

BIOCHEMISTRY 401**Spring 2018**

Instructors: Prof. M. Feig (MF; feig@msu.edu)
 Prof. J. Kaguni (JMK; kaguni@msu.edu)
 Prof. T. Zacharewski (TRZ; tzachare@msu)

M, Tu, Th, F; 9:10-10:00 a.m.
 E100 Vet. Med. Center

Teaching Assistant: Dr. Sarathi Wijetilleke (sarathi@msu.edu)

Recitation Wed; 9:10-10:00 a.m.
 A148 Plant and Soil Sciences

Office Hours: (MF) after class, 218 Biochemistry
 (TRZ, JMK) by arrangement
 (TA) Monday and Thursday, 4-6 pm, 402 Biochemistry

| Date | Chapter/Topic | Assigned Reading Pages, G&G | |
|-------------|---|-----------------------------|-------------------------|
| | | 5 th ed. | 4 th ed. |
| 1/8/18 | MF 1. Introduction | 7-17 | 5-17 |
| 1/9 | MF 2. Water, pH, and ion equilibria | 30-50 | 28-47 |
| 1/11 | MF 3. Thermodynamics | 51-59 | 48-56 |
| 1/12 | MF 3. Thermodynamics | 59-74 | 56-67,593-596 |
| 1/15 | Martin Luther King Jr. Day | No Class | |
| 1/16 | MF 4. Amino acids | 77-98 | 70-91 |
| 1/18 | MF 4. Amino acids | 77-98 | 70-91 |
| 1/19 | MF 5. Proteins: primary structure and function | 101-105,122-135 | 93-97,109-117,119-122 |
| 1/22 | MF 6. Proteins: three-dimensional structure | 141-188 | 134-179 |
| 1/23 | MF 6. Proteins: three-dimensional structure | 141-188 | 134-179 |
| 1/25 | MF 13/14. Enzymes: Introduction; Transition State Stabilization | 407-411,435-436,447-455 | 382-385,409-410,419-426 |
| 1/26 | MF 13. Enzymes: Kinetics part 1 | 134-135,411-423 | 122-123,386-397 |
| 1/29 | MF 13. Enzymes: Kinetics part 2 | 411-423 | 386-397 |
| 1/30 | MF 13/14. Enzymes: Inhibition and Pharmaceuticals | 472, 423-429 | 443, 397-403 |
| 2/1 | MF 15. Enzyme regulation | 481-503 | 452-472 |
| 2/2 | MF 7. Carbohydrates | 193-232 | 181-218 |
| 2/5 | MF 7. Carbohydrates | 193-232 | 181-218 |
| 2/6 | MF 8. Lipids | 233-255 | 219-237 |
| 2/8 | EXAM 1 (includes Feb. 1 lecture) | | |
| 2/9 | MF 8. Lipids | 233-255 | 219-237 |
| 2/12 | MF 9. Membranes | 260-308 | 242-290 |

Text:

Biochemistry, Garrett & Grisham, 5th (4th) ed.

