

# BMS 320 – Virtual Laboratory in Physiology-Section L41/801

## Course Coordinator / Instructor

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## Overview

Each week's coursework involves:

- Pre-lab tutorials using Draw It to Know It and selected on-line Tutorials\*
  - Concepts Tests (open book) on Canvas
  - Laboratory Exercise using PhysioEx 10.0-Laboratory Simulations in Physiology\*
  - Optional: Completion of Data Charts to use for Data Analysis
  - Completion of Lab Report (open book) on Canvas
  - Upload PDF Activity Files from PhysioEx program
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- Three (Closed Book) Unit Exams each covering four experiments.

\*See page 3 for information on purchasing online content for course.

All tests, lab reports, and exams are done through: BMS 320 Virtual Laboratory in Physiology Canvas Course site. Access to this Course is automatic following your registration for the course once you receive your NetID.

To Log on, go to: [canvas.colostate.edu](http://canvas.colostate.edu)

## Pre-/Co-requisite

- Colorado State University Courses BMS 300 (Principles of Human Physiology), which is also available at Colorado State University Online Plus [<http://www.online.colostate.edu/courses/BMS/BMS300.dot>] or
- College level Physiology course at another institution (send unofficial transcript to Dr. Vader for approval)

## Course Description and Goals

This course uses virtual laboratory exercises to study classic physiology experiments and is meant to meet the physiology lab pre-requisite for off-campus students applying for admission to post-graduate biomedical programs.

The course has been designed to fit the needs of students preparing for careers in health-related fields such as Fitness and Athletics; Pre-Medicine; Pre-Physical and Occupational Therapy; Pre-Physician Assistant; Nursing; Bio-Education (Teachers), as well as students simply interested in how their body functions.

Be sure to check with postgraduate institutions of interest to ensure this course meets their requirements. The laboratory exercises are simulations of experiments done in traditional "wet lab" courses. The method of data collection differs, but the recording and analysis of data is similar and rigorous. Students will gain an increased understanding and appreciation for the functions (physiology) of the human body.

## Course Learning Objectives

1. Evaluate different types of cell membrane transport mechanisms with respect to type of transport, rate of transport, conditions that affect the transport (membrane pore size, molecular weight, size, concentration of solutes), and role of carrier molecules and ATP.
2. Evaluate the physiology of neurons including ion concentration, channels, resting membrane potentials, stimuli strength, refractory periods, conduction velocity, and synaptic function.
3. Observe and explain the effect of increasing stimulus voltages (multiple motor unit summation); the effect of increasing stimulus frequencies (wave summation); and the effect of fatigue on skeletal muscle contraction.
4. Evaluate the interaction between thyroid hormones and metabolism, insulin and plasma glucose levels and their role in diabetes mellitus, benefits of hormone replacement therapy, and the role of ACTH on cortisol levels.

5. Explain the effect of blood vessel radius, blood viscosity, blood vessel length, and blood pressure on blood flow rate; and the effect of blood vessel radius and stroke volume on pump activity in the heart.
6. Explain the factors affecting the refractory period of cardiac muscle and the role of vagal nerve stimulation, the effect of temperature, chemical modifiers, and ionic changes on cardiac function.
7. Measure respiratory volumes and calculate capacities and explain the role of surfactant and intra-pleural pressure on respiration.
8. Explain the enzymatic processes involved in digestion of starches, proteins, and fats.
9. Describe the effect of arteriole radius and pressure on glomerular filtration; the renal response to altered blood pressure; the role of solute gradients and their impact on urine concentration; the role of carrier proteins in glucose reabsorption; and the effect of hormones on urine formation.
10. Explain the role of hyperventilation, rebreathing and renal responses in respiratory acidosis and alkalosis; and the respiratory responses to metabolic acidosis and alkalosis.
11. Explain how to measure and the importance of hematocrit, erythrocyte sedimentation rates, hemoglobin and blood cholesterol values; describe blood typing procedures and the importance of blood type determination.
12. Describe the procedures used in and the importance of direct fluorescent antibody, ouchterlony double diffusion, indirect enzyme-linked immune-sorbent assay, and western blotting techniques.

## Course Materials for BMS 320

- **Required (needed by the first day of class):**

- (1) Purchase on-line access to the PhysioEX (10.0) program at <http://www.physioex.com/>. Select [Buy Access] link.

-The price is ~\$35.00. BE SURE you are purchasing access to the PhysioEx 10 website and not just an eBook or paper manual, and:

- (2) Draw It to Know It (Physiology) at [Active Learning for the Medical Sciences | ditki medical & biological sciences](#)-Price for a 6-month subscription is ~\$66 after a one-week free trial.

