

MICR 486 Capstone Experience in Microbiology (3 credits)
Class #6866 & 7583
Spring 2012

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Blackboard site: <http://bb.ndsu.nodak.edu/>

Each student is responsible for all announcements and course material posted on Blackboard. Students are expected to check their NDSU email/Bb site daily.

Lecture: Tuesdays 8:15-9:15 am in Van Es 105

Lab section: Tuesdays (1:00-3:50pm) or Wednesdays (3:00-5:50pm) in Van Es 105 with additional times outside of scheduled laboratory times to prepare/complete laboratory experiments (incubations, transfers, cold room storage, running gels, etc.)

Course Description: The main concept of a capstone experience course is that it be the culminations of earlier course work that will help students broaden, deepen, and integrate the total experience of the major.

Course Objectives: The Microbiology Capstone Experience course is designed to serve numerous functions: 1) to assess student understanding and mastery of essential microbiological principles and techniques, 2) to review many of the important concepts and ideas in microbiology, 3) to help students gain experience and understanding of contemporary laboratory techniques for studying microorganisms, 4) to help students continue to develop and improve their understanding and skills in experimental design, critical thinking, and data analysis, 5) to provide students with experience in professional oral and written communication skills, and 6) to help students understand that organization, time management, excellent record keeping, and additional laboratory time are necessary for success.

Course Material: All course material will be either presented by the instructor, students, or available on the course Blackboard site. This includes lecture material, course discussions, course homework and problems, assigned reading material, and course experiments. Oral and written assignments provide professional experience in the form of posters (following ASM meeting guidelines), PowerPoint presentations, record keeping in lab notebooks, lab reports, problems, homework assignments, etc.

Instructor Responsibilities

- Understand the context by which the students will be learning the material (what, how, when, where, and why)
- Create, collect, plan, organize, and assess the content in a meaningful and timely way
- Openly communicate with and engage students
- Keep the presentation of material and the assignment expectations as clear and fair as possible
- Provide resources and advice to enhance learning and communication
- Give the students the opportunity to develop their auto-didactic skills
- Understand students' scheduling issues, and work with them to meet their needs as much as possible without compromising their or others' learning
- Provide student's the opportunity to comment on instruction and use feedback to improve the learning in the course

Student Responsibilities

- Have a serious attitude and understand that learning takes time and effort
- Have a desire to acquire information and a willingness to work and complete tasks in good faith
- Have a willingness to seek assistance when information is not clear
- Have a willingness to provide constructive and meaningful feedback to help improve instruction
- Complete assignments by scheduled deadlines
 - ***A late assignment will receive zero points; however, all assignments must be completed with serious effort put forth by the student in order to pass this course***
 - In the case of traumatic events, like severe illness or death in the family, make-up assignments will be given; however this need must be communicated to the instructor, with proper authentication, as soon as possible.

- Actively participate in the group discussions and group assignments outside of lecture/lab time
- Attend and actively participate in all lectures and labs; attendance is required and taken each period
 - If a lab must be missed for justifiable reasons (i.e. field trips, professional meetings, interviews – documented properly), the team members and instructor must be notified ahead of time and arrangements made to make up for lost input
 - **For each unexcused absence, a 10 point reduction from the final course point total will result (this includes each unexcused lecture and lab period).**
 - **Tardiness is NOT tolerated, a 5 point reduction from the final course point total will result (this includes each lecture and lab period that you are tardy).**
- **Check Blackboard and/or NDSU email regularly for any updates related to the course**

Disabilities: Any student with **disabilities or other special needs** who needs special accommodations in this course is invited to share these concerns or requests with the instructor as soon as possible.

Veteran consideration: Veterans and student soldiers with special circumstances or who are activated are encouraged to notify the instructor in advance. (Policy 331.1 Course Syllabus)

Any students who may be in immuno-compromised states of health should take extra care in the laboratory portion of this course. Please visit with the instructor to ensure adequate controls are used to prevent infection.

Mission Statement for Department of Veterinary and Microbiological Sciences: “VMS serves the local, national and international communities by teaching the concepts and applications of microbiology in a student-centered environment and by using our unique expertise to explore novel research in microbiology and disease pathogenesis. Our department values lifelong discovery, intellectual integrity, collegiality, and diversity.”

