

Biology 240 AB/AA: GENERAL MICROBIOLOGY

Syllabus: Lecture & Laboratory, Cañada College, Spring 2020

LECTURE (Room 23-203): MW, 11:10 AM - 12:35 PM;

LABs (Rm 23-333): ABX (39410) — MW, 9:35 - 10:50 AM; AAX (38829) — MW, 12:45 - 2:00 PM.

Professor: Nathan Staples, Ph.D.

- ❖ Bldg. 23, Room 355. E-mail: staplesn@smccd.edu. Phone: (650) 306-3251.
- **Office Hours/Open Labs:** Mon./Wed., 9:05-9:35 AM and 2-3 PM;
Tues./Thurs., 12:45 PM – 2:00 PM (or by arrangement!).
 - *** Office hours also available by appointment! Please don't hesitate to ask!! ☺ ***
- **Course Website:** <http://accounts.smccd.edu/staplesn/biol240/index.htm>.
 - Visit often for class news and information, daily lecture slides, biweekly lab quizzes, and informative links.

- **Answer on your notecard:** *What is your Name, Career plan, & favorite (G-rated!) Hobby?*
 - ❖ *What other College-Level SCIENCE courses have you taken, or are you taking now??*
 - ❖ → *What are your 3 main educational goals for this course??*

A. **GENERAL COURSE INFORMATION:** **REQUIRED Materials:**

- Tortora, Funke & Case. (2019), *Microbiology: An Introduction*, 13th ed. OR (2016) 12th ed.
- Staples, N.C. (August 2018), *General Microbiology Laboratory Manual*, 12th Edition.
- 4 **Scantron Sheets** (RED forms, F-289-PAR-L, 100 questions/side); Sharpened #2 or HB pencils.
- **Composition Lab Notebook**, with sewn spine. **Quad-ruled is recommended.
- **Laboratory Safety Glasses/Goggles** (available in the bookstore or a local hardware store)
- Large **Blue Book** (8.5"x11") for lecture Class Journal and pop quizzes. Turn-in at the end of every lecture.
- ❖ **Suggested Reference:** Leboffe, T.J. & Pierce, B.E. (2011), *A Photographic Atlas for the Microbiology Laboratory*, 4th ed.
- ❖ **GOAL:** To establish a strong fundamental understanding of microbial biochemistry, cellular structures, metabolism, and genetics, as well as the defense mechanisms our bodies use to fight infectious diseases. In the laboratory, we will practice techniques of microbial isolation, cultivation, identification, and control of microbial growth. We will explore how these microbes are a part of our daily lives – from the bacteria and fungi that create or spoil our food and medicines, to varieties that strongly impact human health and agriculture. We will consider beneficial symbiotic bacteria in and on our bodies, and microbes in soil and waste that are SO important for acquiring and recycling elements and nutrients that provide nourishment for all species worldwide!
 - **Have fun delving into the mysterious and fascinating world of microscopic life!!**

COURSE LEARNING OUTCOMES: Upon completion of BIOL 240, students should be able to

- 1) Distinguish between the major types of macromolecules and subcellular structures in bacteria and eukaryotes, and explain how specific structures determine their functions in microbes.
- 2) Describe and compare the processes and regulation of cellular metabolism (respiration and photosynthesis) and gene expression, and how these processes drive microbial growth.
- 3) Compare and contrast major groups of bacterial, archaeal, eukaryotic, and acellular microbes, and explain their interactions and effects on environmental or human health.
- 4) Compare and contrast specific mechanisms of innate and acquired immunity in humans, and explain how each helps to defend against different kinds of infectious disease.
- 5) Safely use proper laboratory methods to culture, isolate, and characterize microorganisms, and coherently organize and analyze related data in writing.