Vander's Human Physiology is the text used for the pre-/co-requisite course (BMS 300) for BMS 320 and is recommended (**but not required**) as additional reading for this course. Chapters are referenced in the Lab Report assignment. The referenced edition is the 13<sup>th</sup>, but anything from the 10<sup>th</sup> to the 15<sup>th</sup> would be acceptable. It can be found online. If you have another college level Physiology text, it can be used instead. You can use the index to find the topics covered in each experiment. If you are going to be in the Biomedical field professionally, a good physiology textbook is always a good resource.

10th: 978-0073122861

11th: 978-0077216092

12th: 978-0077350017

13th: 978-0073378305

14th: 978-1259294099

15th: 978-1259903885

If you do not have the current version, used texts and older editions can be purchased from Amazon.com at reduced prices.

Special needs statement: Students with disabilities are encouraged to contact the Student Disability Center at 491-6385 or [Types of Accommodations - Student Disability Center \(colostate.edu\)](#) to arrange for accommodation and support services. Experiment assignments are not timed, and double time is already allowed for the three exams.

Please submit your SDC Accommodations Letter to Dr. Vader the first week of class.

## Schedule

The course is divided into three units of four laboratory exercises each, followed by a Unit Exam. During Summer Semester two experiments will be due each week or one experiment and one Unit exam. Plan to spend up to 8-12 hours every week on this course during the 8-week summer session. Assignments/Exams will be due at 8 pm MDT on Mondays and 8 am on Fridays. This gives the student 3.5 days on each experiment. Because many students have jobs during the summer all the assignments for each Unit are released with the first experiment in that unit so students can work ahead if they wish. Due dates remain the same for all experiments and Exams will only be released after the due date for the 4th experiment in the Unit. Plan ahead and give yourself time to deal with illnesses, "technical difficulties" or other emergencies should they arise. A suggestion would be to have the assignments completed 24 hours in advance of the due date/time to allow time to deal with problems, should they arise. Students who do this usually earn a letter grade higher than those who are submitting just prior to the deadline on a regular basis. Plan Ahead.

### **Available Date/Due Date:                      Assignment/Exam**

June 13/June18:    **Introduce Yourself:** post message under Discussions

#### **Unit I**

June 15/June 19:    **Expt 1:** -Cell Membrane Transport  
June19/June 22:    **Expt 2:** -Skeletal Muscle Physiology  
June 22/June 26:    **Expt 3:** -Neurophysiology  
June 26/June 29:    **Expt 4:** -Endocrine System Physiology  
June 29/July 3:      **Unit Exam I**

#### **Unit II:**

July 3/July 6:        **Expt 5:** -Cardiovascular Dynamics  
July 6/July 10:       **Expt 6:** -Cardiovascular Physiology  
July 10/July 13:      **Expt 7:** -Respiratory System Mechanics  
July 13/July 17:      **Expt 8:** -Chemical and Physical Processes of Digestion  
July 17/July 20:      **Unit Exam II**

#### **Unit III:**

July 20/July 24:      **Expt 09:** -Renal System Physiology  
July 24/July 27:      **Expt 10:**-Acid-Base Balance (Fluid & Electrolyte Balance)  
July 27/July 31:      **Expt 11:**-Blood Analysis (Immune System)  
July 31/Aug 3:        **Expt 12:**-Serological Testing  
Aug 3/Aug 7:         **Unit Exam III**

Aug 3/Aug 7:         **Course Evaluations**

## Academic Integrity

We take academic integrity seriously. At minimum, academic integrity means that no one will use another's work as their own. The Student Conduct Code defines infractions to academic integrity as:

- Cheating: includes using unauthorized sources of information and providing or receiving unauthorized assistance on any form of academic work or engaging in any behavior specifically prohibited by the faculty member.
- Plagiarism includes copying language, structure, ideas, or thoughts of another, and representing them as one's own without proper acknowledgment. *(This includes copying answers found on internet sites such as Quizlet, Chegg, and Anki, etc. and the use of AI)*
- Unauthorized Possession or Disposition of Academic Materials; includes the unauthorized selling or purchasing of examinations or other academic work; stealing another student's work; unauthorized entry to or use of material in a computer file; and using information from or possessing exams that an instructor did not authorize for release to students.
- Falsification; any untruth, either verbal or written, in one's academic work.
- Facilitation: knowingly assisting another to commit an act of academic misconduct.