Academic Dishonesty/Plagiarism: Academic dishonesty and plagiarism are prohibited according to university policies. Acts of dishonesty include cheating, facilitating academic dishonesty, failing to report observed academic dishonesty, fabrication, and plagiarism. This course adheres strictly to the NDSU University Senate Policy (section 335) Code of Academic Responsibility and Conduct. The Honor System operates to prevent and stop cheating, as well as penalizing those who cheat. Cases can be reported to any Honor Commission member, your instructors, or the Dean. Please refer to the following websites for more information: <http://www.ndsu.nodak.edu/policy/335.htm> & <http://www.ag.ndsu.nodak.edu/colag/honor.htm>

Familiarize yourself with what plagiarism is at <http://www.plagiarism.org>. This research site has excellent information regarding plagiarism and when/how to cite sources. **Please ask if you are unsure.**

Here are some examples of plagiarism:

“All of the following are considered plagiarism:

- turning in someone else’s work as your own
- copying words or ideas from someone else without giving credit
- failing to put a quotation in quotation marks
- giving incorrect information about the source of a quotation
- changing words but copying the sentence structure of a source without giving credit
- copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not (see our section on "fair use" rules)
- Changing the words of an original source is not sufficient to prevent plagiarism. If you have retained the essential idea of an original source, and have not cited it, then no matter how drastically you may have altered its context or presentation, you have still plagiarized.”
- The above information was quoted/copied from www.plagiarism.org as viewed on January 5, 2012.

Course Requirements:

Attendance and Participation: Since the majority of this course is laboratory based, attendance, participation, and adequate preparation in all aspects of the course will be required. **10 points will be deducted from the final point total for each unexcused absence. 5 points will be deducted from the final point total for each time tardiness is exhibited.**

Individual Homework Assignments: These are designed to help you prepare for the laboratory experiments through determining necessary calculations for needed materials such as media, solutions, PCR reactions, restriction digests, etc. In addition to calculations, there will also be critical thinking questions that will start the problem solving process necessary for the major experiments. **The homework assignments will comprise 60 points of your final grade.** All homework assignments are to be completed **individually**.

Individual Laboratory Notebooks: Each student will be required to maintain a laboratory notebook detailing the research being done in the laboratory throughout the semester. Notebooks are a critical component of all laboratory work. It is essential that they are accurate, organized, thorough, and up to date. The time of collection will not be announced ahead of time. Your notebook needs to be detailed enough for the research to be replicated. This means you should include final reagent concentrations, percentages, equipment utilized, reagent information (Difco, BBL, Promega, etc.), temperatures for storage/incubation, methods used—basically anything that is pertinent to replicate the research. Research notebooks are considered working documents that are legally binding. **Pen should be used and mistakes should not be “whited-out” or crossed out repeatedly. If a mistake is made, cross it out with one line so as to not hide the mistake, date it, and initial it.** **The notebooks will be evaluated 2 times during the semester. The notebooks will comprise 60 points of your final grade. See the notebook guidelines folder on Blackboard for requirements and proper notebook keeping details.**

Laboratory Experiments: Protocols for the 4 major microbiology experiments that incorporate classical and molecular techniques must be available as a printed hard copy or digital format during lab. Each student is expected to have the appropriate experimental protocol with them as the lab begins. These experiments will cover various aspects of microbiology such as immunology, pathogenic microbiology, and physiology/gene regulation. Each student will be responsible for performing and collecting their own data for each experiment. These data will be shared with the class to be used in group posters and individual lab reports. It is critical and essential that laboratory notebooks are up to date with calculations, volumes/amounts, results, and any information needed for poster and report preparation. **Grading for the laboratory experiments will be determined through individual PowerPoint presentations, group posters, and individual laboratory notebook record keeping.**

Scoring rubrics/assessment criteria are available on Blackboard for presentations, posters, and the journal article manuscript.

