# BIOCHEMISTRY 401

**Spring 2022**

***Instructors:*** Prof. M. Feig (MF; feig@msu.edu)
Prof. T. Zacharewski (TRZ; tzachare@msu.edu)
Prof. J. Kaguni (JMK; kaguni@msu.edu)
*Office Hours:* by arrangement via email

**M, Tu, Th, F; 9:10-10:00 am**
**remote via Zoom at least until 2/14**
*in person:* **E100 Vet. Med. Center**

***Teaching Assistant:*** Dr. Giovan Cholico (TA; cholicog@msu.edu)
*Office Hours*: Tue; 4-6 pm

**Recitation: Wed; 9:10-10:00 am**
**remote via Zoom at least until 2/14**
*in person:* **223 Natural Res.**

***Zoom:*** Lectures (MF): https://msu.zoom.us/j/96862516659 Passcode: **533861**
Recitation/Office Hour (TA): https://msu.zoom.us/j/95068497246 Passcode: **816936**

***Text:*** Biochemistry, Garrett & Grisham, 5th or 6th eds.

***Exams (via D2L):*** February 10, March 3, April 7, May 3 (12:45 pm; Final)

***Schedule:***

| Date | remote | Chapter/Topic | *G&G 5th ed. pages* | *6th ed. pages* |
|---|---|---|---|---|
| | | **PROTEIN STRUCTURE AND ENZYMES** | | |
| 1/10/22 | *Mo* MF | 1. Introduction | *7-17* | *4-17* |
| 1/11 | *Tu* MF | 2. Water, pH, and ion equilibria | *30-50* | *31-49* |
| 1/12 | *We* TA | Recitation | | |
| 1/13 | *Th* MF | 3. Thermodynamics | *51-74* | *53-76* |
| 1/14 | *Fr* MF | 3. Thermodynamics | | |
| **1/17** | | ***Martin Luther King Jr. Day*** | **NO CLASS** | |
| 1/18 | *Tu* MF | 4. Amino acids | *77-98* | *79-101* |
| 1/19 | *We* TA | Recitation | | |
| 1/20 | *Th* MF | 4. Amino acids | | |
| 1/21 | *Fr* MF | 5. Protein primary structure | *101-105,122-135* | *105-109; 126-143* |
| 1/24 | *Mo* MF | 6. Protein 3D structure | *141-188* | *147-197* |
| 1/25 | *Tu* MF | 6. Protein 3D structure | | |
| 1/26 | *We* TA | Recitation | | |
| 1/27 | *Th* MF | 13/14. Enzyme introduction | *407-411, 435-436, 447-455* | *437-441; 465-466; 477-485* |
| 1/28 | *Fr* MF | 13. Enzyme kinetics | *134-135,411-423* | *138-139; 441-453* |
| 1/31 | *Mo* MF | 13. Enzyme kinetics | | |
| 2/1 | *Tu* MF | 13/14. Enzyme inhibition | *472, 423-429* | *504; 453-460* |
| 2/2 | *We* TA | Recitation | | |
| 2/3 | *Th* MF | 15. Enzyme regulation | *481-503* | *513-536* |
| | | **CARBOHYDRATES AND LIPIDS** | | |
| 2/4 | *Fr* MF | 7. Carbohydrates | *193-232* | *203-242* |
| 2/7 | *Mo* MF | 7. Carbohydrates | | |
| 2/8 | *Tu* MF | 8. Lipids | *233-255* | *245-269* |
| 2/9 | *We* TA | Recitation | | |
| **2/10** | *Th* MF | **EXAM 1 (covers: Jan. 10 - Feb. 3 lectures, or as per instructor)** | | |
| 2/11 | *Fr* MF | 8. Lipids | | |
| 2/14 | *Mo* MF | 9. Membranes | *260-308* | *273-319* |