Source: Student Conduct Code (page 4) [Student-Conduct-Code.pdf](#)

If you plagiarize your work, you could lose credit for the plagiarized work, fail the assignment, or fail the course. At a minimum, violations will result in a grading penalty in this course and potentially a report to the Office of Student Resolution Center.

Of course, academic integrity means more than just avoiding plagiarism. It also involves doing your own reading and studying. It includes accessing the Canvas site regularly, careful consideration of all class materials, and engagement with the class and your fellow students. Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, we will ask to you check off on the CSU Honor Pledge as part of completing all Exams.

"I have not given, received, or used any unauthorized assistance."

## Exams

There will be three written proctored (closed book) unit exams all administered via Canvas. Each unit exam will emphasize the material in that unit (four experiments each). Each of the three exams will consist of 100 points (~80 questions evenly distributed over the tutorial information and laboratory information/exercises). Questions on these written exams will be taken from tutorials, lab exercises, Lab Reports, Concept Tests, and Pre- and Post-Lab quizzes found in PDF files. Extensions for Exams are rare and will result in a 10% deduction per 12-hour extension with a limit of 24 hours. Plan ahead to avoid extenuating circumstances.

### Exam Proctoring:

This course will utilize Respondus LockDown Browser & Respondus Monitor to proctor your online exams.

### **What is Respondus LockDown Browser/Monitor?**

Respondus LockDown Browser is a custom web browser that is used to access quizzes in Canvas. Respondus Monitor is an extended feature of the Respondus LockDown Browser that uses a web camera and microphone to monitor students during an exam. When the LockDown Browser is enabled, students are prevented from opening additional tabs, accessing other applications on their computer, and taking specific actions while on the quiz (e.g., taking screenshots, copying, printing). It along with Respondus Monitor allows you to take your exam from the comfort of your home. You DO NOT need to create an account, download software or schedule an appointment in advance. Respondus is available 24/7 and all that is needed is a computer, a working webcam, and a **stable** Internet connection.

- When you are ready to take a test, log into Canvas, go to your course, and click on your exam. The first time you access an exam (Practice Quiz in BMS 320) Respondus LockDown Browser will be installed on your computer.
- There will be an authentication process, where you will take a picture of yourself, show your ID, and complete a scan of your room.
- Respondus Monitor will record your exam session by webcam as well as recording your screen.
- Good luck! Respondus help is available 24/7/365. If you encounter any issues, you may contact help by live chat and/or email (support@respondus.com.)

## Assignment Policies for BMS 320

- Weekly: Materials for the week's experiment are released at 8 pm on Monday or at 8 am on Friday and are due at 8 am the following Friday or 8 pm the following Monday. See the schedule for specific assignments on each date.
- Please plan ahead to allow for technical problems or extenuating circumstances.

**Late Submissions:** Assignments not submitted by the due date will be accepted with a 25% deduction for late submissions of up to 12 hours and a 50% deduction for late submissions of up to 24 hours. The assignment will be given a zero after 24 hours.

**Early Submissions:** In order to encourage students to submit assignments early (and spread out the grading process for the instructor), extra credit points will be added to the Lab Report grade for Experiments submitted 24 hours or more before the deadline. All exercises for the experiment including the Concept Test, uploaded PDF Activity Files and the Lab Report must be completed for the extra credit points to be awarded. Grades in this course are NOT curved, so the grades of students who choose to submit assignments according to the assigned due date will not be affected negatively by this policy.

Wednesday morning deadline:

before 8 pm Sunday or 8 am Thursday: 5 points

before 8 pm Saturday or 8 am Wednesday: 10 points

### Assignment Completion Sequence

(Order can be altered to meet your learning style after the first week.)

- ✎ Draw It to Know It tutorial (abbreviated DiKi from now on) and/or Animations on Canvas
- ✎ Concept Test on Canvas
- ✎ PhysioEx 10 Laboratory Simulation Exercise  
(abbreviated PEx from now on)
- ✎ Fill in Data Charts for the Lab Report (optional but recommended if having difficulties analyzing data.)
- ✎ Lab Report on Canvas
- ✎ Upload PDF Activity Files to Canvas

### Procedures

1. Do the assigned tutorials on DiKi and/or view the assigned animations.
2. Take Concept Test:  
Conditions for Test:
  - one attempt
  - untimed
  - open book
3. Download the optional Data Charts
4. Log onto PhysioEx 10.0.
  - a. Select Exercise 1-Activity 1
  - b. Read the Activity Objectives. Click [Next]
  - c. Read Introduction and click [Next].
  - d. Take the Pre-lab Quiz. Click [Next] after each question.

