SANTA MONICA COMMUNITY COLLEGE DISTRICT
Faculty Evaluation Summary Form for Probationary Faculty
Year Four

NAME:	DEPARTMENT:
Kevin Roberts	Physical Sciences

Overall Rating		Recommendation	
☐	Satisfactory	☐	Employ the Probationary Employee as a Tenured Employee for All Subsequent Academic Years
■	Unsatisfactory	☐	Not Employ the Probationary Employee as a Tenured Employee

Signature	Date
Dept. Peer: FOROUZAN FARIDIAN (Dec 17, 2025 11:13:12 PST)	Dec 17, 2025
Dept. Peer: Emin Menachekanian (Dec 16, 2025 18:08:39 PST)	Dec 16, 2025
Dept. Chair, faculty leader, or designee:	Dec 16, 2025
Evaluatee:	Dec 17, 2025

Faculty member's signature does not necessarily imply agreement. It is merely an acknowledgement that the complete report has been read and a copy received.

Comments: (optional)

The evaluation committee was unanimous in its decision not to recommend tenure.

This determination is based on the documented, consistent failure to adhere to critical pedagogical standards, specifically regarding the timely grading and return of student assignments. This pattern of non-compliance undermines the student learning experience, which is a core criterion for tenure consideration.

Notes on the final evaluation

4th year, Kevin Roberts

Recap from Spring 2025

During our Spring 2025 conference, Prof. Roberts was asked to provide a written plan for how he would organize and manage his final probationary year at SMC, the exact recommendations read:

The committee will kick off the Fall 2025 evaluation process on September 9 at 11:15 am via a zoom meeting. Prior to the meeting, the committee has requested that Kevin submit a written plan no later than Friday, September 5, addressing the following points:

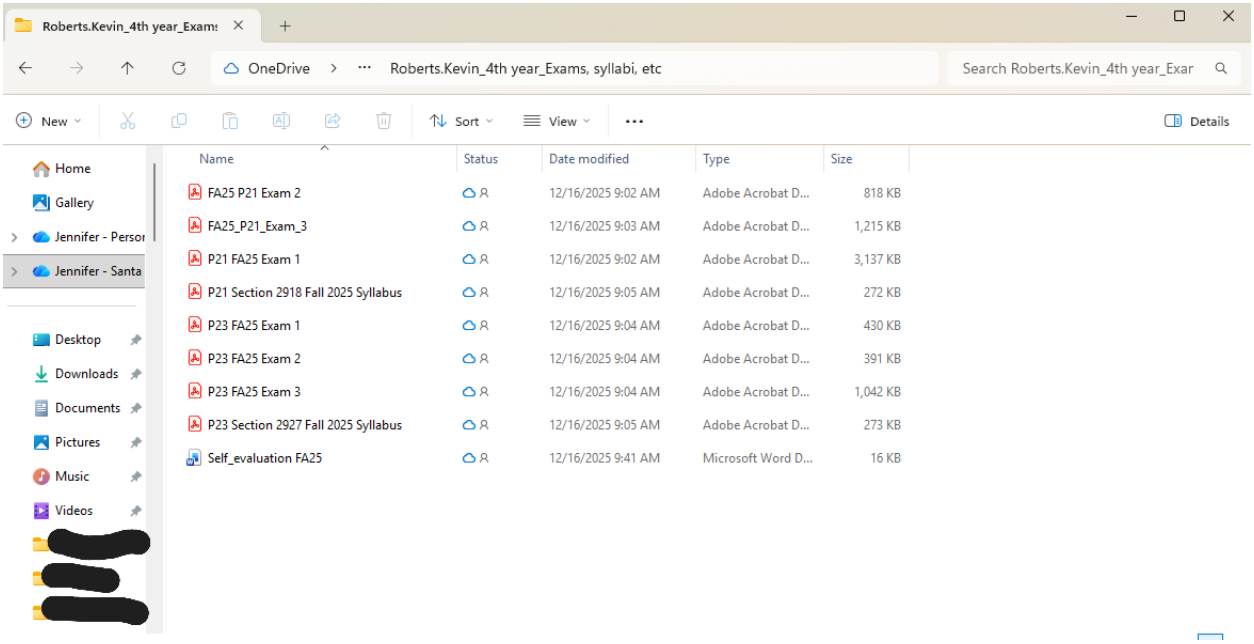
- Elaborate on the issues that arose as a result of not grading assignments in a timely manner in Fall 2024, and grading those assignments using a vague rubric that was not centered in physics logic. Discuss how he will avoid being in this situation again.
- Describe a plan for scheduling the right amount of lab activities for the semester to complement the lecture and can be graded and returned promptly to support learning.
- Describe a plan for how he will prepare rubrics for grading exams prior to giving the exams and returning the exams in a timely manner (two weeks or less). Include a plan for dealing with absences.
- Describe how, if he is awarded tenure, he will manage his time to fulfill his other responsibilities as a tenured colleague, including service work, all while meeting his obligations to his students, like providing fair, consistent, timely feedback.

This plan has been included in the evaluation packet immediately after this document.

Timeline of document submission

During our first conference of the Fall 2025 evaluation cycle, Prof. Roberts was provided with a timeline of materials due, which is also included after this document in the evaluation packet. The instructions request lay out a timeline for sample exams (within two weeks of administering) and syllabi (as soon as possible, or by week 5, per the contract). The deadline for the self-evaluation was set on November 26, so that the committee would have a chance to review it prior to our final meetings.

The exams, syllabi, and self-evaluation were uploaded to the committee's shared OneDrive folder on Dec 16. Most were uploaded with less than 30 minutes prior to our final committee meeting. In fact, the self-evaluation was uploaded after the committee began meeting privately. See screenshot:



Fall 2025 Grading

The main issue throughout the last year was that Prof. Roberts did not grade his students' exams with any urgency, if at all. All three committee members monitored the student gradebooks throughout the Fall semester. I downloaded the Canvas gradebook as a cvs file every few weeks, typically a week or two after an exam had been administered. The other members took screenshots of the class Gradescope dashboards showing grading progress for each class. These screenshots are included later in the evaluation packet to document the lack of grading through the Fall semester.

Commendations & Recommendations

Kevin Roberts | Spring 2025

In Fall 2024, the committee gave Kevin several recommendations for how he should address some large issues associated with grading. After the close of the Fall 2024 semester, several student complaints came in about how late grades were posted, the fact that they walked into the final not knowing where they stood in the course, and concerns about how their exams and labs were graded since no assessments were returned. More details are described in the narrative written by Committee Chair, Jennifer Hsieh.

While Kevin made some progress towards the goals outlined in the Fall 2024 commendations and recommendations, the committee unanimously voted in support of giving Kevin an overall "unsatisfactory" on the Spring 2025 evaluation to underscore that Kevin has not made enough progress towards these goals.

As Kevin concludes his third year of the probationary process, he only has one semester remaining: Fall 2025. The committee feels that there are no additional recommendations to offer – the previous evaluations in the last three years are still very relevant. Kevin should review them and take to heart the recommendations made previously. As we go into the last semester of the evaluation period, the committee would like Kevin to demonstrate his best effort toward what he would look like as a tenured colleague.

The committee will kick off the Fall 2025 evaluation process on September 9 at 11:15 am via a zoom meeting. Prior to the meeting, the committee has requested that Kevin submit a written plan no later than Friday, September 5, addressing the following points:

- Elaborate on the issues that arose as a result of not grading assignments in a timely manner in Fall 2024, and grading those assignments using a vague rubric that was not centered in physics logic. Discuss how he will avoid being in this situation again.
- Describe a plan for scheduling the right amount of lab activities for the semester to complement the lecture and can be graded and returned promptly to support learning.
- Describe a plan for how he will prepare rubrics for grading exams prior to giving the exams and returning the exams in a timely manner (two weeks or less). Include a plan for dealing with absences.
- Describe how, if he is awarded tenure, he will manage his time to fulfill his other responsibilities as a tenured colleague, including service work, all while meeting his obligations to his students, like providing fair, consistent, timely feedback.

Dear Tenure Committee,

I want to clarify my plans for Fall 2025 to hold myself accountable so I hopefully will obtain tenure at SMC. My goal is to be an outstanding, organized, timely, enthusiastic and dependable colleague.

In Fall 2024, several issues occurred. My first mistake was not having rubrics prepared before I gave the exams. After I gave the exams, and before I graded them, I agreed to temporarily take over Masoumeh Rousta's class for an extended period until the department could hire an adjunct to teach the remainer of the semester. I love teaching and sharing my knowledge of physics with students. Looking back, I was not prepared to take on the additional load, I hadn't begun to grade my own exams. While it "fit" my schedule, I was working very long hours and finished each day late and exhausted. I also covered for Emin Menachekanian's class for a bit as well. It was a relief when Masoumeh's position was filled with an adjunct and Emin returned, however, I kept overextending myself helping acclimate the new hires.

Eventually, my health was impacted. In October, it began with lightheadedness, vomiting, severe abdominal pain, and nearly fainting in front of Ingrid. This problem led to a diagnosis of kidney stones. Thankfully, this issue did not require me to cancel or miss any of my classes. However, the CT scan revealed a suspicious mass in my colon. It required further lab tests, and I was eventually scheduled for an upper and lower colonoscopy in mid-November. Thankfully, the results were negative. In retrospect, I was trying to be strong and not place any more stress or burden on the department. I felt my own health issue was insignificant compared to those of my colleagues who were facing

severe health issues. In hindsight, I should have reached out for guidance. My students deserve ongoing, punctual evaluation of their course work. By the time this was resolved, my grading was very delayed. Attempting to catch up, I created generic rubrics that were not specific to physics. They merely assessed if the student got the correct answer, had “great”, “good”, or fair progress on their exam questions taking a wholistic approach. This lack of grading the exams until the final weeks of the semester resulted in some very strong accusations from students that were surprised in their grades being low after their exam grades were entered. In the semester before, Spring 2024, I was bit lenient in my grading rubric in similar manner; and, with test corrections, I had inflated scores, with excessive amount of “A” grades awarded that semester. After Spring 2024, I decided I am no longer do test corrections and curve only when necessary. By evaluating the exams promptly, I’ll avoid the scenarios in the Spring 2024 or Fall 2024 semesters. Now, my grades grounded in students’ performance so they will be ready for the next physics class in the series.

In the Spring 2025, I made some progress. My lectures were more on topic, and the first exam for each class was returned within a week. However, for the second exam, several students were absent with documented excuses. When it came to make-ups, several of them had more and more delays. This delayed my grading of my exam 2. I should have been grading the exams I currently had and created an alternate grading scheme for the remaining students. Eventually, I did grade the exams. The third exam and final were returned quickly for each class. For the Summer 2025 session, I was on top of my grading. Each of my exams were graded promptly after giving them. Also, all the rubrics

were completely physics-based: positive scoring for each concept that was illustrated or step that was completed.

During the summer, I delivered lecture topics concisely with well-organized notes. The notes are already templated as lecture slides, and I annotated on top of them. After considering my options, I have decided to get a paper-like screen protector to improve my handwriting and drawing on my iPad, per Emin's suggestion. With most of the notes templated, I don't need to rush as much writing material down. If I need to write longer sentences (usually from a student's question), I will use a keyboard I have attached to my iPad. During Summer 2025, I was continually completing lecture material ahead of schedule, giving students time for more examples, review days before exams, and homework workshops. As per Emin's suggestion, during my lectures I will take opportunities to foreshadow concepts to come. For example, while discussing work as a process and transfer of energy with the net work changing the kinetic energy; I will mention that later that we will consider certain kinds of processes that do work could be thought of as "releasing" a potential energy. And from Jenn's suggestion, if there is a student-led detour from the course material, I will clearly delineate what is and isn't required for my students to know for the exams and clarify when discussions are aimed at satisfying student curiosity. Per Forouzan's recommendation, I swapped out the examples from the given textbook to examples from other sources. (I mainly used Serway's College Physics as a source for examples.) I will continue this practice into the Fall semester. At the committee's recommendation, I included more think-pair-share activities. From Jenn's recommendation, I had the activities be multiple-choice and graded automatically, with answers collected by Microsoft Forms, submitted on their phones. The credit is

categorized as part of “In-class work”; rewarding 2 points for participating; rewarding 1 point for the correct answer; and allowing two of the lowest scores to be dropped. Student had thoughtful discussions of the concepts with their peers during the think-pair-share activities.

Also, during the summer, the lab activities ran very efficiently. Now that I am very familiar with the lab activities, I was able to have the students begin their experiments after 15-20 minutes of explaining the apparatuses. Consequently, all groups would finish their activities in the time allotted, and I was able to review their data before the lab period ended. I also set a firm boundary that students could not join a lab group after the introduction was concluded (which was more than 15 minutes late on lab days). I plan to continue this structure for lab activities in the future.

For Fall 2025, I plan on writing the exam rubric and posting it to Gradescope prior to each exam. This will enable me to begin grading the exams upon completion. I plan on giving each exam on a Wednesday. Since my schedule is a Monday-Wednesday-Friday pattern, I plan on grading them on the subsequent Thursday, Sunday, and Tuesday. I plan on spending a minimum of 15-20 hours grading per week and committing to a few hours on Mondays and Wednesdays during exam weeks. My goal is to grade and post scores within a week, and if I commit full days to grading on that schedule, I will certainly have exams graded and returned in less than 2 weeks. I also plan to stagger the second and third exams for the 2 classes so the workload will be more balanced. Exam 1 can’t be staggered for the 2 classes because I want to give an exam in each class before the “drop without a W” deadline. For excused absences, I will allow make-ups within one week

if they are documented, as this will allow me to release grades on a timely schedule. However, after the 1-week deadline, no make-up exams will be permitted. To compute their grade, I'll either average the other two exam scores or replace it with the final exam grade, whichever is higher. I already have my exams for Physics 21 (with a key and rubric for each) written, and I plan on having my key and rubric written before I give my Physics 23 exams.

For lab activities, I plan on having 11 activities for each class. I believe 11 is the appropriate number to be able to cover a large variety of topics, while being manageable to grade in a timely manner. For physics 23, while there are more possible lab activities (i.e. the heat engine and diffraction) that I am interested in developing later, I will keep them as demonstrations for now. I have developed the rubrics for grading the labs during previous semesters, so I will be able to grade them promptly as part of my Thursday-Sunday-Tuesday grading schedule. To aid in their data-taking and to help them to make comparisons of their data to models, I have prepared Excel files for each lab activity. In the future, I would like them to make Excel files themselves as a pre-lab activity, where they make their own coded spreadsheets based off of sample data (of a similar but not the same situation so they couldn't just use it to "spoof" their data). If this is implemented, the grading of the pre-labs would be streamlined.

As I did at last semester's end, when I observed Forouzan's last labs for Physics 21 and 23, I will observe Emin and Forouzan when they give their pre-lab lectures in order to learn how to give effective and engaging lectures.

If I am awarded tenure, I plan on completing my service work in addition to the teaching/grading schedule I have outlined. Curriculum Committee meets every other Wednesday, and we receive the new packets on the following Wednesday. Every Thursday after receiving the new packet and each Tuesday prior to Curriculum Committee meeting, I will review these packets in detail. I also plan on guiding our AD-T for Physics and the curriculum that Sarah is developing through the committee so that our coursework transfers as smoothly as possible. I will be advising a club, Software Society Club, during activity hour after ensuring that the times do not conflict with our department and tenure evaluation meetings. I'll encourage the students to take the lead while appropriately vetting any invited speakers. Also, during our transition between Physics lab techs this semester, I will help set up and put way the experiments that I will use. Fortunately, I was a very similar lab schedule with Forouzan (where she has her Physics 21 and 23 labs on Thursdays and I mine on Fridays), so we can work together in coordinating our labs. Eventually, I would like to help update our lab manual. It is something I can contribute to the department in the future. I also will help ensure the new building's labs are fully operational in the Fall 2025 semester. I will coordinate with Kyle Strohmaier and other faculty to see how I can be the most helpful.

In conclusion, I want to exceed all the committee's expectations for tenure. I am focused on returning feedback on exams and lab reports within 2 weeks for exams, one week for lab reports. I'll have rubrics for my assignments and exams written ahead of time. I will give focused lectures and pre-labs to give my students time to problem-solve

themselves. I am committed to becoming the best professor I can be for my students, as well as a great colleague to my peers at SMC.

Fall 2025 Evaluation Process: A Guide for Faculty

Faculty Member: Kevin Roberts, 4th year

This document outlines the process for your Fall 2025 faculty evaluation. The goal of this evaluation is to provide a comprehensive and supportive review of your work.

Evaluation Committee Members

- **Jennifer Hsieh**, Department Chair
- **Emin Menachekanian**, Department Peer
- **Forouzan Faridian**, Department Peer

Key Information and Reminders

- **Teaching Schedule:**
  Physcs 21
  MW 8:30 – 11:00 am, Sci 101
  F 8:30 – 11:30 am, Sci 101

  Physcs 23
  MW 12:30 – 2:35 pm, MSB 316
  F 12:30 – 3:30 pm, MSB 316
  Please notify the committee immediately if your schedule changes.

- **Syllabus and Schedule:** Please send your current syllabus and teaching schedule to the committee as soon as possible.
- **Canvas Shell Access:** Provide committee members with access to your Canvas course by submitting the SMC's SMC's Alternative View Request Form
- **Classroom Visits:** Visits from your evaluators will be unannounced.
- **Final Meeting Date:** TBD.

The Evaluation Timeline

Below is a step-by-step guide to the evaluation process, with key actions and deadlines.

Step 1: Self-Evaluation Submission

- **Action:** Submit a comprehensive self-evaluation to your evaluators. This should be a narrative describing your current teaching methods, your plans for improvement, and any professional growth activities you've been involved in.
- **Deadline:** Committee is requesting that it is submitted no later than **November 26** (the end of the thirteenth week).
- **Note:** For additional guidance, please review the **Faculty Self-Evaluation** document attached to this email.

- **Additional note:** In the 4th year, you should include an updated plan for professional development along with your self-evaluation.

Step 2: Exam and Materials Submission

- **Action:** Submit two of your most recent exams to the committee. Grading rubrics should be submitted with the exams. Optional materials such as quizzes or worksheets can also be submitted to provide a more complete picture of your teaching approach.
- **Deadline:** Within two weeks of administering the exam.

Step 3: Classroom Observation

- **Timeframe:** Now through **November 21** (the end of the twelfth week).
- **Action:** Your evaluators will conduct one or more unannounced classroom visits to both lectures and labs.

Step 4: Student Evaluations

- **Timeframe:** Coordinated by Human Resources.
- **Action:** You will receive an email from HR with instructions on how to administer student evaluations through Canvas.

Step 5: Forms Review and Conference

- **Action:** Your evaluators will provide you with the **Class Observation Forms** and the Chair will provide you with the **Professionalism Form**.
- **Review:** You will be given a minimum of 24 hours to review these forms before your individual conferences.
- **Conference:** Meet with each evaluator separately to discuss their observations. You will sign the forms at this time, which confirms you have received and discussed them. Your signature does not indicate agreement with the content.
- **Deadline for Forms:** Forms must be given to you by **November 21** (the end of week twelve).
- **Deadline for Conferences:** Conferences must be completed by **November 26** (the end of week thirteen).