PowerPoint Presentations (tips & topics pages 9, 10): You will be assigned 2 PowerPoint presentations during the semester with constructive feedback provided from the instructor and your peers. The first PowerPoint presentation will be created and presented as a team in which you and another student will cover an assigned core microbiology topic (25 min); whereas, the second PowerPoint presentation will essentially be a review of a journal article you choose to read, evaluate, and present (20 min). Each presentation will be worth 40 points. Assessment and scoring criteria rubrics can be found on Bb. **The PowerPoint Presentations comprise 80 points of your final grade.**

Group Poster: The instructor will determine the experiment and poster group assignments. You will be assigned a group poster presentation at the end of the semester with constructive faculty feedback provided. Poster guidelines will be available on our Blackboard site and discussed in class. Posters can be designed in PowerPoint and printed at the IACC. IACC needs **at least** 24 hours in advance. Poster content and presentation will be the most important factors. Assessment and scoring criteria rubrics can be found on Bb. **The group poster will comprise 40 points of your final grade (group members will be assigned later in the semester).**

Individual Journal Article Manuscript: Each student will analyze experimental data provided by the instructor and incorporate the data into a journal article manuscript. Instructions, data, assessment and scoring criteria rubrics can be found on Bb. **The individual journal article will comprise 40 points of your final grade.**

Group Based Problems: Assigned groups will be required to critically think and research literature to answer thought-based microbiology problems. These problems will require group problem solving and thought, provide acceptable references (journal articles and credible sources), and type-written answers. Group assignments and problems will be posted on Blackboard. **The 3 group based problems will comprise 45 points of your final grade.**

Group work: You will be given the opportunity to evaluate group member's participation on all group work (group based problems, group posters). If inadequate participation by member(s) has occurred, please contact the instructor immediately by completing the form on Blackboard for that/those member(s). Remember, group/team work is commonly used in many major corporations/research facilities for which you

may hold a job in the future. It is in your best interest to learn how to work in situations now since you may be faced with other individuals that have different work ethics, methods, etc. in your future endeavors.

Individual Unknown Identification: Each student will be individually assigned a Genus to isolate from a soil sample. Upon isolation, you will be asked to identify the species. This will be an exercise in organization and time management. You will be asked to determine the media and biochemical tests required to isolate and identify this unknown early in the semester. Unknown isolation and identification must be organized methodically as to not waste media. Selective and enrichment media are strongly recommended/suggested for isolation of your unknown. Research to identify appropriate media is necessary. Media and biochemical tests should be indicated in a time line to assist you to ensure adequate time for isolation and identification. Students will prepare the various media in groups. You will be required to save the media used to isolate your Genus as well as the pure cultures. It will be evident to the instructor if you have completed your project in a timely manner. You will turn in a flow chart indicating the steps required to isolate and identify the *Genus species*. **More detailed instructions are provided on Bb. The Unknown Identification will comprise 50 points of your final grade.**

Individual Capstone Project: The Capstone project will be a paper-based problem involving virology. You will individually be asked to analyze data that you will computer generate. You will also need to incorporate the data into appropriate figures (diagrams, tables and/or graphs). Further information will be provided prior to mid-term. **The capstone project comprises 95 points of your final grade.**

Assignment	Points
Unknown Identification	50
Group Based Problems	45
Problem #1 <i>Salmonella</i>	15
Problem #2 Swimming Rings (Gene Regulation)	15
Problem #3 Fermentation	15
Individual Homework Assignments	60
Experiment: Immunology Assignment	15
Experiment: Gene Regulation Assignment	15
Experiment: <i>E. coli</i> Assignments	15
Experiment: Cryptosporidium Assignment	15
Individual Journal Article (data analysis & writing)	40
Notebooks (unannounced)	60
Notebook #1 Collection	20
Notebook #2 Collection	40
PowerPoint Presentations	80
PowerPoint presentation #1 (Team PPT on Core Course Topics)	40
PowerPoint presentation #2 (Individual PPT on Journal Article Topics)	40
Experiments	40
Group Poster Presentation on Gene Reg, InVitro Imm/ELISA, <i>E. coli</i> or <i>Crypto</i>	40
Capstone Project	95
Total	470

Grades will be determined as follows with no extra credit opportunities:

A= 421-470 points B= 374-420 points C= 327-373 points D= 280-326 points F= <280 points
 (90-100%) (80-89%) (70-79%) (60-69%)

Success Tips for this Course:

- **Treat this course as your first place of employment after graduation.** The instructor can serve as a great job reference when you put forth tremendous effort in this course. All aspects of this course will be found in the workplace setting: presentations, writing, group work, lab work, literature reviews, critical thinking, record keeping, etc. Get as much out of the assignments as you can. Strive to achieve!
- There are no exams in this course; therefore, there will be many out of class assignments that will require considerable time to complete (plan accordingly as many assignments begin to accumulate).
- Manage your time wisely. Procrastination will hurt your grade.
- Learn how to do simple searches for published research papers. These will get you so many more points on your assignments than website references will. Wikipedia is not considered a credible source; however, it can give you acceptable journal article references to begin your search. It is strongly recommended that you use more recent references; however, original references are just as important as updated references.
- Data collection is extremely important! Keep your lab notebooks up to date—this is considered real time data collection. This means the data should go into the notebooks as it happens! An individual should be able to pick up your notebook and replicate the research (concentrations of reagents, media components, process/protocol, etc.). Images collected during the experiment should be included in the results section. Graphical analysis is an important method for analyzing the results and should be utilized. **Essentially, your notebook should contain ALL necessary information for experimental replication.**
- The grading process for assignments gets tougher as the semester goes by, as I expect you to improve. Learn from mistakes on your first few assignments to improve the quality of your later assignments. If you are not sure why points are taken off, meet with the instructor to clarify.
- Ask for clarification if anything is not clear to you. There are no dumb questions. This will prevent mistakes by you and/or me. This will benefit not only you, but also other students in the course (it will also help improve the course).
- Meet with your group members in a timely manner. Do not put off group assignments until the last minute—it usually shows and results in a lower quality assignment for all group members.
- When an assignment is due, you are expected to put forth your best effort upon submission. There are no second opportunities (no “re-do’s”). It is assumed that you have submitted what you want graded.
- There is no extra credit in this course.

Equipment Usage

- Any items used must be put away when you are done. If you don't know where it belongs, ASK!
- Do not leave cultures/inoculated media incubating in incubators when you are done with them---BIOHAZARD them appropriately (plates in red biohazard bag, test tubes in tube disposal area, pipets/pipettor tips in benchtop biohazards).
- Culture supernatant must be discarded in benchtop biohazards! Do not put culture supernatant in the beakers at your benchtop work area.
- Always ask me first before using chemicals and prepared/dehydrated media. If I am unavailable, discuss what you need with Linda Parmer or Janice Haggart. It is a courtesy to Linda to ensure there is enough media available for laboratory classes as well as keeping the lab/media kitchen orderly.
- Sharpies and lab tape can be used on glassware, BUT both must be removed prior to disposing test tubes/glassware in test tube disposal area. Permanent marker can be removed w/ "decolorizer" and a Kim-wipe.

Waterbaths: put waterbath lids back on securely and avoid media spillage into water (contamination)

Autoclaves: media bottle lids should be tightened and then loosed ¼ of a turn to prevent pressure buildup

- 121°C, 15 min, 15 psi for media sterilization
- Filter sterilize liquid antibiotics to add to tempered media (50°C waterbath until temperature has equalized)
- Contaminated tubes, etc.: media kitchen will sterilize if disposed of properly

37°C Shaker: turn motor and timer to "zero" or motor will continue to run and burn out

Centrifuge (mini, benchtop, Beckman TJ-6): balance tubes before use, put on lid, and clean up area when done

Media & chemicals: ask before using, use a new spatula, pipet, or pipettor tip for each chemical, be conservative with usage to avoid wasting, put them away when finished, and clean spills from benchtop

Benchtop: clean with spray sanitizer and sponge

Gel rigs: rinse with DI water and allow to air dry on towel; TAE buffer can be disposed of down the drain

Test tube racks: return to shelving

Spectrophotometer: blank with media, check culture OD, discard cuvette (disposable), and clean up bacterial spills appropriately

Microscopes: use immersion oil only on 100X objective, use lens paper to clean objectives 10x→40x→100x, leave lowest power objective in view position, wrap cord appropriately, return scope to appropriate location on the shelf w/scope # facing out

Sterile microcentrifuge tubes: retrieve by shaking out of container into lid; NEVER retrieve by placing hands into container as these will no longer be sterile

Pipettors/tips: demo aspirating—plunger depressed to first stop, slowly release plunger when pipettor tip is in liquid to avoid air bubbles and pipettor contamination, depress plunger slowly to first stop when pipettor tip is in tube, etc.

- The blowout position can be used to aspirate entire contents, but never use it when obtaining your liquid sample. If you are doing serial dilutions, it is best to not use the blowout to maintain consistent volumes.