| DNA STRUCTURE AND DNA TOPOLOGY | | | | |
|--|--|--|--|---|
| 2/13 | JMK | 10. The composition of DNA and RNA | 309-328 but not insets on 312, 325 | 291-309 but not insets on 294, 306 |
| 2/15 | JMK | 11. DNA and chromosomes | 341-363, 961-962 but not 352-3 on DNA quadruplex | 320-340 but not 329-30 on DNA quadruplex |
| 2/16 | JMK | 11. tRNA; rRNA | 365-374 | 341-351 |
| THE THREE R'S: DNA REPLICATION, RECOMBINATION, AND REPAIR | | | | |
| 2/19 | JMK | 28. Rules of DNA replication | 947-950 | 862-865 |
| | | 28. DNA polymerases | 950-962 | 865-875 |
| 2/20 | JMK | 28. The replication fork | 950-962 | 865-875 |
| | | 28. RNA replication | 963-964 | 876-877 |
| 2/22 | JMK | 28. DNA recombination | 964-973 but not the part on 972 on fork restart | 877-886 but not the part on 885 on fork restart |
| 2/23 | JMK | 28. DNA repair | 973-978 | 887-891 |
| 2/26 | JMK | 28. More DNA repair | 973-978 | 887-891 |
| TRANSCRIPTION | | | | |
| 2/27 | EXAM 2 (includes Feb. 23 lecture, or as per instructor) | | | |
| 3/1 | JMK | 28. Mutations; mutagenesis | 978-981 | 891-894 |
| 3/2 | JMK | 29. Bacterial transcription: initiation, elongation, and termination | 993-1000 | 906-912 |
| SPRING BREAK (3/5-3/9) | | | | |
| 3/12 | JMK | 29. Transcriptional regulation: <i>lac</i> , <i>ara</i> , and <i>trp</i> operons | 1000-1011 | 912-923 |
| 3/13 | JMK | 29. Eukaryotic promoters, enhancers, and response elements | 1011-1024 | 924-935 |
| 3/15 | JMK | 29. RNA processing in eukaryotes | 1027-1036, 1024-1027 | 939-945, 935-939 |
| | | 29. Structural motifs | | |
| TRANSLATION | | | | |
| 3/16 | JMK | 30. The genetic code; tRNAs and tRNA synthetases | 1047-1057 | 952-961 |
| 3/19 | JMK | 30. Protein synthesis, ribosome structure | 1057-1061 | 961-965 |
| 3/20 | JMK | 30. Mechanism of protein synthesis | 1061-1080 | 965-984 |
| 3/22 | JMK | 31. Protein folding and translocation, degradation | 1087-1099 | 987-998 |
| 3/23 | JMK | 31. Protein degradation | 1099-1107 | 998-1005 |

| | | | | |
|-------------|-----|--|---------------|---------|
| 3/26 | TRZ | 17. Overview of metabolism | 551-562 | 511-521 |
| 3/27 | TRZ | 17. Metabolic Energy | 562-573 | 521-532 |
| 3/29 | TRZ | 17. Nutrition/vitamins | 577-595 | 535-551 |
| 3/30 | TRZ | 18. Glycolysis | 595-603 | 552-559 |
| 4/2 | TRZ | 19. TCA cycle | 609-625 | 563-578 |
| 4/3 | TRZ | 19. TCA cycle | 628-638 | 581-589 |
| 4/5 | TRZ | 20. Electron transport/oxidative metabolism | 70-74,643-660 | 592-611 |
| 4/6 | TRZ | 20. Electron transport/oxidative metabolism | 660-674 | 611-624 |
| 4/9 | TRZ | 22. Gluconeogenesis | 719-731 | 662-673 |
| 4/10 | | EXAM 3 (includes April 6 lecture, or as per instructor) | | |
| 4/12 | TRZ | 22. Gluconeogenesis and glycogen | 719-731 | 662-673 |
| 4/13 | TRZ | 22. Glycogen metabolism | 731-744 | 673-683 |
| 4/16 | TRZ | 22. Pentose phosphate shunt | 744-755 | 683-693 |
| 4/17 | TRZ | 23. Fatty acid catabolism | 761-786 | 697-718 |
| 4/19 | TRZ | 24. Lipid metabolism | 791-808 | 722-737 |
| 4/20 | TRZ | 24. Lipid metabolism | 808-820 | 737-750 |
| 4/23 | TRZ | 24. Cholesterol & hormones | 820-832 | 751-761 |
| 4/24 | TRZ | 24. Bile, steroids and nuclear receptors | 833-837 | 761-765 |
| 4/26 | TRZ | 25. Nitrogen assimilation & metabolism | 841-886 | 768-810 |
| 4/27 | TRZ | 25. Amino acid metabolism | 841-886 | 768-810 |

FINAL EXAM: Tuesday, May 1, 12:45 pm to 2:45 pm, E100 VMC
Noncumulative (covers from end of Exam 3 material to end of course)