Step 6: Committee Review and Final Meeting

- **Action:** All evaluators will submit their materials to the Chair, who will share them with the committee. The committee will meet to complete the **Evaluation Summary Form** and then meet with you to discuss the final evaluation.
- **Deadline for Materials to Chair:** No later than **December 12** (the end of week fifteen).
- **Deadline for Committee Final Meeting:** No later than **December 19** (the end of week sixteen).

Step 7: Written Response and Final Submission

- **Action:** You have the option to submit a written response to your evaluation. This will be included in your final evaluation packet.

- **Deadline for Written Response:** Within 10 business days of your final evaluation conference.
- **Final Submission:** The Chair will submit all signed forms and supporting documents to HR no later than **December 19**.

FACULTY OBSERVATION FORM

Evaluation of: Kevin Roberts Semester: Fall 2025

Department: Physical Sciences

Evaluator: Jennifer Hsieh Position: Department Chair

Knowledge, Skill and Ability as an Instructional Faculty Member	Satisfactory or Better	Needs Improvement	Unsatisfactory	Not Observed (NO) Not Applicable (NA)
1. Establishes a student-instructor relationship conducive to learning	◉	○	○	○
Comments:				
2. Communicates ideas clearly and effectively	◉	○	○	○
Comments:				
3. Stimulates students' interest and desire to learn	◉	○	○	○
Comments:				
4. Promotes active involvement of students in learning activities	○	◉	○	○
Comments: Active involvement during the lecture was very limited to a few multiple choice questions. Students asked very few questions.				
5. Demonstrates sensitivity in working with students from diverse backgrounds and with different needs	◉	○	○	○
Comments:				
6. Employs appropriate pedagogy	○	◉	○	○
Comments: See notes on shift to using publisher slides.				
7. Begins class promptly and ends at time designated on schedule of classes	◉	○	○	○
Comments: Was 2 minutes late to lecture, but I don't know the back story. At least on lab day, students looked like they were on track to finish by the end of class.				
8. Uses class time efficiently	◉	○	○	○
Comments: Ok, not great. The lab day was the best I've seen. The lecture day, he got distracted with setting up the air track for an extemporaneous demonstration.				

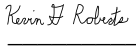
9. Maintains an appropriate pace during class session	◉	○	○	○
Comments:				
10. Provides students with a syllabus which includes a written explanation of the evaluation process, expectations and requirements, assignments, course content, relevant dates, and other information	◉	○	○	○
Comments:				
11. Teaches course content that is consistent with the official course outline of record	◉	○	○	○
Comments:				
12. Uses materials pertinent to the course content	◉	○	○	○
Comments:				
13. Teaches at a level that is appropriate to the course content	◉	○	○	○
Comments:				
14. Has appropriate command of the subject matter to be able to respond to students' needs	◉	○	○	○
Comments: He is always happy to answer student questions related to the material.				
15. Assesses students' progress regularly	○	○	◉	○
Comments: While students are assessed regularly, they have not received their grades for Exams 1 or 2 or any of their labs this semester. Instructors obligation goes beyond assessing, the feedback is equally crucial.				
Additional comment: Please review my comments in the attachment.				

Date(s) of Visit: Oct 10 & Oct 29

Length of visit: 2hrs & 1.5hr Course (if applicable): Physics 21

Conference Date: 11/25/2025

Evaluator's Signature: 

Evaluatee's Signature: 

Faculty member's signature does not necessarily imply agreement. It is merely an acknowledgement that the complete report has been read and a copy received.

Observation Notes

Evaluation of Kevin Roberts

Fall 2025

Beyond the classroom, Nov 17, 9:40 am

At the time of writing up my observation notes, I have checked the committee's shared folder for standard documents requested by the committee. Currently the folder that should contain files for Exam 1 and Exam 2 from both Physics 21 and Physics 23 is empty. The syllabi for both classes should also be available in this folder, neither are there.

I have reviewed the Canvas gradebooks for both Physics 21 and Physics 23 and present my findings below.

Physics 21

In Physics 21, the weekly homework assignments from Week 1 – 11 have been populated, presumably from a homework system. "In class work" points have been entered for the weeks from Sept 8 through Oct 15.

All labs, labs 1 – 11, remain ungraded. According to the syllabus available on Canvas, students would have collected data on lab #10 last Friday. So I would expect at least labs 1 – 8 to be graded and returned to students. Lab 8 was conducted on Oct 31, allowing students a week to complete the analysis. Students should submit Lab 8 by Nov 7 and that would give Prof. Roberts 10 days to grade it.

Exam 1 and Exam 2 remain blank in the gradebook. According to the syllabus posted on Canvas, Exam 1 was administered on Sept 24. Exam 2 was administered on Oct 22. Exam 3 will be administered on Nov 19th.

Physics 23

In Physics 23, the weekly homework assignments from Week 1 – 12 have been populated presumably from a homework system. "In class work" points have been entered for the weeks from Sept 8 through Oct 8. There are no entries beyond Oct 8.

All labs, lab 1 – 12, remain ungraded. According to the syllabus available on Canvas, students would have collected data on lab # 10 last Friday. So, I would expect at least labs 1 – 8 to be graded and returned to students. Lab 8 was conducted on Oct 31.

Exam 1 remains blank in the gradebook. Exam 2 does not have a column in the gradebook. Exam 1 was administered on Sept 24. Exam 2 was administered on Oct 29. Exam 3 will be administered on Nov 19.

Summary on grading

Grading has been an issue for more than a year. The problem became apparent in Fall 2024 when the committee noted that almost every student in the Spring 2024 term was awarded an A. Further review revealed that this outcome was due to a failure to grade most of the assignments, and the limited grading that did occur was lacking in rigor or depth.

Since then, Prof. Roberts has attempted to adjust, like in Fall 2024. However, assignment grades were posted just before the final letter grade due date, which surprised many students. This approach resulted in two students filing grade appeals at the start of the Fall 2025 term. While the grade appeal committee upheld the original letter grade of one student (the second is still under review), they provided the following recommendation to Prof. Roberts:

> *The Committee firmly believes that failing to return exams to students until finals week is thoroughly unacceptable. The Committee strongly recommends prompt grading of course work and exams noting that timely feedback to students is critically important to the learning experience. Communication regarding any delays in grading should be sent out to students as soon as possible and include expected timelines for grading submissions.*
>
> *Likewise, the rationale with regards to test corrections and the implementation of a grading curve should be clearly articulated in the syllabus to prevent any future misunderstandings. Furthermore, if necessary, the syllabus should specify that exams are to be returned prior to subsequent exams, ensuring that students have the essential information needed for their success. This additional clarity will aid in preventing future complications and enhance student experience.*

The Grade Appeal Committee reiterates the concerns communicated by Professor Robert's tenure committee over the past year. However, this situation remains unresolved: Current gradebooks for the Fall 2025 term show that no exams or lab reports have been graded. The failure to evaluate student work is a fundamental breach of an instructor's primary duties.

Classroom visit, Physics 21, Oct 10

I visited Prof. Roberts' Physics 21 class on Friday, Oct 10. The class was scheduled to complete Experiment 5, Newton's Laws. I arrived at 8:50 am, 20 minutes after class started. I stayed until 11:00 am, class was scheduled to end at 11:30 am.

By the time of my arrival, I noted good attendance. Students' eyes were up and focused on what Prof. Roberts was saying. While students were watching, very few were taking notes. This is an area that needs improvement. Students should be taking notes for the prelab and it's something that the instructor should remind them to do.

For the most part, the instructions were clear. He outlined a few equations and suggested how to set up their data table. At some point during the lecture, he disappeared to the stockroom and came back with a pulley. He started to demonstrate how to use the pulley and then left to the stockroom again to get something else. I would encourage Prof. Roberts to be better prepared and have the equipment set up ahead of time.

Around 9:05 am, students broke into 7 groups . Generally everyone seemed to know what they were supposed to do. This is a big improvement over past lab observations.

I watched the students work on their labs until 11 am. By that time, 6 out of 7 groups have moved on from the wooden block on an incline to studying the pulley systems. Overall, the classroom felt calm and organized. Students did not appear to be feeling rushed or unprepared. In this area, I note major improvement.

Classroom visit, Physics 21, Oct 29

I visited Prof. Roberts class on Wednesday, Oct 29. I arrived before 8:30 am. Class starts at 8:30 am. Kevin arrived at 8:32 am. When we entered the classroom, only 6 students were present. Prof. Roberts was able to start lecture at 8:34 am.

Prof. Roberts jumped right into lecture with no "good morning" or any sort of greeting. It appeared that he picked up in the middle of a concept or problem that the class was solving during their previous class meeting. I would encourage Prof. Roberts to start with a greeting and a review of their last discussion, especially if jumping right into the middle solving a problem presented at the last class meeting.

As Prof. Roberts moved through the material, I noticed that there was a student in the back watching YouTube. Generally, the five students in the front were very engaged, whereas the students sitting elsewhere were not as engaged.

In this class meeting I noticed that Prof. Roberts has switched from using his own follow along notes to using publisher slides. He spent considerable time typing on the slides while audibly reading as he types. As I look back on how he presents his lectures, it reminds me a lot of how many of us taught during the pandemic, where we didn't have an active audience to interact with. As instructors, it was common to solve problems by narrating out loud as we go, while not really checking in with students (because there were none, if the class was asynchronous).

By 8:50 am there were 15 students present. At that time, he went to the back of the classroom to grab gliders from a drawer to do an extemporaneous demonstration.

After the demonstration, he began talking about impulse and proceeded to type a whole paragraph on the publisher slide, however the font size was so small that I could not read it.

Prof. Roberts gave the students a problem to solve, I believe it was labeled 11.1. There were answers a – f. He had students submit their answers using a QR code that leads to a MS Office form. However, the form did not appear to be working. Also, during the time that the students were supposed to be working on the problem, he started talking about the Dodgers game and the physics related to why the game may have gone the way it did – materials, collisions, air temperature.

At 9:27 am, he gave the students a 10-minute break, 18 students were present.

After the break, he gave an impromptu demonstration using the air track system. Afterward, he asked students to complete the "stop to think" question 11.2, however the font was so small that I could not see the text of the question.

At 10:00 am, I left the observation.

I am confused by Prof. Roberts' apparent shift in instructional material preparation. While his initial use of chalk talks (Fall 2023) was hampered by disorganization and illegible writing, the committee's recommendation led him to produce initial custom follow-along notes that demonstrated positive momentum. However, his current reliance on generic publisher slides in this final probationary year appears to be a significant step backward from the personalized materials he had begun to develop. This return to basic, non-customized materials raises questions about his sustained commitment to engaging with and preparing unique content for his courses.

A persistent and critical area for development is Professor Roberts' lecture delivery, specifically the lack of conceptual synthesis and storytelling. I have observed that his instruction often defaults to simple narration (e.g., reciting definitions or solving problems from the instructor bench) rather than active teaching and facilitation. He tends to present information sequentially but fails to consistently connect the complex concepts or convey the underlying "story" of the theory and its real-world application. Effective teaching requires integrating these ideas to provide context and meaning; therefore, developing this element of conceptual integration is a crucial to enhance student comprehension and engagement.

FACULTY OBSERVATION FORM

Evaluation of: Kevin Roberts Semester: Fall 2025

Department: Physical Sciences

Evaluator: Forouzan Faridian Position: Associate Professor of Physics

Knowledge, Skill and Ability as an Instructional Faculty Member	Satisfactory or Better	Needs Improvement	Unsatisfactory	Not Observed (NO) Not Applicable (NA)
1. Establishes a student-instructor relationship conducive to learning	◉	○	○	○
Comments: Professor Roberts demonstrated the lab and invited students to see it upcllose and ask questions. Professor Roberts attended various lab groups and helped them as needed.				
2. Communicates ideas clearly and effectively	◉	○	○	○
Comments: During the lecture portion of the class professor Roberts used pusblisher's slides to introduce the concepts and proceeded to add to them while lecturing by typing on them.				
3. Stimulates students' interest and desire to learn	◉	○	○	○
Comments: Professor Roberts used a demonstration of polarizers to interest the students.				
4. Promotes active involvement of students in learning activities	◉	○	○	○
Comments: Professor Roberts passed polarizers around for students to experience it for themselves.				
5. Demonstrates sensitivity in working with students from diverse backgrounds and with different needs	◉	○	○	○
Comments: Professor Robert uses appropriiate and supportive language in the Syllabus to convey support for students of diverse backgounds.				
6. Employs appropriate pedagogy	◉	○	○	○
Comments:				
7. Begins class promptly and ends at time designated on schedule of classes	◉	○	○	○
Comments:				
8. Uses class time efficiently	◉	○	○	○
Comments: Professor Roberts used the end of the class time that was scheduled for a lab to continue the lecture, as the lab did not take the entirety of the session.				

9. Maintains an appropriate pace during class session	◉	○	○	○
Comments:				
10. Provides students with a syllabus which includes a written explanation of the evaluation process, expectations and requirements, assignments, course content, relevant dates, and other information	◉	○	○	○
Comments:				
11. Teaches course content that is consistent with the official course outline of record	◉	○	○	○
Comments:				
12. Uses materials pertinent to the course content	◉	○	○	○
Comments:				
13. Teaches at a level that is appropriate to the course content	◉	○	○	○
Comments:				
14. Has appropriate command of the subject matter to be able to respond to students' needs	◉	○	○	○
Comments:				
15. Assesses students' progress regularly	○	○	◉	○
Comments: No exams nor any labs have been graded as of the twelfth week of the course.				

Additional comment:
Please see attached observation narrative.

Date(s) of Visit: 11/7/25

Length of visit: 90 minutes Course (if applicable): Physics 23

Conference Date: 11/25/2025

Evaluator's Signature: _____

Evaluatee's Signature: Kevin H Roberts

Faculty member's signature does not necessarily imply agreement. It is merely an acknowledgement that the complete report has been read and a copy received.

Observations of Probationary Faculty: Kevin Roberts - Fall 2025

Professor Roberts is a fourth-year probationary faculty in the Physical Sciences department who is enthusiastic, active, and knowledgeable in his field. He is currently teaching Physics 21 and Physics 23 and is serving on the curriculum committee.

In previous discussions during the Fall term of 2024 and Spring of 2025, the tenure committee faculty had observed a significant delay in Professor Roberts' grading of labs and exams which had resulted in multiple students contesting their grades. The committee had intervened and asked professor Roberts about his grading practices during those terms, and the effect on students was discussed. Suggestions were made and Professor Roberts was asked to demonstrate to the committee that he was able to be managing his courses and grading in a timely manner without further direct input from the committee.

I looked at Professor Roberts' Canvas shell and Gradescope at multiple intervals(Weeks 7,8 and 10) and also observed his Physics 23 class in person. The following is a report of my observations followed by screenshots of Professor Robert's Canvas grades and Gradescope in the time period mentioned.

Midterm Review – End of Weeks 7 & 8

Canvas and Gradescope Review (October 17, 2025 – End of Week 8)

Upon reviewing Professor Roberts' Canvas shell on Friday of Week 7, the following issues were observed:

- No posted grades for any labs or for Exam 1 (administered in Week 4 to assist students with drop decisions).
- Students had submitted their work, but no feedback or scores were available.

Physics 21

- Only homework and classwork grades were posted.
- Exam 1: Partially graded
    - Gradescope shows 64% complete. No grades are posted.
    - Multiple-choice graded; long-response items graded only 0–46%
- Labs 1–4:
    - Submitted by students
    - Lab 1**:** 4% graded
    - Labs 2–4: 0% graded

Physics 23

- Canvas shows grades only for in-class work and homework**.**
- None of the seven labs or Exam 1 had grades entered.
- Grade-scope shows all assignments at 0% graded, despite student submissions (6 labs + Exam 1).

Observation: Impact of Grading Rubric Complexity

- Lab assignments appear to include detailed, subdivided rubrics with 100 points per lab. Note that Exams are also graded out of 100 points, while the weight given to labs does not equal that of exams.
- While thorough, this level of detail for lab grades seems extremely time-consuming and might be responsible for the lack of timely grading. This has resulted in no grade feedback for students during the first part of the semester.

Screenshots provided show:

- 19–26 students submitted labs 1-4 and Exam 1.
- All labs at 0% graded; Exam 1 at 64% graded on Gradescope. No grades are posted on Canvas.
- Students had no access to feedback on any major assignment.

Follow-Up Review – End of Week 10

At the conclusion of Week 10:

- Only homework and classwork (which only reflect 15% of total grade) had been graded.
- Students' Canvas grade totals are therefore misleading and not reflective of their actual performance**.**

Physics 21

- Grades visible to students are exclusively homework/classwork.
- Many students have stopped turning in lab work, as shown on Gradescope.(18 submissions for lab 6, and 0-1 submissions for labs 7-8…)
- Exam 1 grading increased only to 78%(of the exam, meaning none of the exams are fully graded**),** still incomplete six weeks after administration. No grades are posted on Exam I on Canvas.

Physics 23

- Class grades still reflect only homework and classwork. This results in the total grade for the class to be largely inflated and not an accurate value.
- Students continue submitting labs, but:
    - Exam 1 (Sept. 24) remains 0% graded**.**
    - All labs (including labs 1-8) remain ungraded.

Screenshots provided at the end.

Classroom Observation – November 7, 2025

Course Observed: **Physics 23**

Time**:** 12:35–2:15 PM
Session Type**:** Lab followed by lecture

Class had started with 14 students. Professor Roberts had set up the "Pfund Refraction" experiment and asked all the students to gather to see what to expect and see the "Ring" they were supposed to see. He talked about part I of the lab, how to find the index of refraction of the glass.
For part II, Professor Roberts demonstrated the second part and answered some questions. A few more students showed up. Then the class proceeded to perform the lab. They used the black-out curtains and Professor Roberts would go to different groups and help them as needed. Some students finished around 1:40 pm. Some all the way to 2 pm. Professor Roberts said there will be a lecture at 2 pm. The topic of the lecture was polarizers and polarization. He also passed polarizer filters around, talked about how multiple polarizers worked together, mentioned quantum mechanical probability of being in one state or another. Lecture slides were available to students. Professor Roberts was using Young and Freedman lecture slides and was typing on them.
All together the lab was OK, and lecture was OK.

While the students were engaged in performing the lab, I privately asked Professor Roberts if he was using any platform outside of Gradescope and Canvas to post grades, as I had not seen any grades on those. Professor Roberts said no, there were no other locations where grades were posted.

Overall Summary

Professor Roberts is an active Physics faculty member who is enthusiastic and caring. He is knowledgeable in his field and eager to come up with new experiments and demonstrations.

This said, there has been persistent deficiency on Professor Roberts' part to grade labs and exams for any of his courses during the first 10 weeks of the class. Teaching is not simply the presentation of material, but also guidance and timely feedback that provides opportunity for improvement and growth in learning. Without timely feedback on assignments, students are navigating the course blindly.

