities to demonstrate how well you have achieved the 6 learning objectives (see above) for that module. The letter grades of each exam (and the final grade for the course) will be determined by the point scale outlined in the following table.
Calculation of Final Grade
The final grade will be calculated as follows:
1. The In-Class Exercises (clickers and BIGAs) will count for 20% of the final grade (10% each).
2. The exam that you score the highest percentage will count for 30% of your final grade.
3. The 2nd highest of the exam grades will count 20% toward the final grade.
4. The remaining two semester exam grades will each count 15% toward the final grade.
5. No exam grades will be dropped. The final grade will be calculated using the following formula:
Extra Credit
There are no provisions for extra course credit, so please don’t ask. Do your best to get the regular credit.

Examination Materials
The exams will be administered in class. You are allowed to have a stand-alone calculator, writing utensils, erasers, something to scratch with and nothing else. The calculator function on a cell phone will not be allowed. I will not allow other electronic materials to be out during examinations as well. I will also be paying attention to your use of smart watches.

Missed Exams:
If you miss one exam, you will receive a “0” score for that exam. As policy, I will not give make-up exams. However, I will consider providing a make-up exam if your circumstances are extreme or unusual circumstances.

Disputing Grades:
You will have 7 calendar days from the date that you received the graded exam to bring to my attention any perceived errors in grading. However, doing so also gives me the right to re-check the entire exam and adjust the grade accordingly, whether it is to your advantage or disadvantage. I will only allow one re-grade per exam and the score assigned after a re-grade is final.

To request a re-grade, you should do the following:
1. Download the Exam Grade Dispute Form from iLearn. It is a fillable PDF document.
2. Carefully follow the instructions on how to complete the form and the regrade request process.
3. Submit the completed form to me.

You have 7 days after receiving your exam to request a regrade and then we’ll continue on, so it is to your benefit to examine the graded exam soon after receiving it.

If you base a regrade request on another student’s graded exam (i.e., “My friend answered the question the same way I did and got more points.”), then I will require that both exams be considered for a regrade so that both may be adjusted, if deemed necessary.
(NOTE: Occasionally, I make errors in adding up points. Submitting an exam for a correction of this type will not count as a regrade, so the exam will not be checked otherwise.)

Tentative Exam Schedule

Here is the planned schedule for exams. However, I reserve the right to change the exam date as I see necessary. Any changes will be announced and any date change will be to move the exam to a later date, not an earlier one.

<table>
<thead>
<tr>
<th>Exam</th>
<th>Exam Type</th>
<th>Day/Date</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Semester</td>
<td>Wed/September 25</td>
<td>Module I</td>
</tr>
<tr>
<td>2</td>
<td>Semester</td>
<td>Wed/October 30</td>
<td>Module II</td>
</tr>
<tr>
<td>3</td>
<td>Semester</td>
<td>Wed/November 20</td>
<td>Module III</td>
</tr>
<tr>
<td>4</td>
<td>Semester</td>
<td>Wed/December 18</td>
<td>Module IV</td>
</tr>
</tbody>
</table>

8:00 a.m. - 10:00 a.m.

Other Policies and Information

**General Class Issues:**
For consistency in your learning experience and to promote positive interactions, I expect regular attendance and considerate classroom behavior from you. Please silence your mobile device(s) before class begins. If you enter the class late, please do so quietly and discreetly as noisy entrances may disrupt the learning process for your classmates. Once you have entered the classroom, please remain for the entire class period. If you know beforehand that you must leave early for some reason, please seat yourself near the exit to minimize any disturbance your exit may cause.

**Pre-requisites:**
CHEM 340 should have been taken with a final grade of C or better earned. *It may not be taken concurrently with CHEM 341.* Registered students who have not completed all of the pre-requisite courses will be dropped from the roll. If you have completed the pre-requisites at another institution, you may need to provide proof before are are allowed to enroll or remain in the course.

**Add Policy:**
I will take attendance during the first two class meetings. I will be drop any registered students who are not in attendance on the first day of class unless we made a prior agreement. If room is available, students who have not registered for the course, but have attended the first two meetings and have satisfied all pre-requisites will be allowed to add the course until the class has reached its capacity. Priority will be given to those students in the following order (to be considered for adding based on priority assumes that pre-requisites have been satisfied):

<table>
<thead>
<tr>
<th>Priority</th>
<th>Classification</th>
<th>Major</th>
<th>Other Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Biochem/Chem/Biol</td>
<td>1st time enrollment and tried unsuccessfully to add in a previous semester and satisfied pre-reqs in that previous semester</td>
</tr>
</tbody>
</table>
Students with Disabilities:
Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) is available to facilitate the reasonable accommodations process. The DPRC is located in the Student Service Building and can be reached by telephone (voice/415-338-2472, video phone/415-335-7210) or by email (dprc@sfsu.edu).

Student Disclosure of Sexual Violence:
SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Title IX Coordinator by completing the report form available at http://titleix.sfsu.edu, emailing vpsaem@sfsu.edu or calling 338-2032. To disclose any such violence confidentially, contact:

The SAFE Place - (415) 338-2208; http://www.sfsu.edu/~safe_plc/
Counseling and Psychological Services Center - (415) 338-2208; https://psyservs.sfsu.edu
For more information on your rights and available resources: http://titleix.sfsu.edu

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<tr>
<th>Priority</th>
<th>Classification</th>
<th>Major</th>
<th>Other Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>SFSU Undergrad</td>
<td>Biochem</td>
<td>1st time enrollment</td>
</tr>
<tr>
<td>3</td>
<td>SFSU Undergrad</td>
<td>Chem</td>
<td>1st time enrollment</td>
</tr>
<tr>
<td>4</td>
<td>SFSU Undergrad</td>
<td>Biol</td>
<td>1st time enrollment</td>
</tr>
<tr>
<td>5</td>
<td>All Others</td>
<td>All Others</td>
<td>1st time enrollment</td>
</tr>
<tr>
<td>6</td>
<td>SFSU Grad</td>
<td>Chem/Biochem/Biol</td>
<td>1st time enrollment</td>
</tr>
<tr>
<td>7</td>
<td>Open University</td>
<td>All</td>
<td>1st time enrollment</td>
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Please note that the official registration wait list is only valid up until registration concludes. After that point, the wait list content or order is irrelevant and it is up to my discretion to add students as I see fit.