B. STUDENT REQUIREMENTS:

- STUDENTS are expected to keep-up with ALL assigned reading BEFORE each day's lecture. Weekly Objectives and Study Questions (online) are DUE EVERY WEDNESDAY at the start of your Lab Section.** Also, be sure to complete Study questions, practice problems, Critical thinking and clinical applications questions at the end of chapters. **Work NOW on the posted study guides on the class website!!** You will be tested upon your **knowledge** gained in this class, and especially on your level of **comprehension** and ability to **apply** the major concepts (So, do NOT just memorize facts and details!!). Diligence will be your key to success in this class. I want you ALL to do well and have FUN learning about the fascinating, "invisible" world of microbiology!!
 - *** See also tutorials and practice quizzes at <https://masteringmicrobiology.com> and various links on our course homepage! ***
- ** **EXAMS**: You will be given 3 Midterm Examinations, and a Cumulative Final Exam. Midterm exams will cover the lecture material indicated on the course schedule. Exams will be ~60% multiple-choice questions, and ~40% short essay questions. For every exam, bring **a pencil** (#2/HB lead), **a blank RED Scantron answer sheet (100 questions/side, answers "a-e")**, your **STUDENT I.D. CARD**, and a well-rested and ready mind!
 - ❖ **There will be NO MAKE-UP or RESCHEDULING of Exams (except in case of verifiable emergency), so check your schedule NOW and PLAN appropriately!!**
 - **If you have or foresee any problems, contact Dr. Staples IMMEDIATELY!!!**

- ATTENDANCE POLICY:** There will be MUCH important information covered in class that will NOT be in the Textbook or online slides, and there will be assignments/quizzes and information on schedule changes that are only available if you are in class. **My policy is to drop students after missing more than six class hours (two lecture and lab periods) without a documented excuse.**
 - ❖ ****Attendance at ALL LAB sessions is absolutely REQUIRED** – missing more than two lab sessions without a **documented** excuse will very negatively affect your course grade. Do NOT be late!!
 - ❖ **If you can no longer attend the course, it is YOUR RESPONSIBILITY to contact the professor and to WITHDRAW from the course. Failure to do so will result in an "F" grade on your Academic Record.**
 - **You must satisfactorily pass BOTH the Lecture Exams and the Lab with at least 60% in each to pass this course with a C or better!!! Lecture Exams are the most highly-weighted factor in determining final course grades.**

- *****
- Academic Integrity** (Nathan Staples & Doug Hirzel, Department of Biological Sciences, Cañada College)

Academic dishonesty consists of copying from someone else, copying from the Internet, using crib notes on exams, or handing in written reports that do not represent your own work. Any student turning in an assignment overly similar to that of another student or another author, or found committing academic dishonesty of any other type, will receive a failing grade for the assignment, and a report of the incident will be filed with the appropriate college authorities and will appear on the student's academic record. If the infraction is serious enough, or if subsequent infractions occur, the student will also be dismissed from the class with a failing grade. For more information, see Cañada College's Academic Integrity Policy, available on the college website.

- ❖ **Cheating in any form will NOT be tolerated, and disciplinary action will be severely enforced by College Administration!!**
- ❖ **Do NOT PLAGIARIZE!! Especially on reports! ANY information that does not ORIGINATE from your own mind, nor is a part of general public knowledge, MUST be FULLY CITED with Author, Date, Title, Publication, Volume and Page #s!!**
- **Have fun** learning, and **take pride** in your own work & what you can accomplish in this class!!!

C. **GRADING & SUCCESS in General Microbiology:**

Information from my **lecture**, the **lab**, and from the **textbook** will be on the Exams.

Lectures are taken mostly from information in the textbook, although *I regularly present material NOT covered in the textbook*. To excel in this class you will have to READ all assigned chapters BEFORE each class!!, attend all lectures, participate in **all labs**, and answer for yourself all Review and Self-Quiz questions. Read every part of each chapter, and take serious time to study the Figures in each chapter – these usually illustrate the most important concepts in the chapter!! **DRAW! DRAW! DRAW!–out every major process or concept we discuss!!** Do NOT just read about it! Finally, if you learn well by listening (auditory learner), **record the lectures** and listen to them again!

Download my **Study Guides** from the course website (“Additional Materials”) and work on the terms and study questions EVERY DAY! **I lead REVIEW SESSIONS before and after lab class on WEDNESDAYS in the lab room during the week before each Exam. Come prepared!!** If you want additional help, come to my office hours, or see the very qualified **Tutors** in the **Learning Center & STEM Center**.

Form study groups!! Discuss and explain chapter concepts with a group of fellow students, or even with your family and friends!! If you can explain course material well to a “layperson”, then you are doing VERY well in your studies!! Take excellent NOTES and RECORD lectures! ☺ Finally, NEVER HESITATE to come to my OFFICE HOURS or make an appointment!! I love to see and hear how you are doing, and any difficulties you may be having are likely shared by your fellow students. LET ME KNOW how I can help you to better learn the information, and to perform better in the class!! ☺

Students receiving a C- (70%) or lower on any exam MUST meet with me ASAP to discuss improving performance in the course.