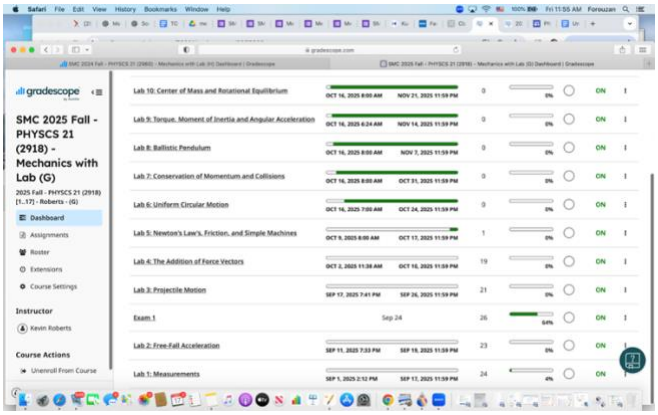
Professor Roberts' classroom instruction is fine, and he adds anecdotes and extra information for engaging the students, but the grading issue significantly impacts course quality and students' success. The continued absence of grading is particularly concerning given that students in Physics 23 will mostly be transferring, and need accurate, timely grade information to know their standing in the class and how they are performing. The lack of timely exam and laboratory grades updated throughout the term results in students having no accurate course grade information, preventing them from taking any measures to improve their grades on time, creating potential academic and emotional consequences for them.

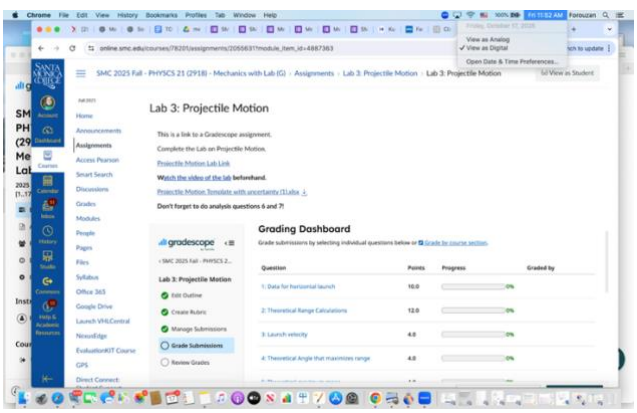
Despite the tenure committee's multiple previous interventions and recommendations, Professor Roberts has not demonstrated any measurable improvement on this front despite the extended timeline.

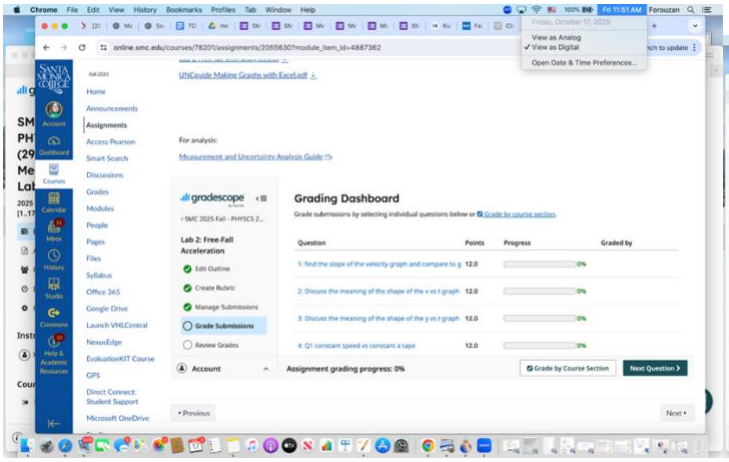
Addendum:

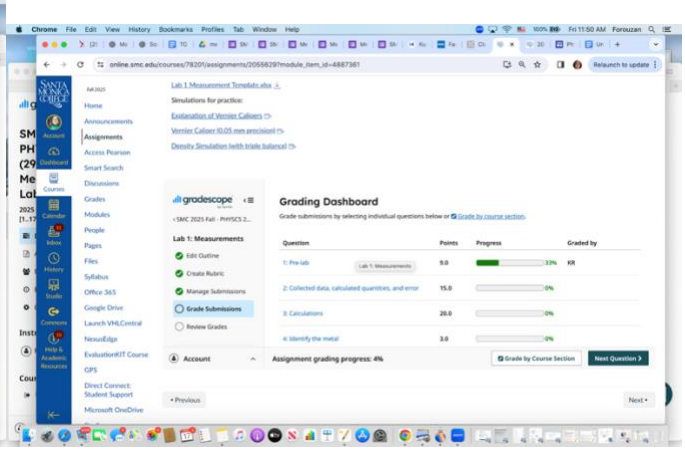
Screen shots of Professor Roberts' Canvas and Gradescope Fall 2025