- e. [Submit] the Pre-lab Quiz.
  - f. Read each instruction, do what it says. Then click [Next].
  - g. **Be sure to answer the "Stop and Think" and "Predict" Questions as they are presented.** [Submit Question].
  - h. Once you complete the Experimental procedures for Activity 1, [Submit] to record results of the Lab, then select [Submit] to record answers..., and proceed to the Post-lab Quiz.
  - i. Answer Questions in Post-lab Quiz. You can review data by clicking View Experiment Results or use the Optional Data Charts if you complete them. Select [Next] to move to next Question.
  - j. After completing the Post-lab Quiz, select "[Submit] to record your answers..., and proceed to the Review Sheet."
  - k. **When Review Sheet Question 1 is presented, click [Next] to bypass it. Repeat for next three Review Sheet Questions. The questions will be answered as part of your Lab Report Assignment to follow.**
  - l. Select "[Submit] to record your answers in the Lab Report..."
  - m. Your completed Lab Report will be presented. **Click [Printable Version] at the bottom of the page.**
  - n. Enter your name. **[Required]**
  - o. Click [Print] at the top of the screen. **Print as a PDF file to a folder on your hard-drive that you can easily access.** Do not change the default name. Print a copy to be used in answering questions in the Lab Report and studying for exams.
5. Optional: Fill in the Data Charts for Activity 1. This will help you observe and evaluate the data you collected, and the organization of the Data Charts should make evaluation of the data easier.
  6. Repeat steps b-o above with all assigned Activities for that Lab Experiment.
  7. Complete and submit the Lab Report on Canvas.  
Conditions for Lab Report
    - one attempt
    - untimed
    - open book (use your PhysioEx Exercise Activity x.pdf files).
  8. Upload the PDF Activity files.  
Submission of the Activity Files:
    - Use the Submit Assignment link on the right side of the "Upload PDF Activity Files Here" window in Canvas.
    - **Repeat the upload process with each Activity PDF file saved while doing the Laboratory Exercises.** For example, you will have the following Activity Reports for Experiment #1. **Do Not change the name** of the Activity Report pdf file. There will be a one-point deduction for each changed name.
      - PhysioEx Exercise 1 Activity 1.pdf
      - PhysioEx Exercise 1 Activity 2.pdf
      - PhysioEx Exercise 1 Activity 3.pdf

## Grading Policies for BMS 320

1. Assignment available dates and times and due dates and times are listed in the schedule. Anything not submitted by the deadline will receive a deduction/zero. Contact me concerning extenuating circumstances, but since you have 3.5 days to do the exercise associated with each experiment, it is expected that you will schedule your time to accommodate last-minute problems or illnesses that might arise. This course moves quickly, and it will be hard to catch up if you get behind.
2. You can define your own schedule within the week if the assignment deadlines are met, however, you must complete all the assigned activities. The next set of assignments are released when the previous due date occurs.
3. The instructor will be available to answer questions from about 8 am to 5 pm Monday through Friday MDT and will monitor emails during the evening and on weekends but unless the problem is urgent, may not respond until the next morning or on Monday morning if contacted over the weekend.
4. Lab Reports will be graded and returned within 24 hours of the due date/time.
5. Concept Tests (on Canvas) are based on 50 points and have between 10-30 questions.
6. Lab Reports (on Canvas) are graded on a 100-point scale.
7. Uploaded PDF Activity files are worth 40 points and based on completion of the experiment and the post-lab tests found in the PhysioEx program that are completed at the end of each activity in the experiment.
8. Unit Exams will each be 100 points distributed over about ~80 questions (20 from each topic in the Unit) and are closed book. The highest exam grade will be counted twice at the end of the semester.
  - The Course Average will be calculated based on the following percentages:
 

Communication Assignments	5.0%
12 Concept Tests (Open Book)	12.5%
12 Lab Reports (Open Book)	20.0%
12 PDF Activity File Uploads	12.5%
3 (+1) Unit Exams (Closed Book)	50.0%
  - Communication Assignments help to develop a sense of community in the course and give the instructor insight into how the course is going for the students. Assignment Details will be given on Canvas at the beginning of the course.
  - The lowest score for the Concept Tests, Lab Reports, and PDF Activity Files will be dropped at the end of the semester. Use this policy to address extenuating circumstances such as illnesses.
  - The exam average will include 3 Unit exams plus the score for the highest unit exam grade.
  - Final Grades will be defined by the following breakdown. Note: scores are not rounded up.
 

90.00-100% = A;	60.00-69.99 % = D;
80.00-89.99% = B,	< 60% =F.
70.00-79.99% = C;	