❖ The most stringent grade distribution in the class will be **≥ 92% = A, 92-90% = A-, 90-87% = B+, 87-82% = B, 82-80% = B-, 80-77% = C+, 77-70% = C, 69-60% = D, < 60% = F.** Grading scales may be adjusted as deemed appropriate to ensure fairness and the best possible success of each student.

3 midterms x 100 pts. each	= 300 points
1 FINAL (33% Comprehensive, 50/150)	= 150 points
Blue Books, Weekly Objectives, & Class Participation	= 50 points
Biweekly Online Quizzes (7 x 20 pts; Drop lowest quiz)	= 120 points
2 Formal Lab Reports (Sections III & V = 50 + 50 pts)	= 100 points
Pre-Lab preparation, Technique & HBA	= 70 points
Lab Final PRACTICAL	= 50 points
Lab Notebook (2 x 30 pts.)	= 60 points
TOTAL:	= 900 points

A Note on Recommendation Letters:

Many of you will need recommendation letters for transfer to Bachelor's or Graduate programs, or for professional employment. I am honored when students ask me for a letter of recommendation, but be wary that all professors are VERY busy during the course of a semester. Therefore, please give us **at least 3 WEEKS after we have received ALL of your application information** (forms, personal statements, resume, grade summaries, GPA, etc.) to complete the letter or form. If the application requires a form, please provide electronic format if possible, unless your signature is required.

Please plan appropriately and far in advance for employment applications and academic applications, or we faculty may not be able to help you or to provide the quality of recommendation that you might deserve [After all, we evaluate your organizational skills as well !! ☺]. Oh, and be sure to send us **MULTIPLE REMINDERS** as the due dates approach - we don't take offense!! Thank you!

Sincerely, Dr. Staples

D. LABORATORY INFORMATION:

1. **Lab** will take place in **Room 23-333** (upstairs from this room) on Mon. and Wed. Always follow proper chemical, sharps, fire, and biohazard safety practices. **Lab GOGGLES, CLOSED-toed SHOES, and a lab coat should always be worn in the laboratory.** Lab is worth ~38% of your grade (340/900 points). You are expected to come to each lab mentally prepared: having read-over the daily exercises, and **TYPED on loose-leaf paper** (or uploaded to CANVAS, if instructed) a **PRE-LAB WRITEUP** (due each **MONDAY, for each entire Experiment begun that WHOLE week!**):
 - a) Explain the **Goal/Purpose** of the WHOLE experiments for the entire week (**What? Why? How are we doing in lab?**).
 - b) Formulate a **Scientific Question** and predict a thoughtful Answer or **HYPOTHESIS** about possible scientific outcomes of experiments (**In Hypothesis-Prediction or "IF...[hypothetical answer], THEN...[predicted observations]" format**).
 - c) Write a **BRIEF** summary of **procedural strategies** we will use to achieve the goal of the week's experiments.
2. **Doing and learning real science goes far beyond 6 hours of class per week.** Microbiology Lab requires real technical skill and practice that cannot be learned at home. Also, Microbiology concepts and processes are greatly enhanced by group review and participation. Therefore, **** 0.5-1 Hour of Open Lab or Group Review Sessions per week on average is EXPECTED (8-16 hours for the semester)** from every student. **These Hours By Arrangement (HBA) will be documented for: training and practice of laboratory skills, answering all questions from the lab manual, finishing calculations and recording data, keeping up with experiments, and cultivating your organisms in the Laboratory.** These hours are not absolutely required every week, but GREATLY contribute to student success in the course, and can build towards earning Extra Credit. So, for your own sake, plan this time into your weekly schedule. 😊 Group work on **Lab Data Analysis, Lab Questions, and Lecture Study Guides** should also be completed in the lab. Open lab times are available on **Mon./Wed. mornings & afternoons, and Tue./Thur. afternoons by arrangement.**