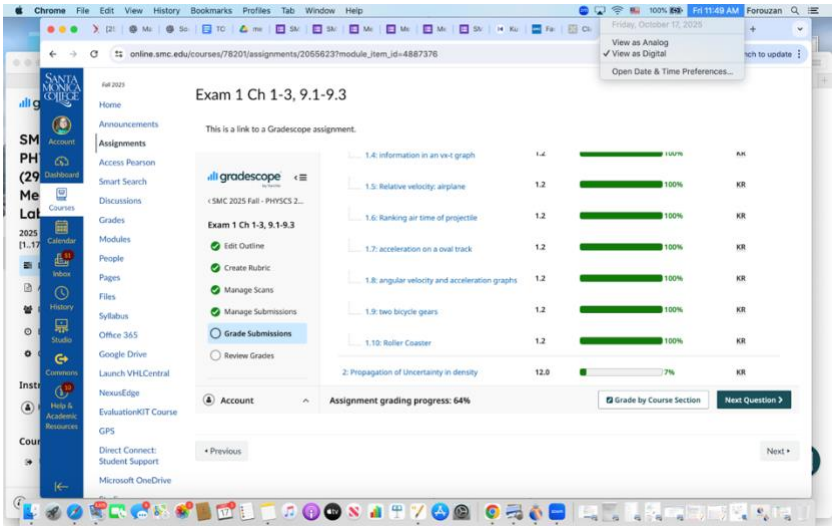
End of Week 8



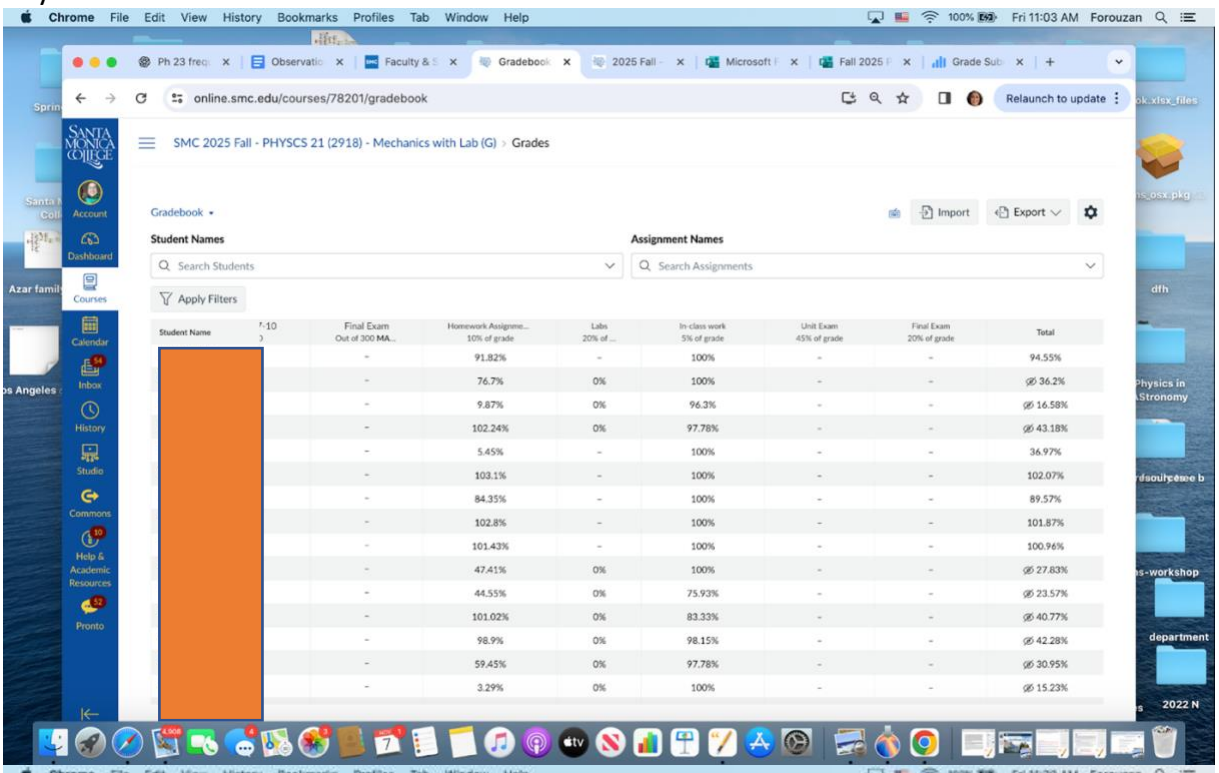


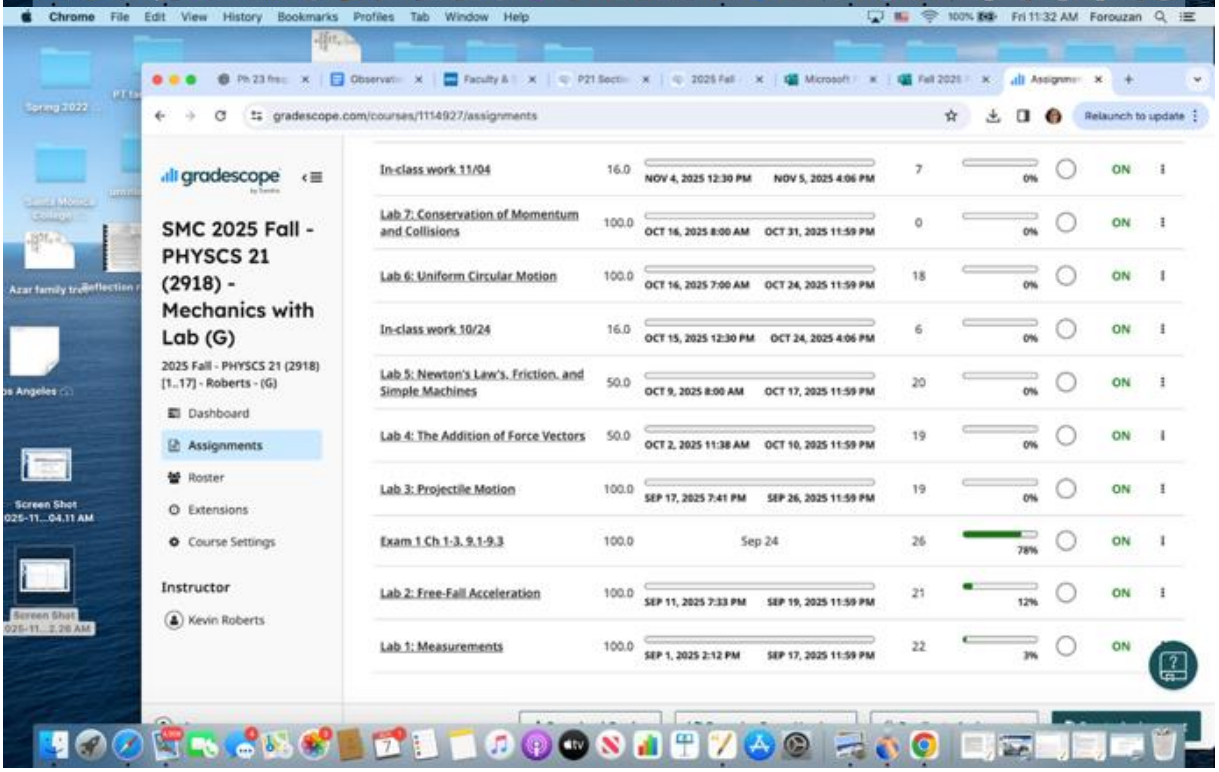


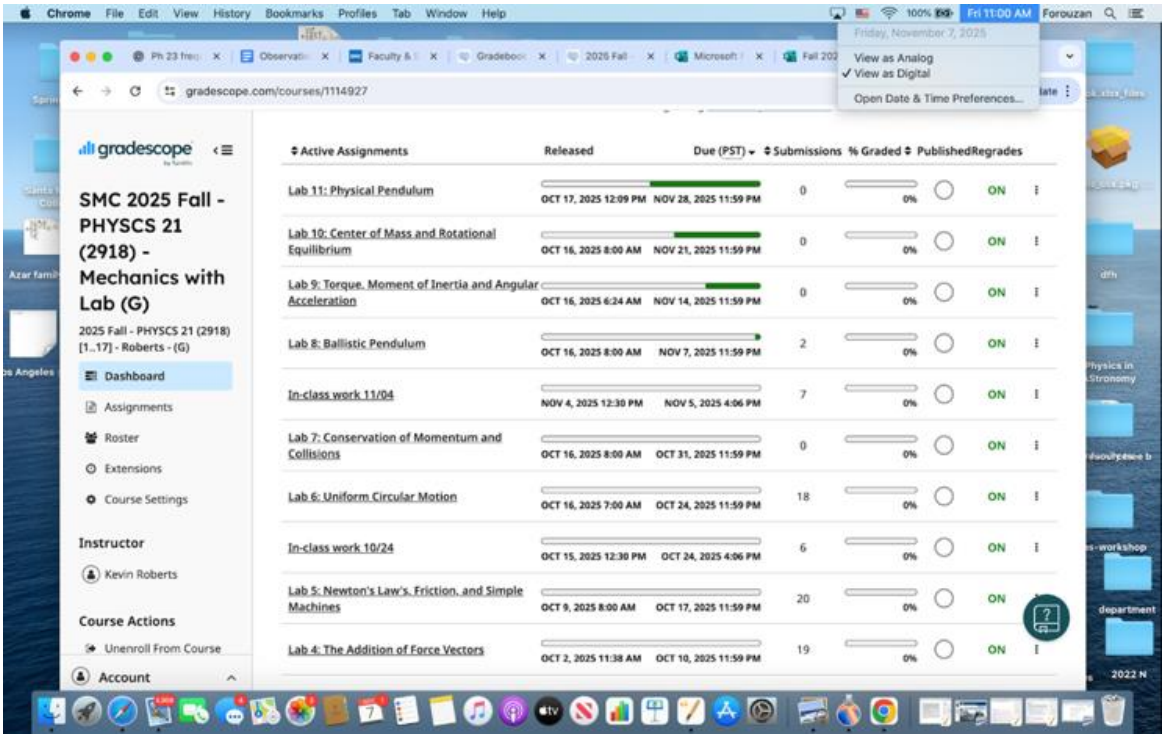




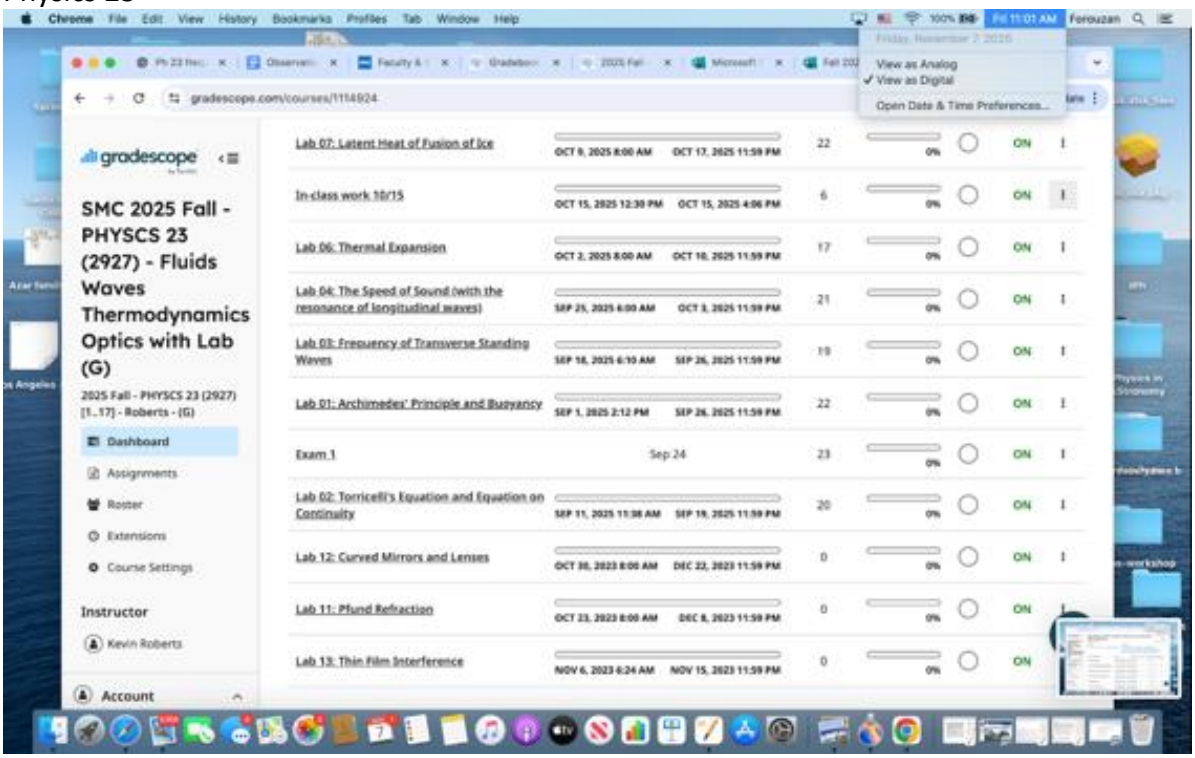
End of Week 10
Physics 21

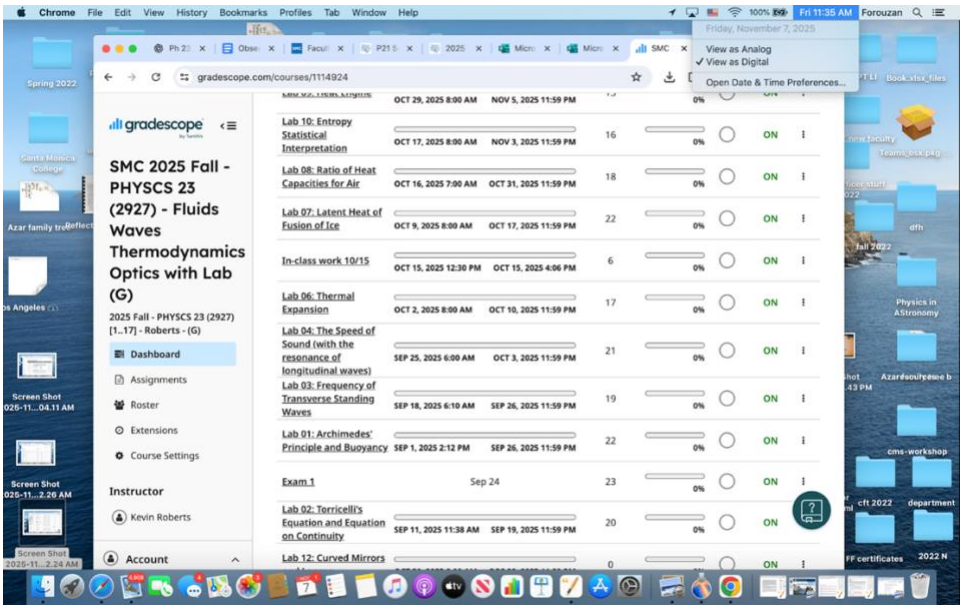


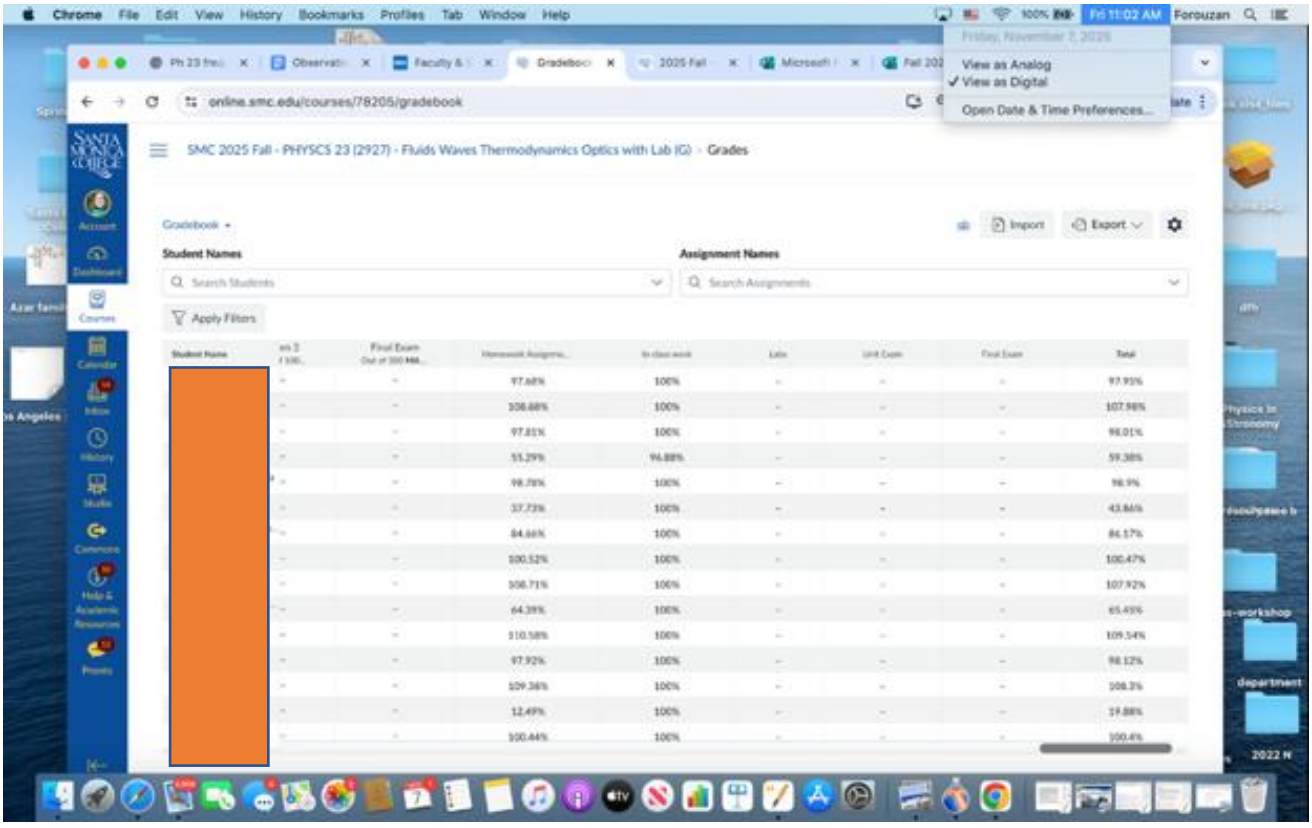



gradescope.com/courses/1114927
gradescope
SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)
2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)
Dashboard
Assignments
Roster
Extensions
Course Settings
Instructor
Kevin Roberts
Course Actions
Unenroll From Course
Account
Active Assignments
Released
Due (PST)
Submissions
% Graded
Published
Regrades
Lab 11: Physical Pendulum
Lab 10: Center of Mass and Rotational Equilibrium
Lab 9: Torque, Moment of Inertia and Angular Acceleration
Lab 8: Ballistic Pendulum
In-class work 11/04
Lab 7: Conservation of Momentum and Collisions
Lab 6: Uniform Circular Motion
In-class work 10/24
Lab 5: Newton's Law's, Friction, and Simple Machines
Lab 4: The Addition of Force Vectors
View as Analog
View as Digital
Open Date & Time Preferences...

Physics 23


gradescope.com/courses/1114924
gradescope
SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)
2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)
Dashboard
Assignments
Roster
Extensions
Course Settings
Instructor
Kevin Roberts
Account
Lab 07: Latent Heat of Fusion of Ice
In-class work 10/15
Lab 06: Thermal Expansion
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)
Lab 03: Frequency of Transverse Standing Waves
Lab 01: Archimedes' Principle and Buoyancy
Exam 1
Lab 02: Torricelli's Equation and Equation on Continuity
Lab 12: Curved Mirrors and Lenses
Lab 11: Pfund Refraction
Lab 13: Thin Film Interference
View as Analog
View as Digital
Open Date & Time Preferences...





As can be seen, with only the homework and classwork grades shown, the total for the class is an inflated grade not representative of students' actual course grade.

FACULTY OBSERVATION FORM

Evaluation of: Kevin Roberts Semester: Fall 2025

Department: Physical Sciences

Evaluator: Emin Menachekanian Position: Professor of Physics

Knowledge, Skill and Ability as an Instructional Faculty Member	Satisfactory or Better	Needs Improvement	Unsatisfactory	Not Observed (NO) Not Applicable (NA)
1. Establishes a student-instructor relationship conducive to learning	◉	○	○	○
Comments: He calls his students by their name, and is seemingly very respectful of them and their ideas.				
2. Communicates ideas clearly and effectively	◉	○	○	○
Comments:				
3. Stimulates students' interest and desire to learn	◉	○	○	○
Comments: I like that he tries to relate many of the topics being covered to everyday experiences and real-world examples.				
4. Promotes active involvement of students in learning activities	◉	○	○	○
Comments: I didn't see a learning activity during my observation, but I know he has done it in other situations. It might be worthwhile to incorporate such activities more regularly.				
5. Demonstrates sensitivity in working with students from diverse backgrounds and with different needs	◉	○	○	○
Comments:				
6. Employs appropriate pedagogy	◉	○	○	○
Comments: I think that there isn't a necessity to follow the textbook's presentation of the material in so closely.				
7. Begins class promptly and ends at time designated on schedule of classes	◉	○	○	○
Comments: This was done fairly well, although the start of class could have been a bit more streamlined by coming to class a few minutes before the official start time.				
8. Uses class time efficiently	◉	○	○	○
Comments:				

9. Maintains an appropriate pace during class session	◉	○	○	○
Comments: The pace is okay, but the transitions are a bit choppy. Please see the narrative to look at some discussion of this point.				
10. Provides students with a syllabus which includes a written explanation of the evaluation process, expectations and requirements, assignments, course content, relevant dates, and other information	○	◉	○	○
Comments: Although an evaluation process is listed in the syllabus, there really should be some type of an evaluation turn-around time for assignments and assessments themselves, as he is not holding true to evaluating things, particularly exams, in a timely manner. Please see the narrative for further details.				
11. Teaches course content that is consistent with the official course outline of record	◉	○	○	○
Comments:				
12. Uses materials pertinent to the course content	◉	○	○	○
Comments: The materials are pertinent to the content, but it's unclear to me why he's making use of the official Pearson slides so heavily. He could try to develop some more of his own slides instead of following the book so closely.				
13. Teaches at a level that is appropriate to the course content	◉	○	○	○
Comments:				
14. Has appropriate command of the subject matter to be able to respond to students' needs	◉	○	○	○
Comments: There are occasions during which students' questions are not necessarily answered well, or in the best way possible.				
15. Assesses students' progress regularly	○	○	◉	○
Comments: Please see the narrative regarding the fact that, as of this writing, none of the exams have been fully graded and returned to the students.				

Additional comment:

Please see the attached narrative for further details.

Date(s) of Visit: 10/13/2025

Length of visit: 147 minutes Course (if applicable): Physics 21

Conference Date: 11/25/2025

Evaluator's Signature: [signature]

Evaluatee's Signature: Kevin F Roberts

Faculty member's signature does not necessarily imply agreement. It is merely an acknowledgement that the complete report has been read and a copy received.

Narrative on the Observation of Prof. Kevin Roberts

Emin Menachekanian

November 20, 2025

Prior to describing my observation of one of Prof. Roberts' class, there is a single, incredibly important and grave point to highlight: namely, grading. In the many semesters spanning Prof. Roberts' probationary period for tenure, he has been making use of Gradescope, which is an online grading software that allows instructors to grade directly on the scans of assignments and tests that are uploaded to the service, either directly by the student (which is typically the case for non-test assignments) or indirectly by the instructor (which is the case for test-related assessments). To my knowledge, apart from an online homework suite which automatically grades homework submitted by students, Gradescope is the only means by which Prof. Roberts does grading. To that end, from Spring 2025, there has been no improvement in the promptness with which feedback is given to students regarding assignments uploaded to Gradescope, especially for exams. If anything, it has become substantially worse.

In Spring 2025, some of the exams were graded in a somewhat timely manner; however, the current status for Fall 2025 is that none of the exams have been returned to the students. For Prof. Roberts' Physics 23 class, his grading of Exam 1 is still at 0% (i.e., even at the time of the writing of this narrative), even though he uploaded the scans of his students' exams on 09/24/25. For his Physics 21 class, the Exam 1 scans were uploaded on 09/24/25 as well. By 10/07/25, 60% of that exam was graded, which at least showed promise to be released relatively soon thereafter. Nevertheless, by 10/21/25, that progress had only increased to 64%. By 10/23/25, it was at 66%, and by 10/26/25, it was at 78%. Thereafter, it has stayed at 78%, even up to the point of the writing of this narrative.

In addition, even though Exam 2 was listed to have been taken on 10/22/25 for Physics 21 and on 10/29/25 for Physics 23, the scans of those exams are still not even present on his Gradescope dashboard. So, even if he has actually scanned those exams, they have not made their way to Gradescope for the students to see. As such, they have, of course, not even been graded. Indeed, practically the only things that appear in Prof. Roberts' Canvas grade-book are the homework scores—which again are automatically graded by the software suite for the homework. In other words, because Prof. Roberts has not mentioned any alternate means of grading materials, then the progress percentages on Gradescope, or lack thereof, are indicative of his failure to perform his duty as an instructor. At this rate, the way the grading is going for this semester is not really any different from Fall 2024. The end of that semester saw a few students making fairly strong accusations about Prof. Roberts' handling of the grading for the course. Indeed, the approach to grading for the current semester could certainly lead to a similar fallout. If there is a need to verify what has been described above about Prof. Roberts' grading progress on Gradescope, I have amassed a collection of screenshots of his Gradescope dashboard for both Physics 21 and 23 for Fall 2025, spanning from 10/07/25 all the way to 11/20/25.

At this point, this narrative will begin describing some details during my observation of Prof. Roberts' Physics 21 lecture, which took place on Monday, 10/13/25 in SCI 101 from 8:30 - 10:57 am. There were 14 students in attendance at the start of class. By 8:56 am, there were 23 students. Finally, by 9:20 am, there were 24 students, after which it stayed at that number for the remainder of the class. The observation spanned the entirety of this class.

Prof. Roberts arrived to class around 8:33 am, at which point he asked the students if they had any questions while he was setting up in order to get started with class. His main setup was similar to past setups, particularly when lecturing within the classroom. Namely, he made use of an iPad that was directly projected to the projector screen. In addition, he utilized a laptop that he would also use to project onto the screen when needed. He used the iPad to annotate a bunch of prepared slides regarding the content. In tandem, he used the laptop to look up various information on the fly. For the latter, he would do some searches on the internet to bring up real-life information to relate to everyday experiences. He would also make use of Wolfram Alpha, mainly to input numbers in the associated examples he was presenting to then have the program crunch through the calculation. He emphasized the usefulness of Wolfram Alpha, specifically for its ability to handle units, as well as to show the numerical outcome in a variety of units, some of which might be easier to understand.

The projected slides on the screen were directly taken from Pearson, the publisher of the required textbook for the class. Although he would modify the slides with text boxes and handwritten work (which mainly comprised of a streamline of equations to work through problems), I think it would be useful to not necessarily rely so heavily on publisher-made slides. Sure, it gets the job done, but I feel as though instructors should try to be more independent in the way they craft the content to be used within the classroom. I understand

that following the progression of the textbook is useful to some degree, as the students have a direct reference to use for content being presented in the classroom. However, I also feel like an instructor should try to diversify the way content is being presented, so that it doesn't try to follow directly in the footsteps of the textbook, but rather provides the instructor's own way of teaching the content that can complement—as well as at times supersede—what is being shown in the textbook itself. I'll return to this point a little later in the narrative.

It is nice that Prof. Roberts took some of the committee's feedback in the way that he uses his iPad. In particular, when he annotated the prepared slides, he made sure to type up statements that he was verbalizing within a textbox, so that it would require less time to make those words seen by the students. In past observations, he would handwrite such statements, which took a very long time and would make the flow of the content be a bit more choppy. Nevertheless, I would recommend being consistent with enlarging the font of the words within the textboxes themselves. There were times that the font was too small to view, even for students sitting towards the front of the class. He did occasionally adjust the font sizes, but it wasn't always consistent. In any case, his handwriting was also nicely legible, so that the progression of equations when going through a problem's solution was easy to follow.

Because the lab benches are quite low for taller people, Prof. Roberts seemed to be a bit uncomfortable in the way that he was using his iPad. When he would set it on the workbench, he would be leaning over quite heavily, to the point that it certainly did not feel like it was really good for his posture, or for his ability to take a glimpse of his audience when annotating things. He would at times cradle the iPad with one arm and use his writing arm to handwrite things on the iPad's screen. That also seemed to be a bit clunky, as it would affect his handwriting. Moreover, it likely made him overly cautious to make sure the iPad didn't slip out of his arm, especially given the expensive nature of the device itself. I would recommend seeing if the college can provide a sit-to-stand-like platform that could rest on the workbench and give him the opportunity to adjust its height with the iPad resting on it. In this way, he could maintain his posture and always feel comfortable in managing the things that he was annotating on the screen.

Also, because of the awkward nature of keyboard cases on iPads, trying to switch between typing on the keyboard to handwriting required adjusting the way the iPad was placed. There are some cases that can provide a bit of a compromise, but none of them are really ideal in terms of keeping the iPad in a fixed position throughout the presentation. Likely the only solution of which I can think is to just keep the iPad in an orientation that is most convenient for handwriting, and then to perhaps pair a Bluetooth keyboard to it to use exclusively for typing. I haven't tried it myself to see how simple it is to go back and forth, but it should work relatively well if the keyboard is kept nearby without affecting the ability to handwrite on the screen. Again, these are just recommendations to potentially help streamline the process.

Even with these difficulties, I think Prof. Roberts handled things reasonably well in terms of shifting between typing and handwriting, as well as transitioning between communicating directly with the students and looking up stuff on the nearby laptop.

As for the content being presented in the class, Prof. Roberts started with a recap of circular motion, specifically uniform circular motion (UCM). He described how one can use Newton's 2nd Law to showcase the existence of a centripetal force. Although some of his slides made use of pictures that illustrated the systems on which he touched, I think his presentation could have benefitted a lot from making use of live demonstrations. In particular, he was emphasizing how some of the most common types of forces encountered in mechanics can serve as the centripetal force in a UCM problem. He tried to showcase a demonstration whereby he walked around the classroom and exaggerated a turn to walk in a different direction. I liked that he walked into areas of the classroom that one normally doesn't go when lecturing, as that made the students perk up and pay better attention. Nevertheless, I don't think the demonstration itself was all that illuminating, as it's not entirely clear how a friction force, in this case, even can be visualized pointing radially inward to allow him to turn his body. Indeed, because one's body has a lot of moving parts and is an extended system, it's hard to really pinpoint the details regarding the feet that lead to this type of turning ability.

To that end, there are a lot of simple demonstrations that can illustrate the process quite nicely, all of which can be more easily showcased by making use of the document camera in the room. One involves just taking a cylindrical plastic container (e.g., a transparent yogurt container) and describing how the normal force of the wall acting on a marble in the container can cause the marble to move around in a circle, constrained by the wall's circular nature itself. We also have single marbles attached to a piece of string—which we, for example, typically use to illustrate the simple harmonic motion associated with a pendulum—that we can also use to showcase how tension can serve as the centripetal force. Just take the string with the marble, place them on a table, hold the string with your finger, and show how shooting the

ball horizontally with your other hand can make the ball move in a circle. As a final example regarding friction, we have a few turntables that can be made to spin (either electrically or mechanically). Placing a rubber puck on the turntable and spinning it at relatively low angular speed will see the puck move as one with the turntable, all owing to the static friction force that acts on the puck. Spinning the turntable very fast will, in turn, lead the puck to be unable to move in a circle. In fact, if it is suddenly spun at a high angular speed (particularly with the electric turntable), it serves as a great demonstration of how the circularly moving object flies off tangent to the circle when losing traction

Prof. Roberts eventually made a note of how it's more useful to solve problems associated with UCM by using an external, inertial reference frame to analyze things. He mentioned that trying to solve problems in the frame of the circularly moving object ends up introducing additional terms that need to be placed into Newton's 2nd Law to make the analysis work. Although I don't think it's a problem to describe these centrifugal effects in the non-inertial reference frame of the circularly moving object, perhaps more can be done to make the effort worthwhile for the students. For instance, one can recall the relative velocity equation of velocity measurements in different reference frames, then take derivatives with respect to time to then end up with a relative-acceleration equation. For example, if frame A is moving relative to frame B, and both frames are trying to establish the velocity of another item, C, then we can write a relative-velocity equation,

$$\vec{v}_{\mathrm{C/A}} = \vec{v}_{\mathrm{C/B}} + \vec{v}_{\mathrm{B/A}}.$$

Taking time derivatives of both sides would lead to

$$\vec{a}_{\mathrm{C/A}} = \vec{a}_{\mathrm{C/B}} + \vec{a}_{\mathrm{B/A}}.$$

So, if both A and B are inertial reference frames, then $\vec{a}_{\mathrm{B/A}} = \vec{0}$, and thus both frames agree on the acceleration of C. However, if A is inertial and B is non-inertial, then generally $\vec{a}_{\mathrm{B/A}} \neq \vec{0}$. This would mean that the frames disagree about the acceleration of C, so that if one writes down Newton's Second Law in frame A—which we know is totally correct to do so—then we would say,

$$\Sigma\vec{F} = m\vec{a}_{\mathrm{C/A}}.$$

Because of the relative acceleration between A and B, this would mean that there's an additional, fictitious term that would need to appear in the 2nd Law when looking at things from the non-inertial frame, B:

$$\Sigma\vec{F} = m\vec{a}_{\mathrm{C/A}} = m\left(\vec{a}_{\mathrm{C/B}} + \vec{a}_{\mathrm{B/A}}\right).$$

Again, it could easily be limited to a 10-minute discussion, and it would likely give students something concrete about which to think, rather than keeping the discussion to a few obscure words and leaving it at that.