| | | | | | |
|---|---|---|---|---|---|
| | | | **METABOLISM** | | |
| 2/15 | *Tu* | TRZ | 17. Overview of metabolism | *551-562* | *583-597, 601-605* |
| 2/16 | *We* | TA | Recitation | | |
| 2/17 | *Th* | TRZ | 17. Metabolic energy | *562-573* | *583-597, 601-605* |
| 2/18 | *Fr* | TRZ | 17. Nutrition/vitamins | *577-595* | *583-597, 601-605* |
| 2/21 | *Mo* | TRZ | 18. Glycolysis | *595-603* | *611-636* |
| 2/22 | *Tu* | TRZ | 19. TCA cycle | *609-625* | *643-670* |
| 2/23 | *We* | TA | Recitation | | |
| 2/24 | *Th* | TRZ | 19. TCA cycle | *628-638* | *643-670* |
| 2/25 | *Fr* | TRZ | 20. Electron transport/oxidative metabolism | *70-74; 643-660* | *679-710* |
| 2/28 | *Mo* | TRZ | 20. Electron transport/oxidative metabolism | *660-674* | *679-710* |
| 3/1 | *Tu* | TRZ | 22. Gluconeogenesis | *719-731* | *755-766* |
| 3/2 | *We* | TA | Recitation | | |
| **3/3** | *Th* | MF/TRZ | **EXAM 2 (covers: Feb. 4 - Feb. 28 lectures, or as per instructor)** | | |
| 3/4 | *Fr* | TRZ | 22. Gluconeogenesis and glycogen | *719-731* | *767-779* |
| ***3/7 - 3/13*** | | | ***SPRING BREAK*** | | |
| 3/14 | *Mo* | TRZ | 22. Glycogen metabolism | *731-744* | *767-779* |
| 3/15 | *Tu* | TRZ | 22. Pentose phosphate shunt | *744-755* | *780-787* |
| 3/16 | *We* | TA | Recitation | | |
| 3/17 | *Th* | TRZ | 23. Fatty acid catabolism | *761-786* | *795-816, 818-819* |
| 3/18 | *Fr* | TRZ | 24. Lipid metabolism | *791-808* | *825-841* |
| 3/21 | *Mo* | TRZ | 24. Lipid metabolism | *808-820* | *841-851* |
| 3/22 | *Tu* | TRZ | 24. Cholesterol & hormones | *820-832* | *851-865* |
| 3/23 | *We* | TA | Recitation | | |
| 3/24 | *Th* | TRZ | 24. Bile, steroids, and nuclear receptors | *833-837* | *869-872* |
| 3/25 | *Fr* | TRZ | 25. Nitrogen assimilation & metabolism | *841-886* | *877-887* |
| 3/28 | *Mo* | TRZ | 25. Amino acid metabolism | *841-886* | *889-921* |
| | | | **DNA STRUCTURE AND DNA TOPOLOGY** | | |
| 3/29 | *Tu* | JMK | 10. Composition of DNA and RNA | *309-328* *(but not insets on 312/325)* | *325-345* *but not insets on 328,331,342* |
| 3/30 | *We* | TA | Recitation | | |
| 3/31 | *Th* | JMK | 11. DNA and chromosomes | *341-363;961-962* *(but not 352-3 on DNA quadruplexes)* | *360-383; 999-1000 (but not 373-4 on DNA quadruplexes)* |
| 4/1 | *Fr* | JMK | 11. tRNA and rRNA | *365-374* | *386-394* |
| | | | **DNA REPLICATION, RECOMBINATION, AND REPAIR** | | |
| 4/4 | *Mo* | JMK | 28. DNA replication and DNA polymerases | *947-962* | *985-1000* |
| 4/5 | *Tu* | JMK | 28. Replication fork and RNA replication | *950-962; 963-964* | *988-1000; 1001-1002* |
| 4/6 | *We* | TA | Recitation | | |
| **4/7** | *Th* | TRZ/JMK | **EXAM 3 (covers: March 1 - April 1 lectures, or as per instructor)** | | |
| 4/8 | *Fr* | JMK | 28. DNA recombination; RecA, RecBCD, transposons | *964-973* *(but not 971-2 on knockout mice, fork restart, euk recomb)* | *1001-1012* *(but not 1009-1010 on knockout mice, fork restart, euk recomb)* |
| 4/11 | *Mo* | JMK | 28. DNA repair | *973-978* *(but not transgenic mice)* | *1012-1017* *(but not transgenic mice)* |

| | | | | | |
|---|---|---|---|---|---|
| 4/12 | *Tu* | **JMK** | 28. DNA repair | *973-978* | *1012-1017* |
| 4/13 | *We* | **TA** | Recitation | | |
| 4/14 | *Th* | **JMK** | 28. Mutations; mutagenesis | *978-981* | *1017-1020* |
| | | | **TRANSCRIPTION** | | |
| 4/15 | *Fr* | **JMK** | 29. Bacterial transcription: initiation, elongation, and termination | *993-1000* | *1035-1042* |
| 4/18 | *Mo* | **JMK** | 29. Transcriptional regulation: *lac*, *ara*, and *trp* operons | *1000-1011* | *1042-1053* |
| 4/19 | *Tu* | **JMK** | 29. Eukaryotic promoters, enhancers, and response elements | *1011-1024* | *1053-1066* |
| 4/20 | *We* | **TA** | Recitation | | |
| 4/21 | *Th* | **JMK** | 29. RNA processing in eukaryotes; RNA structural motifs | *1024-1035* | *1066-1078* |
| | | | **TRANSLATION** | | |
| 4/22 | *Fr* | **JMK** | 30. Genetic code; tRNA and tRNA synthetases | *1047-1057* | *1091-1101* |
| 4/25 | *Mo* | **JMK** | 30. Protein synthesis, ribosome structure | *1057-1061* | *1101-1105* |
| 4/26 | *Tu* | **JMK** | 30. Mechanism of protein synthesis | *1061-1080* | *1105-1124* |
| 4/27 | *We* | **TA** | Recitation | | |
| 4/28 | *Th* | **JMK** | 31. Protein folding and translocation | *1087-1099* | *1131-1144* |
| 4/29 | *Fr* | **JMK** | 31. Protein degradation | *1099-1107* | *1144-1154* |
| **5/3** | *Tu* | **JMK** | **FINAL EXAM (covers: April 4 - April 29 lectures, or as per instructor) 12:45 – 2:45 pm** | | |