❖ **NOTE: Your experiments are ALIVE!! If you do not tend to your organisms every 1-3 days, they might DIE and ruin your experiment!!** There is not enough time in the semester to repeat entire experiments, so if this happens, you will lose all credit for the experiment. **Keep your microbial "pets" happy** all during the semester, and **they will keep you happy!!!** 😊
3. Your **Composition LAB NOTEBOOK** will be checked regularly for **completion of all observations, calculations, questions, detailed descriptions, and for LOTS of CAREFUL DRAWINGS of the organisms that we observe.** **Keep a detailed record of what you've done, so that another STUDENT could follow it!! Be sure to complete all questions, calculations, tables, and graphs EVERY week during lab and Hours By Arrangement.** See your Lab Manual for more detailed instructions.
4. ****Bi-Weekly QUIZZES** will be posted online every two weeks. Quizzes will cover information from the last two weeks of **Laboratory and Lecture**, and possibly a few questions from the current or upcoming week. The quiz **MUST be completed by WEDNESDAY evening** following the post, and is a required part of your HBA hours that week. **The lowest quiz score will be dropped.** Quizzes are found on **SMCCD Canvas: [http:// smccd.instructure.com](http://smccd.instructure.com).**
5. **BLUE BOOKS:** During each lecture period, I will present brief questions/writing prompts and occasional quizzes for you to answer in-class. These will be written down in your Blue Books, which you must leave with me at the end of class. These **Class Journals** will track and encourage your active thinking during class and thorough review, study, and reading preparation before class. **Blue Book Journal work will make up a large part of your Class Participation Grade.**
6. ****LAB REPORTS** will be turned-in about one week after the final experimental analysis (Expts. 12 & 17), including a brief discussion of the experiment, and a complete flow-chart of the deductive process towards identifying your investigated bacterial species. Specific instructions are provided in the Introductory pages (Preface) of the Lab Manual.
7. **TEAMWORK and COURTESY:** In the laboratory, we always **work as teams.** **If you find that you cannot attend a laboratory session for any reason, you must contact BOTH me AND your lab PARTNERS as soon as possible to ensure that your experiment does not fail by neglect.** Please be responsible for your experiment and materials, and be conscientious of your lab colleagues as well!!

➤ **It is EVERY student's responsibility to CLEAN-UP after him/herself!! Each student must make sure that his/her ENTIRE bench and immediate area are clean and disinfected at the end of each period, chairs are pushed in, and ALL equipment and reagents are rinsed and put back in their proper places for use by later sections.**
8. **PUNCTUALITY:** **Students who arrive late to class are expected to do extra lab cleanup at the end! Students arriving more than 10 minutes LATE to lab are marked as ABSENT, but may stay and work, so as not to fall behind in lab projects. ANY minutes late are recorded as partial absence!**

BIOL 240: Spring 2020 TENTATIVE LECTURE SCHEDULE Nathan Staples, Ph.D.**Textbook: Tortora, Funke & Case (2019). *Microbiology: An Introduction, 13th Ed.***