In any case, after a broad discussion of centripetal forces, Prof. Roberts transitioned into an example of a car turning on an arc of a circle. The goal was to determine the minimum static friction coefficient that would allow this turn to be made without slipping. He drew a free-body diagram (FBD) of the car on the iPad. This was a bit weird, as the slide itself had such a diagram already. The problem was solved properly, but his conventions for applying Newton's 2nd Law were a bit weird. It seems as though he's adopting a convention of always choosing the radially outward direction to be positive; however, since the net force always points inward for an object undergoing UCM, then the acceleration term must always come with a negative sign to account for that effect. It seems a bit unorthodox and, at times, confusing, as I think it's a pretty common rule—even prior to describing UCM problems—to solve Newton's 2nd Law by picking the line of acceleration, if there is any, as one of your axes, and making that axis point positive in the direction of acceleration. In that way, it avoids having to account for additional negative signs. Again, not to say that the problem's analysis being presented by Prof. Roberts was wrong, but I've found it to be very confusing for students to handle negative signs properly, particularly when there's no need to include them in the first place. I'd be curious to see how students have handled UCM problems when doing classwork, homework, or in-class assessments. Do they follow Prof. Roberts' prescription, or do they use an alternate approach?

Students were quite consistently asking questions, not only in this example, but also in earlier and later portions of the lecture. For this example in particular, a student asked if people take these types of analyses into account when considering how fast a car should make a particular type of turn. Prof. Roberts answered tactfully and accurately, also mentioning that those speed limits also have a built-in buffer, particularly for people who try to take the turn at a higher speed than shown on the sign. Another student asked about whether the normal force between the car and the road factors into how "grippy" the surface is. I think Prof.

Roberts' answer was good, in the sense that the grippiness in the typical model used for friction in this class is not a function of the strength of the normal force (i.e., the coefficient of friction itself doesn't seemingly have a built-in dependence on the normal force itself). He did bring up the notion of deformation, which is something we don't consider in this model. Mainly, the point is that the tire of a car is slightly deformed when rolling on the asphalt in various ways, and that this deformation is partly a function of how much the tire is being pushed by the asphalt at the various points of contact. Another question was about drag, which led into a discussion about spoilers that aim to prevent a car from "taking off" of the road like an airplane. At this point, Prof. Roberts reverted to his laptop to show pictures via a Google search about laminar flow and turbulence.

To finish out the example, Prof. Roberts compared the static friction coefficient they outputted in the problem to a table of coefficients. Given that rubber on dry concrete has a coefficient that's approximately unity, this meant that the value they found, which was far lower than this, was a safe value for the turn at hand. Nevertheless, he also showed that rubber on wet concrete has a coefficient that is lower than what they found in this problem. To that end, he correctly interpreted that the turning speed in this problem would inevitably lead to skidding if the road was wet. He also posed a final question to students when moving on from this problem, asking why they were making use of static friction instead of kinetic friction. Students were somewhat on the right track, but Prof. Roberts eventually mentioned how a rigid object that rolls has the point(s) of contact with the road be stationary when there's no skidding. I thought it was great that he was making a conscious effort to relate what they were learning in this example to real-life circumstances.

The next problem involved having a car make a turn on a banked curve. The process was similar to the previous example, and Prof. Roberts had a good approach in presenting the solution to the problem. He showed how to decompose certain force vectors, and eventually also modeled how to relate the angle of the bank to relevant angles in the force diagram of the car. A notable thing he did in the illustration of this example was to try to search for a real-life example of a banked curve on his laptop. He eventually found a good picture and a video of a coin funnel, where people roll coins into the funnel and find that the coins—especially when rolled properly—can find themselves circling the funnel on account of its banked nature. Again, any chance to relate the content to everyday life is paramount, as it allows the students to be aware of how the science that they're learning in class can be found in many forms around them.

Eventually, Prof. Roberts took a break at 9:46 am, and resumed class again at 10:01 am. Earlier in the narrative, I mentioned that I would eventually revisit a case-in-point regarding following the textbook too closely. It is here that I wanted to return to this point, describing Prof. Roberts' decision to discuss fundamental forces. Again, I understand that this is not necessarily a completely off-topic discussion, but the way the content was presented suggested to me that it was really just done because the book does it as well. The discussion was done at so much of a surface level that it almost defeated the purpose of even bringing it up. If anything, I think the connection to the forces students have already seen could have at least been described a bit, primarily to make covering this topic much more worthwhile. For instance, tension, friction, and normal force can be understood as manifestations of the electromagnetic interaction. Friction involves bonding between the atoms between the surfaces of contact of the objects; whereas the normal force can be described in terms of electron-cloud repulsion. Finally, tension can be understood in terms of the strong bonding between adjacent atoms in a solid. Perhaps talking about some of the basic details of why they can be understood as electromagnetic in nature could have easily made the content flow better.

After this somewhat choppy transition regarding fundamental forces, Prof. Roberts began Chapter 6, which focuses on principles of work and energy. He showed a slide displaying some learning outcomes, again prepared by Pearson. To reiterate, I don't know if it's necessarily useful to do whatever the book's prepared slides do, especially when they tend to be written in a very formal language that often times doesn't make a good connection with the students themselves. It would be far better for the instructor to summarize such goals in a more informal way, especially if one is trying to provide the students with an alternative way to go through the material.

In any case, after showing those learning outcomes, he quickly stated that even though Newton's Laws can solve all problems, that it's useful to explore other tools that may solve a subset of these problems in a more efficient fashion. He also introduced the standard unit of energy: the Joule. After this, a student asked Prof. Roberts about whether or not static friction can do work. The answer Prof. Roberts provided wasn't satisfactory. He eventually tried to use an example of pushing a chair at constant velocity to describe work done by friction; however, the problem with this is that the force is inherently not static friction. Rather, the force in that scenario is kinetic friction. In that way, the student's question was not really answered. My answer to that question would have used the following example: imagine a crate sitting at the middle of a truck-bed without being strapped in any way by bungee cords. From everyday experience, we know that

if the truck, for example, comes out of rest with some small acceleration, then the crate can actually move as one with the truck (i.e., without slipping relative to the truck's bed). However, in doing so, the crate accelerates. By Newton's 2nd Law, this would imply that the crate feels a net external force in the same direction as its acceleration. Finally, we know that the net force arises from static friction, as the crate is not moving relative to the surface of the truck's bed. Therefore, if we then use the reference frame of the ground to specify a certain displacement over which the crate moves relative to the ground, then we can calculate a positive value for the work done on the crate by static friction.

After the student's question, Prof. Roberts immediately moved onto reviewing dot products, which are used to calculate the work done by some force. There wasn't really a justification of why work should condense down to a dot product, but I think steps can be taken to rationalize the use of this product to describe this quantity. The review of dot products lasted no longer than two minutes, and based on the body language of the students, it didn't seem like many of them were confident in their abilities to perform dot products. I think this could have been a great time to implement a concept check, which is another point I'd like to highlight. In Spring 2025, Prof. Roberts made great strides in implementing some think-pair-share activities with students in his Physics 8 class from that semester; however, throughout this 2.5-hour class, not a single activity was even utilized. I felt that there were some pretty notable points at which an activity would have done wonders to breathe new life into the lecture.

The rest of the class was spent on doing some more examples regarding how the sign of the work done by a force is mediated by the angle-dependence of the dot product. He related one situation to an isometric (or "iso") workout, whereby one exercises their muscles by holding a static position. In one case, he was holding a chair at a constant height and walking. He noted that the body is not doing any work on the chair, even though there is energy expelled by one's body (via, say, the muscles) to hold the chair in that manner. He also described the sign of the work done by one's body (i.e., hands) in the case of lifting the chair in a standing position, or lowering the chair in such a position.

Encroaching on the end of the class, Prof. Roberts had a desire to derive the Work-Energy Theorem, which is Newton's 2nd Law viewed from the lens of work principles. Nevertheless, noticing that he had little time left to do the derivation, he opted to instead stop and answer any questions to close out the class. Students did not have any questions, thus the class was adjourned around 10:56 am.

All in all, I think the lecture was a decent one. It could have easily benefitted from at least a couple of activities to not only get the students to diversify their learning modality, but to also garner some direct feedback in their comprehension of the content. I did appreciate Prof. Roberts' savviness in transitioning well between his iPad, laptop, speech, and movement around the classroom, and I also think he was very respectful of his students, particularly when answering their questions. With all of this said, I think the clear elephant in the room is the unacceptable lack of feedback Prof. Roberts has provided to his students regarding where they stand in their performance within the class.

PROFESSIONALISM FORM

Evaluation of: Kevin Roberts Semester: Fall 2025

Department: Physical Sciences

Evaluator: Jennifer Hsieh Position: Department Chair

This section to be completed by the department chair / leader or department chair/ leader designee *As input to the evaluation procedure*	Satisfactory or Better	Needs Improvement	Unsatisfactory	Not Observed (NO) Not Applicable (NA)
1. Demonstrates cooperation and sensitivity in working with colleagues and staff	◉	○	○	○
Comments:				
2. Responsive to constructive feedback	○	○	◉	○
Comments: Despite the repeated recommendations from the tenure committee that returning graded exams and lab reports is a critical function of an instructor's duties, he has not returned any exams or lab reports this semester.				
3. Participates at the appropriate level in creation, assessment, and / or discussion of SLOs	◉	○	○	○
Comments:				
4. Submits required departmental reports and information on time (Drop roster, grade roster, flex form)	◉	○	○	○
Comments:				
5. Maintains adequate and appropriate records	◉	○	○	○
Comments:				
6. Observes health and safety regulations	◉	○	○	○
Comments:				
7. Per the collective bargaining agreement, maintains office hours and attends required meetings	◉	○	○	○
Comments:				

8. Responsive to students and is accessible to students	○	◉	○	○
Comments: While he is accessible to students for office hours and questions, he is not responsive in the sense that he does not provide timely feedback.				
9. Adheres to departmental and college policies	○	○	◉	○
Comments: Department policy is to return exams and lab reports to students in a timely manner.				
10. Participates in departmental and campus wide activities	◉	○	○	○
Comments: Supports our program by serving as the departmental representative on curriculum committee.				
11. Maintains currency in professional knowledge through professional literature, professional memberships, workshops, conferences, or other activities	◉	○	○	○
Comments:				

Additional comment: Please review my additional comments in the file titled "observation notes".

Conference Date: 11/25/2025

Evaluator's Signature: _____

Evaluatee's Signature: _____

Faculty member's signature does not necessarily imply agreement. It is merely an acknowledgement that the complete report has been read and a copy received.

Santa Monica College

Course Outline for
PHYSICS 21, Mechanics with Lab

Course Title: Mechanics with Lab — Units: 5.00

Total Instructional Hours (usually 18 per unit):	144.00
Total Student Learning Hours:	270.00
Hours per week (full semester equivalent) in Lecture:	3.50
In-Class Lab:	4.50
Arranged:	0.00
Outside-of-Class Hours	180.00

Date Submitted: March 2022
Date Updated: June 2022
C-ID: PHYS 205
Transferability
CSU/UC:
Transferability
Transfers to CSU
Transfers to UC

Cal-GETC Area:
Cal-GETC Area 5: Physical and Biological Sciences
5A: Physical Science
5C: Laboratory

IGETC Area:
IGETC Area 5: Physical and Biological Sciences (mark all that apply)
5A: Physical Science
5C: Physical or Biological Science LABORATORY

CSU GE Area:
CSU GE Area B: Scientific Inquiry and Quantitative Reasoning (mark all that apply)
B1 - Physical Science
B3 - Laboratory Sciences

SMC GE Area:
GENERAL EDUCATION PATTERN (SMC GE)
Area I: Natural Science

Degree Applicability: Credit - Degree Applicable
Prerequisite(s): MATH 7
Pre/Corequisite(s): None
Corequisite(s): None
Advisory(s): None

I. Catalog Description

This course is a calculus-based study of the mechanics of rigid bodies, emphasizing Newton's laws and its applications. This course includes an introduction to fluids. It is designed for engineering, physical science, and computer science majors.

II. Examples of Appropriate Text or Other Required Reading: (include all publication dates; for transferable courses at least one text should have been published within the last seven years)

1. University Physics with Modern Physics, 14th , Young & Freedman, Pearson © 2015, ISBN: 9780321973610;
2. Physics for Scientists and Engineers, 10th, Serway & Jewett, Cengage Learning © 2018, ISBN: 9781337553278;
3. Fundamentals of Physics, 11th, Halliday, Resnick, Walker, Wiley © 2018, ISBN: 9781119286240;
4. Santa Monica College Physics Faculty . Online Laboratory Manual for Physics 21, Santa Monica College
5. Mastering Physics, computer-based homework management and tutoring program to accompany text.
6. Heuvelen, Alessandris, Braun, Wozny. Study Guide with ActivPhysics 1, Volume 1.
7. Student Solution Manual to accompany textbook.

III. Course Objectives

Upon completion of this course, the student will be able to:

1. Use the basic concepts in physics to qualitatively explain physical phenomena.
2. Compile data from a physical problem and synthesize these data into a mathematical problem.
3. Take the mathematical problem to a successful conclusion using mathematical principles of algebra, trigonometry, and calculus.
4. Operate, adjust, and use the equipment necessary in laboratory experiments to obtain quantitative measurements.
5. Estimate the uncertainty of a measurement and calculate the uncertainty in the results obtained from such measurements.
6. Use the mathematical tools of the computer, such as spreadsheets and graphing programs, to analyze data.
7. Write laboratory reports including statement of purpose, compilation of data, theory involved in the experiment, method of measurements, samples of calculations, tabulation of results, and analyses of sources of error.
8. Continue their science education by having the skills to succeed in more advanced physics courses.

IV. Methods of Presentation:

Other (Specify), Lab, Lecture and Discussion, Experiments, Group Work, Observation and Demonstration

Other Methods: The methods of presentation used in this class reflect the importance of both a conceptual understanding of physics as well as the analytical mastery of the subject. Lecture and class-demonstrations, including computer simulations and videos, are used to introduce topics to students and to ground those ideas in reality. Most experimental work not only reinforces core concepts but teaches experimental measurement techniques and the errors associated with them. Physics Education Research (PER) has shown that active-engagement instructional strategies greatly improve student learning. As a result, collaborative learning activities are used in lecture and lab as part of the methods of presentation.

V. Course Content

% of Course	Topic
20.000%	Kinematics: Introduction & Vectors, Motion in 1 and 2 Dimensions
25.000%	Dynamics: Force, Motion and Newton's Laws, Circular Motion, Gravitation
25.000%	Conservation Principles: Work, Energy, Power, Conservation of Energy, System of Particles, Conservation of Momentum
25.000%	Rotations and Oscillations: Rotational Dynamics, Angular Momentum, Static Equilibrium, Simple Harmonic Motion
5.000%	Introduction to Fluids
100.000%	Total

Vb. Lab Content:

% of course	Topic
8.00%	Measurement and Errors
7.00%	Addition of Vectors
8.00%	Graph Matching and Motion
8.00%	Projectile Motion
8.00%	Circular Motion
8.00%	Newton's Second Law
8.00%	Non-conservative Forces

8.00%	Energy
8.00%	Ballistic Pendulum
8.00%	Rotational Inertia
7.00%	Rigid Equilibrium
7.00%	Physical Pendulum
7.00%	Problem Solving Activities
100.00%	Total

VI. Methods of Evaluation: (Actual point distribution will vary from instructor to instructor but approximate values are shown.)

Percentage	Evaluation Method
55 %	Exams/Tests - 3 or 4 Unit Exams
25 %	Final exam
15 %	Lab Reports - 8 to 12 Laboratory Activities
5 %	Written assignments - Problem Homework Assignments
100 %	Total

VII. Sample Assignments:

See attached files:

See attached files:

VIII. Student Learning Outcomes

1. When presented with a physical situation and asked to solve a particular problem in mechanics (i.e. two masses connected via a string passing over a pulley), the student will follow a logical process based on well-established physics principles (i. e. Newton's laws) and demonstrate ability to use basic mathematical techniques including calculus.
2. When conducting a laboratory experiment and writing a lab report, the student will demonstrate understanding of the basics of the scientific method by being able to state a clear and testable hypothesis, taking careful measurements, estimating uncertainties, and drawing appropriate conclusions based on gathered data and on sound scientific principles.

Santa Monica College

Course Outline for
PHYSICS 23, Fluids, Waves, Thermodynamics, Optics with Lab

Course Title: Fluids, Waves, Thermodynamics, Optics with Lab — Units: 5.00

Total Instructional Hours (usually 18 per unit):	126.00
Total Student Learning Hours:	270.00
Hours per week (full semester equivalent) in Lecture:	4.00
In-Class Lab:	3.00
Arranged:	0.00
Outside-of-Class Hours	144.00

Date Submitted: March 2022
Date Updated: June 2022
C-ID: PHYS 215
Transferability
CSU/UC: Transferability
- Transfers to CSU
- Transfers to UC

Cal-GETC Area:
Cal-GETC Area 5: Physical and Biological Sciences
- 5A: Physical Science
- 5C: Laboratory

IGETC Area:
IGETC Area 5: Physical and Biological Sciences (mark all that apply)
- 5A: Physical Science
- 5C: Physical or Biological Science LABORATORY

CSU GE Area:
CSU GE Area B: Scientific Inquiry and Quantitative Reasoning (mark all that apply)
- B1 - Physical Science
- B3 - Laboratory Sciences

SMC GE Area:
GENERAL EDUCATION PATTERN (SMC GE)
- Area I: Natural Science

Degree Applicability: Credit - Degree Applicable
Prerequisite(s): PHYSCS 21
and
MATH 8
Pre/Corequisite(s): None
Corequisite(s): None

Advisory(s): None

I. Catalog Description

This course is a calculus-based study of fluids, waves, thermodynamics, and light intended for engineering and physical science students.

II. Examples of Appropriate Text or Other Required Reading: (include all publication dates; for transferable courses at least one text should have been published within the last seven years)

1. University Physics with Modern Physics, 15th , H. Young & R. Freedman, Pearson © 2019, ISBN: 9780135159552;
2. Physics for Scientists and Engineers, 10th, R. Serway & J. Jewett, Cengage Learning © 2019, ISBN: 9781337553278;
3. Fundamentals of Physics, 10th, D. Halliday, R. Resnick, J. Walker, Wiley © 2013, ISBN: 978-1118230728;
4. Santa Monica College Physics Faculty . Online Laboratory Manual for Physics 23, Santa Monica College
5. Mastering Physics . Pearson, 15th ed.
   Computer-based homework and tutorial problems to accompany the Young and Freedman text.