<i>Week of</i>	<i>Experimental Schedule</i> <i>Lab Tues 1-3:50 or Wed 3-5:50pm</i>	<i>Presentation Topics</i> <i>Tuesdays 8:15-9:15am</i>	<i>Assignments Due</i> <i>Beginning of Lab</i> <i>Section</i>	<i>Assignments Due</i> <i>Fridays by 11:59pm</i> <i>email</i>
Week 1 Jan 10	Pre- Lab Skills Assessment <i>Unknowns Assigned (Bb)</i>	*Syllabus *Equipment usage: spectrophotometer; shaker, water baths, proper disposal, incubators, pipettors, etc. *Pre-test (don't look up answers)		
Week 2 Jan 17	<i>In Vitro</i> Immunization	1. Innate immunity 2. Humoral immunity (B cells)	<i>*Ind'l Homework #1</i> <i>Immunology(Bb)</i> <i>*Turn in Pre-test</i>	
Week 3 Jan 24	*In Vitro: Coating Antigen Mon 1/23/11 by RR/TA *In Vitro Harvest Supernatant by 1pm (Tues)/3pm (Wed) *96 well plate blocked by RR/ TA (Tues or Wed) *In Vitro ELISA	3. Cell-mediated immunity (T cells) 4. Bacterial transcription/Translation/Knockouts		Group Problem #1 Salmonella 1/27/12
Week 4 Jan 31	*Gene Regulation Culture Inoculation by 10am (Tues)/12pm (Wed) *Gene Regulation day 1 (fliC lysate creation)	5. Bacterial exchange of genetic info (conjugation, transformation, transduction) 6. Bacterial DNA recombination/DNA repair	<i>*Ind'l Homework #2</i> <i>Gene Reg (Bb)</i> <i>* Unknown</i> <i>Background &</i> <i>Materials Due</i>	
Week 5 Feb 7	*Gene Regulation day 2 (create mutant)/extra work b4 lab *Additional outside lab time: Motility Agar	7. Mechanisms of Bacterial Pathogenesis 8. Infectious Diseases of Interest (overview)		
Week 6 Feb 14	Unknown: Organization/Prep Unknown Media (can work on unknown remainder of the semester) Per pair complete by week 7 lab (no "formal" lab): *Isolate bacteria (E. coli expt) *Gram Stain bacteria	9. DNA Viruses: overview 10. RNA viruses: overview		Group Problem #2 Swimming Rings (Gene Reg) 2/17/12
Week 7 Feb 21	*Gram negative "purification" <i>E. coli</i> *Gram negative PCR Unknown	1. Journal Article PPT Review 2. Journal Article PPT Review 3. Journal Article PPT Review	<i>Ind'l Homework #3</i> <i>E. coli PCR table in</i> <i>protocol & #6 on p.3,</i> <i>#1 & #3 on p. 4 and</i> <i>Bb document</i>	
Week 8 Feb 28	<i>E. coli</i> /Gram negative gel electrophoresis Unknown	4. Journal Article PPT Review 5. Journal Article PPT Review 6. Journal Article PPT Review		
Week 9 Mar 6	Unknown	7. Journal Article PPT Review 8. Journal Article PPT Review 9. Journal Article PPT Review		Group Problem #3 Fermentation 3/9/12
<i>Week of</i>	<i>Experimental Schedule</i>	<i>Presentation Topics</i>	<i>Assignments Due</i>	<i>Assignments Due</i>

	<i>Lab Tues 1-3:50pm or Wed 3-5:50pm</i>	<i>Tuesdays 8:15-9:15am</i>	<i>Beginning of Lab Sec</i>	<i><u>Fridays by 11:59pm</u></i> <i>email</i>
Mar 12-16	SPRING BREAK			
Week 10 Mar 20	PCR 2° product gel electrophoresis Crypto Restriction Digest	10. Journal Article PPT Review 11. Journal Article PPT Review 12. Journal Article PPT Review		
Week 11 Mar 27	Crypto Restriction Digest gel electrophoresis	13. Journal Article PPT Review 14. Journal Article PPT Review 15. Journal Article PPT Review	<i>Ind'l Homework #4</i> <i>Rest. Mapping (Bb)</i>	<i>Ind'l Journal Article</i> <i>Due 3/30/12</i>
Week 12 Apr 3	Unknown	16. Journal Article PPT Review 17. Journal Article PPT Review 18. Journal Article PPT Review		
Week 13 Apr 10	Unknown	19. Journal Article PPT Review 20. Journal Article PPT Review	<i>Unknowns: Isolation</i> <i>streaks & Gram Stains</i> <i>by 4pm 4/11/12</i>	<i>Final Unknown</i> <i>Outline Due 4/13/12</i>
Week 14 Apr 17	Group Posters date & groups TBD			
Week 15 Apr 24	Post-Lab Skills Assessment Post-Test		Individual Viral Final Project Due Friday, April 27 by 4pm	
Week 16 May 1	Course Evaluations (Receive Email w/Online Link)			