Wk.	Date:	Chapter:	Lecture Topic (Tortora et al., 2019):
Part I: The Basics of Microorganisms			
1 Mon	M 1/13	Ch. 1	Course expectations and overview; Introduction – Microbial Classification.
Wed	W 1/15	Ch. 1, 3 (in lab)	Microbial Classification. The Microbial World: Historical Perspective.
2 Mon	M 1/20	HOLIDAY!	MARTIN LUTHER KING, JR. DAY!!
2 Wed	W 1/22	Ch. 1, 2	Microbial World: Human Welfare & Disease; Biological Chemistry - atoms, bonds.
3	M 1/27	Ch. 2	Biological Chemistry - atoms, bonds, reactions.
	W 1/29	Ch. 2	Biological Chemistry - Organic Macromolecules -- carbohydrates, lipids.
4	M 2/3	Ch. 2, 3 (in lab)	Proteins, Nucleic Acids; Microscopy: Microscopes, Microscopic methods & staining (Ch.3 in lab)
	W 2/5	Ch. 4	Cell Theory, Prokaryotic v. Eukaryotic Cells; Prokaryotic Cell Structure and function.
5	M 2/10	Ch. 4	Eukaryotic organelles; Endosymbiotic Theory.
	W 2/12	Ch. 5	Microbial Metabolism: Enzymes, Enzyme regulation. REVIEW FOR MIDTERM.
6	M 2/17	HOLIDAY!	PRESIDENT'S DAY!!
	W 2/19	Midterm #1	Midterm #1: Chs. 1-4 (100 pts.)
7	M 2/24	Ch. 5	Glycolysis, TCA Cycle, Cellular Respiration – Electron transport. Fermentation, metabolic yields.
	W 2/26	Ch. 5	Photosynthesis, Trophisms; Amphibolic pathways
8	M 3/2	Chs. 5, 6	Microbial Growth: Physical, chemical requirements; Media, Bacterial Growth.
	W 3/4	Ch.6, Ch.7 (online)	Control of Microbial Growth: Terminology, death, Physical Methods, Chemical methods; Microbial Genetics: genetic material (most of Ch. 7 will be covered as online homework).
Part II: Microbial Molecular Genetics & Biotechnology			
9	M 3/9	Ch. 8	Microbial Genetics: RNA, DNA, Central Dogma;
	W 3/11	Ch. 8	Mechanism of DNA Replication. Transcription. REVIEW FOR MIDTERM.
10	M 3/16	Midterm #2	Midterm #2: Chs. 5-7 (100 pts.)
	W 3/18	Ch. 8	Gene Expression & Regulation: Operons. Mutations, mutagens. Bact. Recombination (horizontal inheritance).
11	M 3/23	Ch. 8, 9 (in lab)	Recombinant DNA: cloning, selection. Mutagenesis, PCR, vectors; Applications.
	W 3/25	Ch.9, 11 (online)	Molecular cloning and analysis. Prokaryotic Domains: Eubacteria & Archaea (online).
M W	3/30-4/1	Vacation	☺ SPRING BREAK WEEK!! ☺
Part III: Microbial Diversity			
12	M 4/6	Ch. 12 (online)	Eukaryotic microbes: Fungi, algae, protozoa, Helminths. (Ch. 12 lecture is online)
	W 4/8	Ch. 13	Viruses, Viroids & Prions; bacteriophage growth & reproductive cycle.
Part IV: Host-Microbe Interactions			
13	M 4/13	Ch. 15 (online)	Microbial Pathogenicity: Entry, evasion, damage; Toxins. Virulence Factors.
	W 4/15	Ch. 16	Nonspecific Host Defenses: barriers, chemicals, cells. REVIEW FOR MIDTERM.
14	M 4/20	Midterm #3	Midterm #3: Chs. 8, 9, 11, 12, 13 (100 pts.)
	W 4/22	Ch. 16	Nonspecific Host Defenses: barriers, chemicals, phagocytes. Inflammation, complement; interferons.
15	M 4/27	Ch. 17	Specific Host Immunity: Antibody-mediated (Humoral).
	W 4/29	Ch. 17	Specific Immunity: Cell-mediated.
16	M 5/4	Ch. 21	Microbial Diseases of Skin & Eyes.
	W 5/6	Ch. 22, 23	Microbial Diseases of Nervous system & Cardiovascular & lymphatic systems.
17	M 5/11	Ch. 24, 25	Microbial Diseases of the Respiratory & Digestive systems.
	W 5/13	Ch. 27	Environmental Microbiology. REVIEW FOR FINAL EXAM!! (During Lab)
18	M 5/18	FINAL EXAM	** Cumulative FINAL EXAM: MONDAY, May 18, 11:10 AM - 1:40 PM **

BIOL 240: Spring 2020 TENTATIVE LABORATORY SCHEDULE Nathan Staples, Ph.D.
Lab Manual: Staples, N.C. (2018). General Microbiology Laboratory Manual. August, 2018 (12th Edition)