III. Course Objectives

Upon completion of this course, the student will be able to:

1. Use basic concepts in physics to construct a qualitative explanation of physical phenomena.
2. Use physical principles and laws to construct a quantitative explanation of physical phenomena through mathematical analysis.
3. Utilize various mathematical methods such as algebra, trigonometry and calculus, to navigate through the quantitative analysis of a physical problem.
4. Proficiently operate and adjust laboratory equipment to obtain quantitative measurements in a physics experiment.
5. Estimate the uncertainty of a measurement and the propagation of error for results dependent upon the measurement.
6. Use various computational tools such as spreadsheets and graphing programs to analyze data.
7. Compose organized and thorough analyses of work done in the laboratory.

IV. Methods of Presentation:

Lecture and Discussion, Other (Specify), Group Work, Lab, Experiments
Other Methods: The methods of presentation used in this class reflect the importance of both a conceptual understanding of physics as well as the analytical mastery of the subject. Lecture and class-demonstrations, including computer simulations and videos, are used to introduce topics to students and to ground those ideas in reality. Most experimental work not only reinforces core concepts but teaches experimental measurement techniques and the errors associated with them. Education research has shown that active-engagement instructional strategies greatly improve student learning. As a result, collaborative learning activities are used in lecture and lab as part of the methods of presentation.

V. Course Content

% of Course	**Topic**

13.000%	Fluid dynamics
24.000%	Mechanical waves: transverse string waves, sound waves
33.000%	Thermodynamics: temperature and 0th law, kinetic theory of classical gases, heat and 1st law, heat transfer, entropy and 2nd law
30.000%	Geometric and wave optics: reflection, refraction, interference, diffraction
100.000%	Total

Vb. Lab Content:

% of course	**Topic**
10.00%	Fluid Mechanics
10.00%	String Waves
10.00%	Longitudinal Waves
10.00%	Thermal Expansion
10.00%	Heat Transfer
10.00%	Latent Heats
10.00%	Ratio of Specific Heats
10.00%	Refraction
10.00%	Mirrors and Lenses
10.00%	Diffraction

100.00%	Total

VI. Methods of Evaluation: (Actual point distribution will vary from instructor to instructor but approximate values are shown.)

Percentage	Evaluation Method
55 %	Exams/Tests - 3-5 Unit Exams
25 %	Final exam
5 %	Homework
15 %	Lab Reports - Laboratory
100 %	Total

Additional Assessment Information:
The unit exams and quizzes are given regularly throughout the semester and will include questions that are of the short-essay type and numerical problems similar to those assigned in class. A comprehensive final exam is given covering the entire semester's work. This three hour exam consists of questions and problems that require the student to apply the knowledge obtained from the course and extend it to new situations.

VII. Sample Assignments:

Sample homework assignment:

1. Weekly homework assignment consisting of 20-30 textbook problems such as:

A soft drink (mostly water) flows in a pipe at a beverage plant with a mass flow rate that would fill 220 0.355-L cans per minute. At point 2 in the pipe, the gauge pressure is 152 kPa and the cross-sectional area is 8.00 cm2. At point 1, 1.35 m above point 2, the cross-sectional area is 2.00 cm2.
a) . Find the mass flow rate.
b) Find the volume flow rate
c) . FInd the speed at point 1
d) . FInd the speed at point 2.

sample lab assignment:

In this laboratory experiment, students apply Archimedes' principle to determine the density of air in the lab room. They also identify an unknown substance using Archimedes' principle.
The sample lab experiment is attached as a file.

VIII. Student Learning Outcomes

1. When presented with a physical situation and asked to solve a particular problem in fluids, thermodynamics, wave phenomena, or optics, the student will follow a logical process based on well-established physics principles (i.e. laws of thermodynamics) and demonstrate ability to use basic mathematical techniques, including calculus.
2. When conducting a laboratory experiment and writing a lab report, the student will demonstrate understanding of the basics of the scientific method by being able to state a clear and testable hypothesis, taking careful measurements, estimating

uncertainties, and drawing appropriate conclusions based on gathered data and on sound scientific principles.

PHYSICS 21, MECHANICS WITH LAB

FALL 2025

COURSE INFORMATION

Course Title:	PHYSICS 21, MECHANICS WITH LAB	
Section Number:	2918	
Units:	5.00 units	
Prerequisite(s):	MATH 7 or equivalent	
Day and Time:	Mon, Wed	08:30 AM – 11:00 AM
Location:	SCI 101	
Day and Time:	Fri	08:30 AM – 11:30 AM
Location:	SCI 101	

INSTRUCTOR INFORMATION

Instructor:	Kevin Roberts	
Email Address:	Roberts_kevin31@smc.edu	
Office Hours:	Monday	02:40–04:40 PM
	Wednesday	11:05–12:05 PM
	Friday	03:35–04:35 PM
Location:	SCI 275	

Additional Meetings by Appointment

I welcome you to contact me outside of class and student hours. You may email me or message me on Canvas. You may make office hours by appointment.

COURSE DESCRIPTION

This course is a calculus-based study of the mechanics of rigid bodies, emphasizing Newton's laws and its applications. This course includes an introduction to fluids. It is designed for engineering, physical science, and computer science majors.

COURSE OBJECTIVES

Upon completion of this course, the student will be able to:

1. Use the basic concepts in physics to qualitatively explain physical phenomena.
2. Compile data from a physical problem and synthesize these data into a mathematical problem.
3. Take the mathematical problem to a successful conclusion using mathematical principles of algebra, trigonometry, and calculus.
4. Operate, adjust, and use the equipment necessary in laboratory experiments to obtain quantitative measurements.
5. Estimate the uncertainty of a measurement and calculate the uncertainty in the results obtained from such measurements.
6. Use the mathematical tools of the computer, such as spreadsheets and graphing programs, to analyze data.
7. Write laboratory reports including statement of purpose, compilation of data, theory involved in the experiment, method of measurements, samples of calculations, tabulation of results, and analyses of sources of error.
8. Continue their science education by having the skills to succeed in more advanced physics courses.

STUDENT & INSTITUTIONAL LEARNING OUTCOMES

1. When presented with a physical situation and asked to solve a particular problem in mechanics (i.e. two masses connected via a string passing over a pulley), the student will follow a logical process based on well-established physics principles (i.e. Newton's laws) and demonstrate ability to use basic mathematical techniques, including calculus.
2. When conducting a laboratory experiment and writing a lab report, the student will demonstrate understanding of the basics of the scientific method by being able to state a clear and testable hypothesis, taking careful measurements, estimating uncertainties, and drawing appropriate conclusions based on gathered data and on sound scientific principles.

REQUIRED TEXTS, MATERIALS, & SUPPLIES

1. Young, Freedman, and Ford, University Physics with Modern Physics. 15th ed. WITH MASTERING PHYSICS REQUIRED
   You can get either the digital or hard cover versions if you have an unused Mastering code. We will be using it for online homework.
2. Scientific or graphing calculator. You may use Desmos or Wolfram Alpha.
3. Computer and Internet access.

4. Installed desktop Microsoft office. (Free via SMC)
5. Notebook and writing implement(s) (digital tablets are an acceptable option)

This Fall SMC will be launching a new program to ensure students have their required course materials in partnership with Slingshot. For a fixed $32 per unit (no cost for OER and zero cost courses) you will receive all of your textbooks. No order required. SMC offers a number of programs to help students cover the cost of textbooks like SMC Promise. If you are eligible, these vouchers will be applied automatically. You can pickup physical materials at the SMC Campus Store a week before the beginning of the semester. You can view digital items and check your balance due in your Slingshot account. For more information and to login go to smc.edu/store. Students can always opt out of this program and purchase textbooks a la carte via Slingshot or purchase their textbooks directly through publishing companies or through companies like Amazon. Students that don't have textbook vouchers will need to either pay for their books/materials at the bookstore or online via Slingshot before their books/materials will be made available to them.

RECOMMENDED RESOURCES & SKILLS

Supplementary Texts

1. Adelson, Get ready for physics
2. McMullen, Essential Calculus-based Physics Study Guide Workbook: Mechanics, Volume 1

Computer Skills

To succeed in this course, you should have the ability to:

- Navigate the Internet using a web browser.
- Manage files using either the Mac or Windows operating systems.
- Send and receive email messages and attachments.
- Use a word processing program like Microsoft Word or its equivalent.
- Navigating Canvas: checking assignment deadlines, uploading work, and checking grades. Every assignment and exam will be hosted here. Check frequently for any updates to assignments.
- Use a spreadsheet program like Microsoft Excel or its equivalent for data analysis for labs.

METHODS OF PRESENTATION

- Lab, Lecture and Discussion, Experiments, Group Work, Observation, and Demonstration
- Other Methods: The methods of presentation used in this class reflect the importance of both a conceptual understanding of physics as well as the analytical mastery of the subject. Lecture and class-demonstrations, including computer simulations and videos, are used to introduce topics to students and to ground those ideas. Most experimental work not only reinforces core concepts but teaches experimental measurement techniques and the errors associated with them. Physics Education Research (PER) has shown that active engagement instructional strategies greatly improve student learning. As a result, collaborative learning activities are used in lecture and lab as part of the methods of presentation.

METHODS OF EVALUATION

- Unit Exams: Exams (3 @100 pts each) are mandatory and must be taken when scheduled. Exams will consist of free-response problems that you fully work out, and some multiple-choice questions. I will provide all physical constants that you will need, and you will make a **hand-written** formula sheet on a single 8.5-by-11-inch sheet of paper (both sides), printouts are NOT ALLOWED. Tests are **not** cumulative, but concepts build throughout the course. **The exam dates are 9/24, 10/22, and 11/19.** The exams will be 2.5 hours long and are given at the beginning of the class period.
- Final Exam: This is a cumulative exam that will be given during finals week, *tentatively* set for Wednesday 12/17 08:00–11:00 AM. It will have questions chosen from the entire course.
- Lab: Labs will be held on Fridays. The labs that we do will be posted onto Canvas. You are expected to read the week's lab, so you can understand before we begin the lab. The experiments are finished more quickly if you come prepared. Lab reports will be due one week following the lab session, unless otherwise noted. During lab days, we will be breaking up into 7 groups. You will receive a 0 for any missed lab. I will drop your lowest lab score.

- Homework: You will be assigned between 20-30 problems each chapter. We will be using online homework via Pearson's Mastering Physics. You will be able to make unlimited attempts for each question without penalty. Anticipate that you will require 6-10 hours to complete the homework each set. Homework will be due at **11:59 PM each Tuesday.**
- A grade of "Incomplete" may be granted at the very end of the term if an unforeseen event or illness prevents you from completing the final coursework and at the time you have earned a "C" or better. "Incomplete" grade situations are extremely rare, and are entirely at the discretion of the instructor, within the parameters set above.

Your final grade will be calculated using the following percentages:

Percentage of Grade:	**Evaluation Method:**
20%	Lab Reports
10%	Homework
5%.	In-class work
45%	Unit Exams
20%	Final Exam

GRADING SCALE

A = 90.0-100%
B = 80.0-89.9%
C = 65.0-79.9%
D = 55.0-64.9%
F = 54.9% and below

ATTENDANCE, DROPS, & WITHDRAWALS

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MISSED AND LATE WORK

- Late homework is accepted up until the unit exam covering the material, but there is a deduction equal to 20% of the assignment. In addition to wanting to avoid the grade penalty, you should make every effort to submit all work by its deadline so you can receive the prompt feedback and grade that are an essential part of the learning process and success in college.
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CLASSROOM POLICIES

Class Participation

- Learning is a collaborative exercise; this classroom is your space too! Everyone belongs here, no matter your background. I highly encourage you to be "wrong" here; it is how we learn! If you already knew everything, you wouldn't need me! Sometimes, active participation can feel uncomfortable, particularly if you are unsure of the "answers." One of the themes of this course, as I teach it, is that science (really all knowledge) is a process more than a set of facts. Like a learning a musical instrument, practicing helps us to become better scientists!
- All of us in the class, you, me, your peers, have a responsibility to create an environment in which we can all learn from each other. I expect everyone to participate in class so that we can all benefit from the insights and experiences that each person brings.
- During lab time, all group members are expected to contribute equally. Before beginning the lab, you will decide among you who will be doing which roles and write them at the top of the lab worksheet. I will be periodically checking in on everyone throughout the lab period. If you do not contribute your portion of work during a lab, you will receive a zero for that lab. If you would like help, do not hesitate to ask me BEFORE the end of the lab.

Classroom Environment

- Please ask questions during class
- This classroom is welcoming to all. I expect everyone to be respectful in how they communicate and interact with every person in this class. Racist, sexist, homophobic, and other forms of language that potentially marginalize or demean any student are not tolerated.
- In this class we will be sharing multiple perspectives. Please remember to be respectful with one another.
- Please refrain from having side-conversations during the lecture portions of the class. We will be having several periods for discussions during class time.
- You are expected to follow all Codes of Conduct as established by Santa Monica College. These documents can be reviewed at the Student Judicial Affairs webpage. See the rules for Student Conduct (AR 4410), Code of Academic Conduct (AR 4411), Student Honor Code (AR 4412).

Electronic Devices

- During the lecture time of the class, the use of electronic devices such as laptops, and smartphones are **NOT** permitted. You may use tablets or foldable laptops with a writing surface that are face-up and in "notetaking" mode. During lab and group work time, laptops are permitted; however, to maximize participation and learning, this usage is limited to activities supporting concurrent class activities.
- Cell phones and other electronic devices should be on silent mode during class time. Put all electronics on "do not disturb" mode during class to create a good learning environment for everyone.

Food & Drink

Food or drink is prohibited in the classroom except for water bottles, which are permitted if they remain closed when not in active use and are kept away from all equipment.

Recording of Class Lectures

In accordance with Section 78907 of the California Education Code, students shall not use any electronic listening or recording device in any classroom without the prior consent of the instructor, except as necessary to provide reasonable auxiliary aids and academic adjustments to disabled students.

Lab Days and Lab Reports

- We will be completing 11 labs this semester.
- You must show up on lab days **on time**. If you are more than 15 minutes late on lab days, you will **not** be allowed to complete the lab.
- Laboratory data must be taken by each student on the day the lab is assigned. You will not receive credit for analysis on data taken by a group where you were not in attendance.
- You will complete the worksheets and turn one week later. The worksheets will be worth 100 points.
- You must use the data you gather for your lab report. You will be turning in your data you take at the end of the lab period.

- You may discuss the experiment with your lab partner and other classmates, but the lab report that you turn in must be your own work. Lab reports are subject to all the rules governing academic honesty.

Homework

- We will be using online homework via Pearson's Mastering Physics. You will be able to make unlimited attempts for each question with no penalty.
- I recommend that while you are completing the homework, you write out your reasoning: for simple conceptual questions, a couple of sentences; for longer problems full reasoning.
- The homework in this class can be rather challenging. Anticipate that you will require 6-10 hours to complete the homework each chapter. You will likely need assistance with at least two or three problems per assignment.
- To ensure that you have enough time available to seek assistance, begin working on the problem sets as soon as possible.
- I encourage you to work with other students to complete homework problems, you should all organize study groups.
- If you are unable to do a problem, you may post online for other students help, email me to ask for help (see contact information above), or go to office hours. There are also FREE tutors offer via SMC, (https://www.smc.edu/student-support/academic-support/tutoring-centers/index.php) and see below.

ACADEMIC HONESTY

The SMC Honor statement, signed by each student upon enrollment, reads: "In the pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and uphold the Santa Monica College Honor Code, Code of Academic Conduct, and Student Conduct Code. I will conduct myself honorably as a responsible member of the SMC community in all endeavors I pursue." Please be extremely careful that you do not engage in any behavior that could even be construed as cheating. Violations could result in failing grades, reports to the Campus Disciplinarian, and subsequent academic disciplinary action. Examples of behaviors that are not permitted include but are not limited to: inappropriate language or physicality in the classroom, and inappropriate behaviors during an exam (talking with another student, looking at or copying from another student's paper, using a disallowed electronic device or calculator, using disallowed notes, leaving the room without prior permission, removing exam materials from the classroom).

ACCOMMODATIONS FOR DISABILITIES

I encourage students requesting disability-related accommodations to contact the Center for Students with Disabilities as soon as possible. I will work with you and the Center for Students with Disabilities to provide appropriate and reasonable accommodations. An early notification of your request for test-taking and/or other accommodations is necessary to ensure that your disability-related needs are addressed appropriately; testing accommodations cannot be applied retroactively.

The Center for Students with Disabilities is located on the first floor of the Student Services Center, and the phone number is (310) 434-4265 or email at dsps@smc.edu Additional Contact Information can be found at the Center for Students with Disabilities website.

EMERGENCY PREPAREDNESS & SAFETY

The safety of students at SMC is a priority. In the event of an emergency, you should contact the SMC Police Department (310-434-4300).

Please note that emergency procedures are posted in this classroom and every classroom. Please take the time to familiarize yourself with these procedures today, when knowledge of what to do can be the most effective. Also, procedures for various emergencies are delineated on the SMC Emergency Preparedness website.

We strongly encourage everyone to use the LiveSafe mobile app that Santa Monica College is providing to all students, faculty, and staff to download for free. The app provides a quick, convenient, and discreet way to communicate directly with Santa Monica College officials, enhancing your overall safety and allowing Santa Monica College to better serve you. Please use the app to anonymously report any acts of vandalism you may observe.

EMOTIONAL SUPPORT

Over the course of the semester, you may face difficult circumstances beyond your control, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down or depressed, or having difficulty concentrating. Having any of these challenges may create barriers to learning or may make it difficult for you to meet some of the course requirements. If you or someone you know is suffering these or other similarly difficult circumstances, please reach out for support. The staff and faculty of Santa Monica College want you to succeed academically and care about your wellbeing. You may contact the college's Center for Wellness and Wellbeing (LA 110, 310-4344503), which provides short-term mental health services, community referrals, and a 24/7 emotional support line 800-691-6003. Or, if the situation is an emergency, you may contact the SMC Police Department (310-434-4300 or the SMC LiveSafe app). Also, please feel you can contact me so that I can help to direct you to support services on campus that might be most beneficial to you.

EQUITABLE LEARNING ENVIRONMENT

Santa Monica College is an intellectual community enriched and enhanced by diversity along a number of dimensions, including race, ethnicity and national origins, gender and gender identity, disability, sexuality, class and religion. We are especially committed to increasing the representation of those populations that have been historically minoritized in U.S. higher education.

GENDER EXPRESSION AND IDENTITY

I will gladly honor your request to address you by an alternate/preferred name or gender pronoun. Please advise me of this preference early in the semester or session so that I may make appropriate changes to my records. I will do my best to address and refer to all students accordingly and support classmates in doing so as well.

TITLE IX (SEX DISCRIMINATION)

Title IX is a comprehensive federal law that prohibits discrimination on the basis of sex in any federally funded education program or activity: No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance. Those interested in the details should view the Title IX Legal Manual.

Students who have experienced some form of sexual misconduct or discrimination are encouraged to talk to someone about their experience, so they can get the support they need. You can learn more about available support at the Student Services Title IX webpage.

UNDOCUMENTED/DACA/AB540

Santa Monica College stands with the California Community Colleges Chancellor's Office—and hundreds of other educational and business organizations—in affirming that our undocumented students are as integral a part of our community as anyone else. Here at Santa Monica College, we remain committed to serving our undocumented students, to helping them fulfill their life's dreams and aspirations; this college will continue to be a safe environment for all students and personnel. We will work to provide the greatest support to students affected by this decision, and campus and student leaders alike have already rallied in solidarity as well as to provide resources. SMC joins the Chancellor's Office and all the other voices that will advocate determinedly in Congress for an effective solution to this issue, to end a cruel and unnecessary action that goes against the interests of local communities and our country at large.