PowerPoint Presentation Tips

1. Dark background with light text *OR* light background with dark text
2. Minimal text per bullet point
 - Use brief bulleted information to prompt your thoughts rather than using sentences/paragraphs of info
 - Your audience is kept engaged by less information per slide (if you just read all of the info off of the slide, your audience feels cheated since they, too, can read)
 - Text size should be large enough to be EASILY viewed from bench 2 (use the default text size or reduce it only slightly)
3. Images should be used to explain information and can replace text sometimes
4. Images/graphics are often helpful as many people understand your topic easier
5. Organization of the content is important—make sure it flows from one topic to another
6. Composure: no leaning, watch your speech (ummmms shouldn't be fillers or transitions), slow down, avoid blocking the projector screen, no hands in pockets, no swaying
7. Know the equipment you are using
 - PowerPoint versions vary from computers!
 - Use a pointer to direct attention to an image (mouse or laser pointer)
 - Some in your audience may find using the mouse pointer distracting

MICR 486 Capstone PowerPoint Presentation #1: Team PPT (40 points)

Each student should present about 10 minutes and be able to field questions on the assigned topic (~5 minutes) resulting in a team presentation total time of 25 minutes. Please find the criteria rubric, peer assessment form as well as my scoring rubric on Bb.

You and your partner only have about 20 minutes (10 minutes each) to present on your topic. You are asked to be concise in your explanations. You can assume that it is not necessary to start from the beginning, but think of this as a “refresher” on your assigned topic. You will need to provide enough information so the audience can follow your presentation: it should obviously tie in with your partner's information on the topic.

Members of the audience are questioners and **MUST** ask 4 questions for 4 different presentations (Jan 17-Feb 14) or will lose 1 point from their overall point total each time they fail to ask a question. You are not prohibited from asking more than 4 questions during these presentations; however, other students must have an opportunity to fulfill their 4 question requirement so be considerate. All 4 questions cannot be asked for one presentation.

Individual PowerPoint Presentation #2: Microbiology Journal Article Review (40 points)

You are asked to find a journal article of interest that **pertains to microbiology**. **Do not choose a review article**. The journal article **MUST** be approved by the instructor and the final approval must be **3 weeks** prior to your presentation to ensure that you have an appropriate article. Failure to get approval may result in loss of points. Email the link or PDF file to me so I can approve and post this on Bb. Below are some topic suggestions, PLEASE feel free to find a topic outside of the ideas listed. Remember: **it must deal with an area of microbiology.**

<i>Individual PPT Topic #2 Journal Article Review Topic Suggestions</i>
1. Biofilm
2. Food micro
3. Microbial ecology
4. Probiotics
5. Antibiotic resistance
6. Patho disease control
7. Antiviral/Vaccinations
8. Antibiotic resistance
9. Immunology
10. Bacterial Metabolism

Guidelines:

- This is an **individual assignment and presentation** unlike the first PowerPoint presentation.
- **The journal article must be from a journal that is affiliated with a branch of microbiology and must deal with microbiology.**
- **The journal article must be recent i.e. 2007 or newer.**
- **The article selected cannot be a review article that pieces together many related articles as this is too in depth to present on in the time allotted.**
- Provide brief background information for your peers as a topic review.
- It is recommended that you work with an electronic journal (if possible) so that you can easily insert tables/images/figures from the journal article for your explanation/discussion.
- **20 minutes total:** ~13-15 minutes to provide background, discuss the experiment, discuss the results, and discuss its importance with ~5-7 minutes for the assigned questioners to ask questions
 - ***Provide background for the research question, explain the purpose of the experiment/hypothesis, results, and discuss any “junk science” if found, flaws, ways to improve the experiment and potential for future research. Were they able to answer their research question?***

Members of the audience are questioners and MUST ask 5 questions for 5 different presentations (Feb 21-Apr 10) or will lose 1 point from their overall point total each time they fail to ask a question. You are not prohibited from asking more than 5 questions during these presentations; however, other students must have an opportunity to fulfill their 5 question requirement so be considerate. All 5 questions cannot be asked for one presenter