Wk.	Date:	Expt. #:	Laboratory Assignment:
1 Mon	M 1/13	1	Course introduction; Laboratory Safety; Introduction to Microscopy. (<i>Text, Ch. 3</i>)
Wed	W 1/15	1 (2.1)	Microscopy, magnification, resolution, depth of field, Kohler illumination. (<i>Diatoms.</i>)
2 Mon	M 1/20	HOLIDAY!	MARTIN LUTHER KING, JR. DAY!!
Wed	W 1/22	2.1	Wet mounts of live organisms. (<i>Textbook, Ch. 3</i>)
3	M 1/27	2.2	Aseptic transfer and Observation of wet mounts (<i>Textbook, Ch. 3</i>)
	W 1/29	2fin, 3.1	Finish wet mounts; Observe aseptic technique. Smears & simple stains. **Quiz 1 DUE Online!**
4	M 2/3	3.2, 4.1**	Gram stain & observations. Spread-plate pond/lake water sample. <i>Practice: Smears, Stains, Microscopy!</i>
	W 2/5	3.3, 4.2	Acid-fast stain & Observe. Examine spread-plates, & Streak plate for single colonies (every student!!).
5	M 2/10	4.3; 5	Restreak single colony isolations. Inoculate selective & differential media. (<i>see Text, Ch. 7</i>)
	W 2/12	4.4, 5fin,	Slant or restreak isolated colonies. Score Select. & Differ. media; **Quiz 2 DUE!!**
6	M 2/17	HOLIDAY!	PRESIDENT'S DAY!!
	W 2/19	4fin, 6, 7	Inoculate BHIA. (<i>Textbook, Ch. 7</i>) Inoculate anaerobic cultures. [Lecture Midterm #1]
7	M 2/24	6fin, 7fin, 8.1**	Score BHIA & anaerobic phenotypes. Perform dilution series & spread-plate <i>E. coli</i> .
	W 2/26	8.2, 9	Calculate CFU/ml. Observe yeast morphology; Inoculate Yeast & Molds. **Quiz 3 DUE Online!**
8	M 3/2	9pB	Score yeast fermentation. <i>Discuss mold growth and morphology.</i>
	W 3/4	9fin, 11.1**	Observe 7+ day molds. (<i>Textbook, Ch. 7</i>). Inoculate mouth/throat samples - YE-Sucrose, Snyder Deep, Blood Agar (wrap with Parafilm)
9	M 3/9	11.2; 10	Examine Snyder deep, BA & CaCO ₃ plates - Catalase, Acid? Dilute & plate phage.
	W 3/11	11.3, 10fin	Gram Stain & Wet mount oral bacteria; Re-examine CaCO ₃ plates. Calculate PFU/ml phage. **Bring DRY soil Monday, 3/16!!** **Quiz 4 DUE Online!**
10	M 3/16	11fin, 12.1**	** BRING DRY Soil Sample!! Pasteurize Soil & cultivate organisms under enrichment conditions. [Lecture Midterm #2]
	W 3/18	12.2, NB1	Observe & restreak sporulators. (<i>Water collection kits</i>) **Collect WATER SAMPLE for Mon., 3/23!** NOTEBOOK Check #1 (Expts. 1-10)
11	M 3/23	12.3, 13.1a**	Streak MnSO ₄ agar. **Bring & Analyze WATER!!!** -- Inoculate LT broths.
	W 3/25	12.4, 13.1b-13.2a.	Spore stains & NA Slants (Wrap agar at Room Temp Thur.!!); Score water for MPN, Streak EMB – Wrap in Parafilm!! (refrigerate Thur.) **Quiz 5 DUE Online!**
M W	3/30-4/1	Vacation	☺ SPRING BREAK WEEK!! ☺
12	M 4/6	12.5**, 13.2b,	Inoculate Differential Media with sporulators. Slant & EC broth (Check TUES.!!);
	W 4/8	12.6, 13.2c	Observe & identify <i>Bacillus</i> species. Score fecal coliform, & Gram stain. (Preview Expt. 17!!)
13	M 4/13	17.1**	Inoculate Unknowns (MANDATORY attendance!!) Come with DIRTY HANDS Wed.!!
	W 4/15	17.2; 14.1	48 hr. observations; Inoculate NB & KCN base broths w/ Unknown. (Preview 17-p3) Hand-Washing Effectiveness – swab, dilute, and plate. **Quiz 6 DUE Online!**
14	M 4/20	17.3**, 14.2	Finish PR & AADC, Score media. Inoculate final tests. (MANDATORY ATTENDANCE!!!) Score Handwashing cultures and calculate class data. [Lecture Midterm #3]
	W 4/22	17.4, 14fin	Observe all media, test & discard Starch agar. **Section III Report DUE!! ** (Preview Expt. 16)**
15	M 4/27	17.5, 16.1**	Test, observe, & discard SIM, Urea, MR & VP, PheDA, TSI, Citrate, KCN, & NO ₃ ⁻ ; pGLO Transformation (refrigerate Tues.!!) (MANDATORY ATTENDANCE!!!)
	W 4/29	17.6, 16.2**	Observe/discard Gelatin. Determine unknown; Score transformation & ARA operon activity. ➤ Do Appendix-F homework.
16	M 5/4	17 fin, Clean Up	Finish unknown & check with Professor. Clean up and Check out. Plan Section V report with partner. Lecture catch-up. Appendix-F Table & Questions due!!
	W 5/6	*Pract. Rev.*	Discussion & REVIEW for Practical (Mandatory!). **Quiz 7 DUE Online!**
17	M 5/11	PRACTICAL	*** FINAL PRACTICAL EXAM *** ; **NB2: Final Notebook Check (11-17)!!
	W 5/13	Report DUE	**Section V Report DUE!! NONE accepted Late!! **Review for Lecture Final**

❖ Remember that ALL lab questions, data analysis, & skills practice must be completed weekly for HBA.

➤ **** = mandatory attendance!!!**