The **Santa Monica College DREAM Program** provides support services to DREAMers (undocumented, AB540 and DACA recipients). Its purpose is to increase the personal growth, development and retention of DREAM students through academic, career, and personal counseling; assistance in applying for the California Dream Act/Financial Aid and scholarships; and providing workshops relative to DREAMers and their families. The Dream Program is located in the Student Services Center (SSC) 2nd Floor, Room 238. To make an appointment, call (310) 434-4892 or email DREAM@smc.edu.

STUDENT SUCCESS

Academic Counseling

The Counseling Department at SMC can help you with choosing and enrolling in classes, educational and career planning, navigating Corsair Connect, understanding financial aid, referrals to campus resources, and more.

Black Collegians

The Black Collegians Program/Umoja Community at SMC is designed to assist students of African descent in transferring to four-year universities and obtaining their associate degree. They offer services to help students become academically competitive and to set personal goals.

Extended Opportunity Program & Service (EOPS)

Extended Opportunity Program & Services (EOPS) at Santa Monica College is a program that supports the enrollment, retention, graduation, and transfer of students who are challenged by economic and educational disadvantages. They offer service such as academic, career, personal and transfer counseling; priority registration; supplemental textbook assistance; one-on-one tutoring; and much more.

Latino Center/Adelante

The Adelante Program is a success-oriented program focusing on academic achievement, transfer, cultural awareness, and personal growth. Adelante classes emphasize verbal, written, and critical thinking skills essential to college success. Classes accentuate the Latino experience within the context of the course subject, and most classes offer credits that are transferable to the UC and CSU systems.

Student Health Services Center

The SMC Health Services Center provides primary health care services to currently enrolled Santa Monica College students who have paid the California State mandated health fee. It focuses on health promotion, illness prevention, referrals, health and nutrition education. The staff consists of two registered nurses, a registered dietitian, two health assistants, and a nurse practitioner. The Center is located on the northeast corner of the Cayton Center Complex.

Tutoring

Free tutoring centers are available across the campus. There are dedicated centers for Business, CSIS, ESL, Math, Modern Languages, Science, and Writing & Humanities tutoring. For more information about their hours and locations, visit the SMC Tutoring Services Webpage.

Veterans Resource Center

The Veterans Resource Center at Santa Monica College serves veterans entering college for the first time or returning to college to further their education. The office acts as a liaison with the Veterans Administration verifying enrollment for students claiming benefits under the G.I. Bill or the Veterans' Vocational Rehabilitation Program. It also can also assist the veteran with referrals to various veteran-serving programs in the West Los Angeles area. If you would like additional information, please call (310) 434-8205.

STUDENT SERVICES CENTER

Located at the North end of campus on the corner of Pico and 20th street.

- Admissions & Records
- Black Collegians
- CalWORKs
- Care & Prevention Team
- Career Services Center
- Cashier's Office
- Center for Students with Disabilities
- Counseling
- Distance Education
- DREAM Program
- EOPS/CARE
- Financial Aid & Scholarships
- Guardian Scholars
- High Tech Center
- Institutional Research
- International Education Center
- Latino Center
- Pico Partnership
- Scholars Program
- Student Judicial Affairs
- Success & Engagement Center
- Transfer Counseling Center
- Welcome Center

DISCLAIMER

Some elements of the syllabus may be changed at the instructor's discretion. Students will be given at least 48 hours notice of changes whenever possible. If there is any aspect of this syllabus which you do not understand, or to which you take exception, please let the instructor know within the first week of class. Your continued attendance in this course constitutes an acknowledgement and acceptance of the requirements delineated in this syllabus.

Week #	Date (Monday)	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
1	09-01	**LABOR DAY HOLIDAY**		Introduction LECTURE Chapter 1.1-1.5		LECTURE Chapter 1.6-1.8 EXP #01 Measurement and Errors
2	09-08	LECTURE Chapter 1.9-1.10 Chapter 2.1-2.3		LECTURE Chapter 2.4-2.6		LECTURE Chapter 2 Practice Chapter 3.1-3.2 EXP #02 Motion of a Freely Falling Body
3	09-15	LECTURE Chapter 3.3-3.4 Refund Deadline (9/14)		LECTURE Chapter 3.5 Chapter 9.1-9.3		LECTURE Chapter 9.1-9.3 EXP #03 Projectile Motion
4	09-22	LECTURE Catch-up/Review		**EXAM 1 CH 1-3, 9.1-9.3**		LECTURE Chapter 4.1-4.3
5	09-29	LECTURE Chapter 4.4-4.6 DROP DEADLINE! (09/28 without W)		LECTURE Chapter 5.1-5.2		LECTURE Chapter 5.3-5.5 EXP #04 Vector Quantities and the Force Table
6	10-06	LECTURE Chapter 5 (Practice Problems)		LECTURE Chapter 6.1-6.2		LECTURE Chapter 6.3-6.4 EXP #05 Newton's Laws
7	10-13	LECTURE Chapter 7.1-7.3		LECTURE Chapter 7.4-7.5		LECTURE Chapter 8.1-8.3 EXP #06 Dynamics of Circular Motion
8	10-20	LECTURE Catch-up/Review		**EXAM 2 CH 4-7**		LECTURE Chapter 8.4-8.6 EXP #07 Momentum and Collisions

9	10-27	LECTURE Chapter 8.4-8.6		LECTURE Chapter 9.4-9.5		LECTURE Chapter 9.6 Chapter 10.1-10.2 EXP #08 Ballistic Pendulum
10	11-03	LECTURE Chapter 10.3-10.4		LECTURE Chapter 10.5-10.7		LECTURE Chapter 10 Practice Problems EXP #09 Torque and Moment of Inertia
11	11-10	LECTURE Chapter 11.1-11.3	**VETERANS DAY**	LECTURE Chapter 11.4-11.5		LECTURE Chapter 11 Practice Problems EXP #10 Rotational Equilibrium
12	11-17	LECTURE Catch-up/Review		**EXAM 3 CH 8-11**		LECTURE Chapter 13.1-13.3
13	11-24	LECTURE Chapter 13.4-13.5 DROP DEADLINE! (11/23 with W)		LECTURE Chapter 13.6-13.8	**THANKSGIVING**	**NATIVE AMERICAN HERITAGE DAY**
14	12-01	LECTURE Chapter 14.1-14.3		LECTURE Chapter 14.4-14.6		LECTURE Chapter 14.7-14.8 EXP #11 Physical Pendulum
15	12-08	LECTURE Chapter 12.1-12.3		LECTURE Chapter 12.4-12.6		LECTURE Chapter 12 Practice Problems
16	12-15	LECTURE Catch-up/Review	FINAL EXAM WEEK	**FINAL EXAM** **8–11 AM** **(Tentative)**	FINAL EXAM WEEK	FINAL EXAM WEEK
17	12-22	FINAL EXAM WEEK	FINAL EXAM WEEK			

PHYSICS 23, WAVES, OPTICS, THERMO DYNAMICS

FALL 2025

COURSE INFORMATION

Course Title:	PHYSICS 23, WAVES, OPTICS, THERMO DYNAMICS	
Section Number:	2927	
Units:	5.00 units	
Prerequisite(s):	Physics 21 and MATH 8 or equivalent	
Day and Time:	Mon, Wed	12:30 PM – 02:35 PM
Location:	MSB 316	
Day and Time:	Fri	12:30 AM – 03:30 PM
Location:	MSB 316	

INSTRUCTOR INFORMATION

Instructor:	Kevin Roberts	
Email Address:	Roberts_kevin31@smc.edu	
Office Hours:	Monday	02:40–04:40 PM
	Wednesday	11:05–12:05 PM
	Friday	03:35–04:35 PM
Location:	SCI 275	

Additional Meetings by Appointment

I welcome you to contact me outside of class and student hours. You may email me or message me on Canvas. You may make office hours by appointment.

COURSE DESCRIPTION

This course is a calculus-based study of the wave motion, heat, kinetic theory, and optics. It is designed for engineering, physical science, and computer science majors.

COURSE OBJECTIVES

Upon completion of this course, the student will be able to:

1. Use basic concepts in physics to construct a qualitative explanation of physical phenomena.
2. Use physical principles and laws to construct a quantitative explanation of physical phenomena through mathematical analysis.
3. Utilize various mathematical methods such as algebra, trigonometry, and calculus, to navigate through the quantitative analysis of a physical problem.
4. Proficiently operate and adjust laboratory equipment to obtain quantitative measurements in a physics experiment.
5. Estimate the uncertainty of a measurement and the propagation of error for results dependent upon the measurement.
6. Use various computational tools such as spreadsheets and graphing programs to analyze data.
7. Compose organized and thorough analyses of work done in the laboratory.

STUDENT & INSTITUTIONAL LEARNING OUTCOMES

1. When presented with a physical situation and asked to solve a particular problem in thermodynamics, wave phenomena, or optics, the student will follow a logical process based on well-established physics principles (i.e. laws of thermodynamics) and demonstrate ability to use basic mathematical techniques, including calculus.
2. When conducting a laboratory experiment and writing a lab report, the student will demonstrate understanding of the basics of the scientific method by being able to state a clear and testable hypothesis, taking careful measurements, estimating uncertainties, and drawing appropriate conclusions based on gathered data and on sound scientific principles.

REQUIRED TEXTS, MATERIALS, & SUPPLIES

1. Young, Freedman, and Ford, University Physics with Modern Physics. 15th ed. WITH MASTERING PHYSICS REQUIRED
   You can get either the digital or hard cover versions if you have an unused Mastering code. We will be using it for online homework.
2. Scientific or graphing calculator. You may use Desmos or Wolfram Alpha.
3. Computer and Internet access.
4. Installed desktop Microsoft office. (Free via SMC)
5. Notebook and writing implement(s) (digital tablets are an acceptable option)

This Fall SMC will be launching a new program to ensure students have their required course materials in partnership with Slingshot. For a fixed $32 per unit (no cost for OER and zero cost courses) you will receive all of your textbooks. No order required. SMC offers a number of programs to help students cover the cost of textbooks like SMC Promise. If you are eligible, these vouchers will be applied automatically. You can pickup physical materials at the SMC Campus Store a week before the beginning of the semester. You can view digital items and check your balance due in your Slingshot account. For more information and to login go to smc.edu/store. Students can always opt out of this program and purchase textbooks a la carte via Slingshot or purchase their textbooks directly through publishing companies or through companies like Amazon. Students that don't have textbook vouchers will need to either pay for their books/materials at the bookstore or online via Slingshot before their books/materials will be made available to them.

RECOMMENDED RESOURCES & SKILLS

Supplementary Texts

1. Adelson, Get ready for physics
2. McMullen, Essential Calculus-based Physics Study Guide Workbook: Laws of Motion, Volume 3

Computer Skills

To succeed in this course, you should have the ability to:

- Navigate the Internet using a web browser.
- Manage files using either the Mac or Windows operating systems.
- Send and receive email messages and attachments.
- Use a word processing program like Microsoft Word or its equivalent.
- Navigating Canvas: checking assignment deadlines, uploading work, and checking grades. Every assignment and exam will be hosted here. Check frequently for any updates to assignments.
- Use a spreadsheet program like Microsoft Excel or its equivalent for data analysis for labs.

METHODS OF PRESENTATION

- Lab, Lecture and Discussion, Experiments, Group Work, Observation, and Demonstration
- Other Methods: The methods of presentation used in this class reflect the importance of both a conceptual understanding of physics as well as the analytical mastery of the subject. Lecture and class-demonstrations, including computer simulations and videos, are used to introduce topics to students and to ground those ideas. Most experimental work not only reinforces core concepts but teaches experimental measurement techniques and the errors associated with them. Physics Education Research (PER) has shown that active engagement instructional strategies greatly improve student learning. As a result, collaborative learning activities are used in lecture and lab as part of the methods of presentation.

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- Learning is a collaborative exercise; this classroom is your space too! Everyone belongs here, no matter your background. I highly encourage you to be "wrong" here; it is how we learn! If you already knew everything, you wouldn't need me! Sometimes, active participation can feel uncomfortable, particularly if you are unsure of the "answers." One of the themes of this course, as I teach it, is that science (really all knowledge) is a process more than a set of facts. Like a learning a musical instrument, practicing helps us to become better scientists!
- All of us in the class, you, me, your peers, have a responsibility to create an environment in which we can all learn from each other. I expect everyone to participate in class so that we can all benefit from the insights and experiences that each person brings.
- During lab time, all group members are expected to contribute equally. Before beginning the lab, you will decide among you who will be doing which roles and write them at the top of the lab worksheet. I will be periodically checking in on everyone throughout the lab period. If you do not contribute your portion of work during a lab, you will receive a zero for that lab. If you would like help, do not hesitate to ask me BEFORE the end of the lab.

Classroom Environment

- Please ask questions during class
- This classroom is welcoming to all. I expect everyone to be respectful in how they communicate and interact with every person in this class. Racist, sexist, homophobic, and other forms of language that potentially marginalize or demean any student are not tolerated.
- In this class we will be sharing multiple perspectives. Please remember to be respectful with one another.
- Please refrain from having side-conversations during the lecture portions of the class. We will be having several periods for discussions during class time.
- You are expected to follow all Codes of Conduct as established by Santa Monica College. These documents can be reviewed at the Student Judicial Affairs webpage. See the rules for Student Conduct (AR 4410), Code of Academic Conduct (AR 4411), Student Honor Code (AR 4412).

Electronic Devices

- During the lecture time of the class, the use of electronic devices such as laptops, and smartphones are **NOT** permitted. You may use tablets or foldable laptops with a writing surface that are face-up and in "notetaking" mode. During lab and group work time, laptops are permitted; however, to maximize participation and learning, this usage is limited to activities supporting concurrent class activities.
- Cell phones and other electronic devices should be on silent mode during class time. Put all electronics on "do not disturb" mode during class to create a good learning environment for everyone.

Food & Drink

Food or drink is prohibited in the classroom except for water bottles, which are permitted if they remain closed when not in active use and are kept away from all equipment.

Recording of Class Lectures

In accordance with Section 78907 of the California Education Code, students shall not use any electronic listening or recording device in any classroom without the prior consent of the instructor, except as necessary to provide reasonable auxiliary aids and academic adjustments to disabled students.

Lab Days and Lab Reports

- We will be completing 12 labs this semester.
- You must show up on lab days **on time**. If you are more than 15 minutes late on lab days, you will **not** be allowed to complete the lab.
- Laboratory data must be taken by each student on the day the lab is assigned. You will not receive credit for analysis on data taken by a group where you were not in attendance.
- You will complete the worksheets and turn one week later. The worksheets will be worth 100 points.
- You must use the data you gather for your lab report. You will be turning in your data you take at the end of the lab period.

- You may discuss the experiment with your lab partner and other classmates, but the lab report that you turn in must be your own work. Lab reports are subject to all the rules governing academic honesty.

Homework

- We will be using online homework via Pearson's Mastering Physics. You will be able to make unlimited attempts for each question with no penalty.
- I recommend that while you are completing the homework, you write out your reasoning: for simple conceptual questions, a couple of sentences; for longer problems full reasoning.
- The homework in this class can be rather challenging. Anticipate that you will require 6-10 hours to complete the homework each chapter. You will likely need assistance with at least two or three problems per assignment.
- To ensure that you have enough time available to seek assistance, begin working on the problem sets as soon as possible.
- I encourage you to work with other students to complete homework problems, you should all organize study groups.
- If you are unable to do a problem, you may post online for other students help, email me to ask for help (see contact information above), or go to office hours. There are also FREE tutors offer via SMC, (https://www.smc.edu/student-support/academic-support/tutoring-centers/index.php) and see below.

ACADEMIC HONESTY

The SMC Honor statement, signed by each student upon enrollment, reads: "In the pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and uphold the Santa Monica College Honor Code, Code of Academic Conduct, and Student Conduct Code. I will conduct myself honorably as a responsible member of the SMC community in all endeavors I pursue." Please be extremely careful that you do not engage in any behavior that could even be construed as cheating. Violations could result in failing grades, reports to the Campus Disciplinarian, and subsequent academic disciplinary action. Examples of behaviors that are not permitted include but are not limited to: inappropriate language or physicality in the classroom, and inappropriate behaviors during an exam (talking with another student, looking at or copying from another student's paper, using a disallowed electronic device or calculator, using disallowed notes, leaving the room without prior permission, removing exam materials from the classroom).

ACCOMMODATIONS FOR DISABILITIES

I encourage students requesting disability-related accommodations to contact the Center for Students with Disabilities as soon as possible. I will work with you and the Center for Students with Disabilities to provide appropriate and reasonable accommodations. An early notification of your request for test-taking and/or other accommodations is necessary to ensure that your disability-related needs are addressed appropriately; testing accommodations cannot be applied retroactively.

The Center for Students with Disabilities is located on the first floor of the Student Services Center, and the phone number is (310) 434-4265 or email at dsps@smc.edu Additional Contact Information can be found at the Center for Students with Disabilities website.

EMERGENCY PREPAREDNESS & SAFETY

The safety of students at SMC is a priority. In the event of an emergency, you should contact the SMC Police Department (310-434-4300).

Please note that emergency procedures are posted in this classroom and every classroom. Please take the time to familiarize yourself with these procedures today, when knowledge of what to do can be the most effective. Also, procedures for various emergencies are delineated on the SMC Emergency Preparedness website.

We strongly encourage everyone to use the LiveSafe mobile app that Santa Monica College is providing to all students, faculty, and staff to download for free. The app provides a quick, convenient, and discreet way to communicate directly with Santa Monica College officials, enhancing your overall safety and allowing Santa Monica College to better serve you. Please use the app to anonymously report any acts of vandalism you may observe.

EMOTIONAL SUPPORT

Over the course of the semester, you may face difficult circumstances beyond your control, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down or depressed, or having difficulty concentrating. Having any of these challenges may create barriers to learning or may make it difficult for you to meet some of the course requirements. If you or someone you know is suffering these or other similarly difficult circumstances, please reach out for support. The staff and faculty of Santa Monica College want you to succeed academically and care about your wellbeing. You may contact the college's Center for Wellness and Wellbeing (LA 110, 310-4344503), which provides short-term mental health services, community referrals, and a 24/7 emotional support line 800-691-6003. Or, if the situation is an emergency, you may contact the SMC Police Department (310-434-4300 or the SMC LiveSafe app). Also, please feel you can contact me so that I can help to direct you to support services on campus that might be most beneficial to you.

EQUITABLE LEARNING ENVIRONMENT

Santa Monica College is an intellectual community enriched and enhanced by diversity along a number of dimensions, including race, ethnicity and national origins, gender and gender identity, disability, sexuality, class and religion. We are especially committed to increasing the representation of those populations that have been historically minoritized in U.S. higher education.

GENDER EXPRESSION AND IDENTITY

I will gladly honor your request to address you by an alternate/preferred name or gender pronoun. Please advise me of this preference early in the semester or session so that I may make appropriate changes to my records. I will do my best to address and refer to all students accordingly and support classmates in doing so as well.

TITLE IX (SEX DISCRIMINATION)

Title IX is a comprehensive federal law that prohibits discrimination on the basis of sex in any federally funded education program or activity: No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance. Those interested in the details should view the Title IX Legal Manual.

Students who have experienced some form of sexual misconduct or discrimination are encouraged to talk to someone about their experience, so they can get the support they need. You can learn more about available support at the Student Services Title IX webpage.

UNDOCUMENTED/DACA/AB540

Santa Monica College stands with the California Community Colleges Chancellor's Office—and hundreds of other educational and business organizations—in affirming that our undocumented students are as integral a part of our community as anyone else. Here at Santa Monica College, we remain committed to serving our undocumented students, to helping them fulfill their life's dreams and aspirations; this college will continue to be a safe environment for all students and personnel. We will work to provide the greatest support to students affected by this decision, and campus and student leaders alike have already rallied in solidarity as well as to provide resources. SMC joins the Chancellor's Office and all the other voices that will advocate determinedly in Congress for an effective solution to this issue, to end a cruel and unnecessary action that goes against the interests of local communities and our country at large.

The **Santa Monica College DREAM Program** provides support services to DREAMers (undocumented, AB540 and DACA recipients). Its purpose is to increase the personal growth, development and retention of DREAM students through academic, career, and personal counseling; assistance in applying for the California Dream Act/Financial Aid and scholarships; and providing workshops relative to DREAMers and their families. The Dream Program is located in the Student Services Center (SSC) 2nd Floor, Room 238. To make an appointment, call (310) 434-4892 or email DREAM@smc.edu.

STUDENT SUCCESS

Academic Counseling

The Counseling Department at SMC can help you with choosing and enrolling in classes, educational and career planning, navigating Corsair Connect, understanding financial aid, referrals to campus resources, and more.

Black Collegians

The Black Collegians Program/Umoja Community at SMC is designed to assist students of African descent in transferring to four-year universities and obtaining their associate degree. They offer services to help students become academically competitive and to set personal goals.

Extended Opportunity Program & Service (EOPS)

Extended Opportunity Program & Services (EOPS) at Santa Monica College is a program that supports the enrollment, retention, graduation, and transfer of students who are challenged by economic and educational disadvantages. They offer service such as academic, career, personal and transfer counseling; priority registration; supplemental textbook assistance; one-on-one tutoring; and much more.

Latino Center/Adelante

The Adelante Program is a success-oriented program focusing on academic achievement, transfer, cultural awareness, and personal growth. Adelante classes emphasize verbal, written, and critical thinking skills essential to college success. Classes accentuate the Latino experience within the context of the course subject, and most classes offer credits that are transferable to the UC and CSU systems.

Student Health Services Center

The SMC Health Services Center provides primary health care services to currently enrolled Santa Monica College students who have paid the California State mandated health fee. It focuses on health promotion, illness prevention, referrals, health and nutrition education. The staff consists of two registered nurses, a registered dietitian, two health assistants, and a nurse practitioner. The Center is located on the northeast corner of the Cayton Center Complex.

Tutoring

Free tutoring centers are available across the campus. There are dedicated centers for Business, CSIS, ESL, Math, Modern Languages, Science, and Writing & Humanities tutoring. For more information about their hours and locations, visit the SMC Tutoring Services Webpage.

Veterans Resource Center

The Veterans Resource Center at Santa Monica College serves veterans entering college for the first time or returning to college to further their education. The office acts as a liaison with the Veterans Administration verifying enrollment for students claiming benefits under the G.I. Bill or the Veterans' Vocational Rehabilitation Program. It also can also assist the veteran with referrals to various veteran-serving programs in the West Los Angeles area. If you would like additional information, please call (310) 434-8205.

STUDENT SERVICES CENTER

Located at the North end of campus on the corner of Pico and 20th street.

- Admissions & Records
- Black Collegians
- CalWORKs
- Care & Prevention Team
- Career Services Center
- Cashier's Office
- Center for Students with Disabilities
- Counseling
- Distance Education
- DREAM Program
- EOPS/CARE
- Financial Aid & Scholarships
- Guardian Scholars
- High Tech Center
- Institutional Research
- International Education Center
- Latino Center
- Pico Partnership
- Scholars Program
- Student Judicial Affairs
- Success & Engagement Center
- Transfer Counseling Center
- Welcome Center

DISCLAIMER

Some elements of the syllabus may be changed at the instructor's discretion. Students will be given at least 48 hours notice of changes whenever possible. If there is any aspect of this syllabus which you do not understand, or to which you take exception, please let the instructor know within the first week of class. Your continued attendance in this course constitutes an acknowledgement and acceptance of the requirements delineated in this syllabus.

Week #	Date (Monday)	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
1	09-01	**LABOR DAY HOLIDAY**		Introduction LECTURE Chapter 12.1-12.3		LECTURE Chapter 12.4-12.6 EXP #1 Archimedes' Principle and Buoyancy
2	09-08	LECTURE Chapter 12.6 Chapter 15.1-15.2		LECTURE Chapter 15.2-15.4		LECTURE Chapter 15.5-15.8 EXP #2 Torricelli's Equation and Equation on Continuity
3	09-15	LECTURE Chapter 15.6-15.8 Chapter 16.1-16.2 Refund Deadline (9/14)		LECTURE Chapter 16.2-16.4		LECTURE Chapter 16.5-16.9 EXP #3 Frequency of Transverse Standing Waves
4	09-22	LECTURE Catch-up/Review		**EXAM 1 CH 12, 15-16**		LECTURE Chapter 17.1-17.3 EXP #4 The Speed of Sound (with the resonance of longitudinal waves)
5	09-29	LECTURE Chapter 17.4-17.7 DROP DEADLINE! (09/28 without W)		LECTURE Chapter 17 Practice Problems		LECTURE Chapter 18.1-18.4 EXP #5 Thermal Expansion
6	10-06	LECTURE Chapter 18.5-18.6		LECTURE Chapter 18 Practice Problems		LECTURE Chapter 19.1-19.3 EXP #6 Latent Heat of Fusion of Ice
7	10-13	LECTURE Chapter 19.4-19.6		LECTURE Chapter 19.7-19.8		LECTURE Chapter 20.1-20.3 EXP #7 Ratio of Heat Capacities for Air
8	10-20	LECTURE Chapter 20.4-20.6		LECTURE Chapter 20.7-20.8		LECTURE Chapter 33.1-33.3

9	10-27	LECTURE Catch-up/Review		**EXAM 2 CH 17-20**		LECTURE Chapter 33.4-33.6 EXP #8 Entropy Statistical Interpretation
10	11-03	LECTURE Chapter 33.7 Chapter 34.1-34.2		LECTURE Chapter 34.3-34.4		LECTURE Chapter 34.5-34.6 Practice Problems EXP #9 Pfund Refraction
11	11-10	LECTURE Chapter 34.7-34.8	**VETERANS DAY**	LECTURE Chapter 34 Practice Problems		LECTURE Chapter 35.1-35.2 EXP #10 Curved Mirrors and Lenses
12	11-17	LECTURE Catch-up/Review		**EXAM 3 CH 33-34**		LECTURE Chapter 35.3-35.4
13	11-24	LECTURE Chapter 35.4-35.5 DROP DEADLINE! (11/23 with W)		LECTURE Chapter 35 Practice Problems	**THANKSGIVING**	**NATIVE AMERICAN HERITAGE DAY**
14	12-01	LECTURE Chapter 36.1-36.3		LECTURE Chapter 36.3-36.5		LECTURE Chapter 36.6-36.7 EXP #11 Thin Film Interference
15	12-08	LECTURE Chapter 36.8		LECTURE Chapter 36 Practice Problems		LECTURE Chapter 36 Practice Problems
16	12-15	LECTURE Catch-up/Review	FINAL EXAM WEEK	**FINAL EXAM 12–3 PM (Tentative)**	FINAL EXAM WEEK	FINAL EXAM WEEK
17	12-22	FINAL EXAM WEEK	FINAL EXAM WEEK			

Self-evaluation Fall 2025 Year 4 Kevin Roberts

I have now completed 7 semesters as a full-time professor at SMC. I did make good progress in several areas of teaching, I am not satisfied with my progress as to become a good teacher and colleague in the SMC physical science department.

First, the parts that I did well. I stayed on schedule the entire time for my classes. We completed all the material in the syllabi and course outline of record with only minimal changes from the syllabus as originally stated.

For the labs, I believe they were well-run. I gave my students the freedom in their labs that I wanted to give them in my previous self-evaluation. The first time that I told some students that they couldn't start a lab when they were more than 20 minutes late, all of my students became much more prompt with their attendance on lab days. I greatly shorten the explanatory "pre-lecture" for labs. Having tried pre-lab assignments in the Spring, I decided against them for this fall. During the lab, I would circle around and make sure that all of my students were taking data and participating in the lab. All of the labs, while they varied in length, were ended promptly before the end of class.

One new thing that I tried was small group work. I held these at about once per week. The students would break up into groups of two to four and work on problems that I assigned them. I believe these were very good to student learning. Often, my students would nod along during class but not fully absorb what I was lecturing. The group work really helped tease out which students needed more help and on which subjects. Each group needed to complete at least three problems during the small group work and they needed to rotate who would write the problem out at any given time.

Curriculum committee work continues to work well. As well as being active during the meetings, I aided my peers in their development of coursework.

I am unsatisfied with my work on grading exams this semester. I wanted to be on top of grading. However, I would somehow find a reason to hold back on grading. As usual, with Jewish holidays and illnesses, I had make-ups. However, I was finding reasons to delay grading. I honestly was hoping that I could find "the right time" to finish up grading. And it wasn't until I forced myself to finish that I got the first few exams finished and returned to my students. I ***do not*** view my progress on returning my exams as satisfactory. If I am given the chance to continue to teach at SMC, I would redouble my efforts at grading more quickly. My exams appear to have a good distribution of scores for my classes. I apply a slight curve to each exam to have my grading distribution match what is expected in our department.

I am also worried about a possible student cheating. I didn't catch this cheating myself, but another student reported that one student would have their phone out whenever I wasn't looking and scan the exam. Presumably they were using AI to search for answers. The student

that is suspected of cheating is also scoring very high on the exams. So I am very worried on how to best monitor for the final. I will be implementing assigned seating for the class so I will have a clear view of my student during the final. I will be also implementing this for my next semester of teaching in the spring semester.

Finally, while my lecture notes are focused and to the point, they are based on the lecture notes made by Pearson, with some examples that I added in. These notes kept me very focused and completed all of the material on time; but they weren't my style. I still have my notes that I made myself. I would like take the best of both. I will look again at how to make my notes as targeted and focused as the adapted Pearson notes.

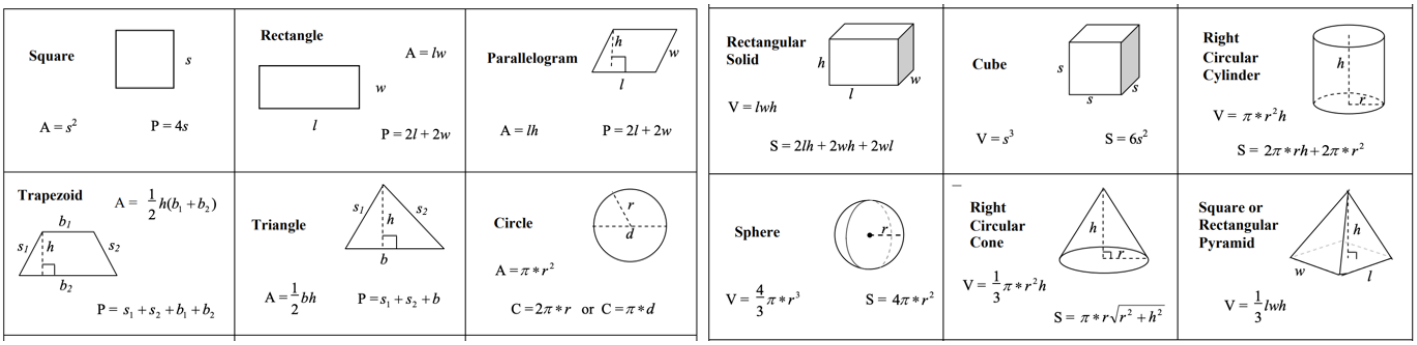
Honestly, I also rushed this self-evaluation as well. I would like to take the time over the winter break at my time management so that I would submit my documents in a timely fashion.

Exam 1
Physics 21
Version A
Chapters 1 – 3, 9.1-9.3

Name:

Your test has 10 multiple-choice and 8 free-response problems, for a total of 100 points.

Some useful constants:
Acceleration due to gravity: $g = 9.80\ m/s^2$



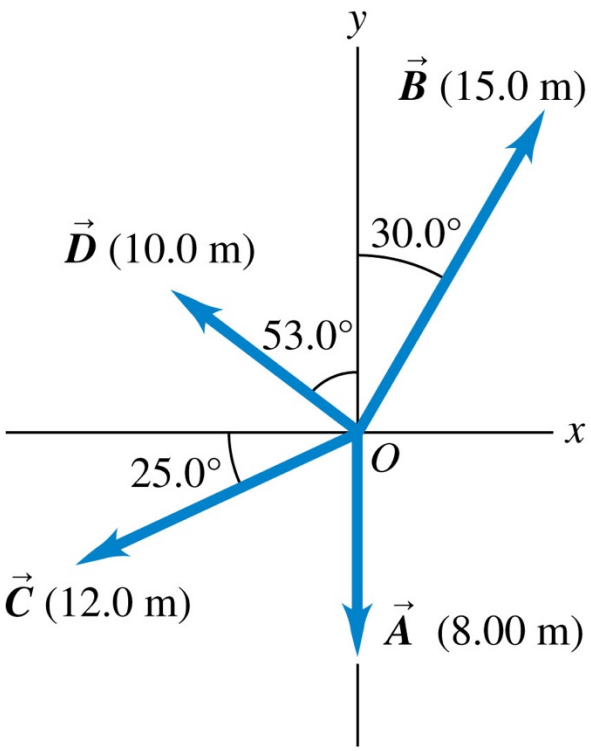
Guidance for problem-solving:

i. Draw a clear motion diagram illustrating the problem.
ii. Draw a coordinate system, with a clearly marked origin.
iii. Identify and number the moments of interest (make sure to draw any vectors that are constant on the side)
iv. Write the kinematic variables for each moment of interest and fill in the known kinematic variables.
v. Write down the equations you will use to solve the equation for the unknown variables.

Solve the equations via algebra (do NOT plug in numbers for a variable unless that number is zero)

Multiple Choice:

1. Consider the vectors shown. Which is a correct statement about $\vec{\mathbf{A}} - \vec{\mathbf{B}}$?
   a. x-component > 0, y-component > 0
   b. x-component > 0, y-component < 0
   c. x-component < 0, y-component > 0
   d. x-component < 0, y-component < 0
   e. x-component = 0, y-component > 0



Explanation:

2. Consider the two vectors $\vec{A} = 3\hat{i} - 4\hat{j}$

$\vec{B} = 6\hat{k}$

I: What is the dot product $\vec{A} \bullet \vec{B}$?

a. zero
b. –6
c. +6
d. 42
e. –42

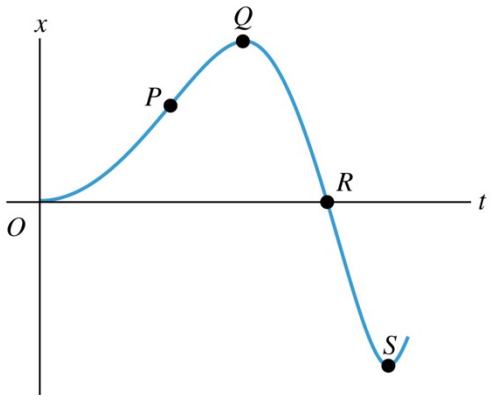
II: What is the cross product $\vec{A} \times \vec{B}$?

a. Zero
b. $24\hat{i} + 18\hat{j}$
c. $-24\hat{i} - 18\hat{j}$
d. $-18\hat{i} + 24\hat{j}$
e. $-18\hat{i} - 24\hat{j}$

Explanation:

3. This is the *x*-*t* graph of the motion of a particle. Of the four points *P, Q, R,* and *S*, the acceleration a_x is greatest (most positive) at

a. Point P
b. Point Q
c. Point R
d. Point S
e. Not enough information is given to decide.



Explanation:

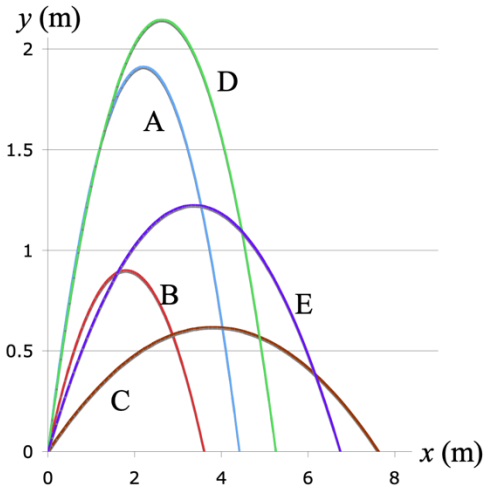
4. You are given the v_x-t graph for an object moving along the x-axis with constant acceleration. Which of the following could you not determine from the information given in this graph alone?
    a. the object's x-acceleration at any time t
    b. the object's x-velocity at any time t
    c. the object's position at any time t
    d. more than one of the above
    e. misleading question—you could determine all of these from the v_x-t graph alone

Explanation:

5. Suppose the nose of an airplane is pointed due east and the airplane has an airspeed of 150 km/h. Due to the wind, the airplane is moving due north relative to the ground and its speed relative to the ground is 150 km/h. What is the velocity of the air relative to the earth?
    a. 150 km/h from southwest to northeast
    b. 150 km/h from southeast to northwest
    c. 212 km/h from southwest to northeast
    d. 212 km/h from southeast to northwest
    e. There is no possible wind that would make this airplane move north at 150 km/h.

Explanation:

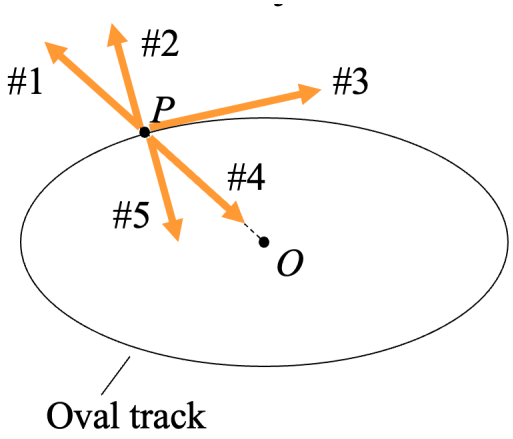
6. Five identical objects, A through E, are launched simultaneously from the ground. Air resistance can be ignored. Rank the objects in order of when they hit the ground, from first to last.



Explanation:

7. An object moves at a constant speed in a clockwise direction around an oval track. The geometrical center of the track is at point O. When the object is at point P, which arrow shows the direction of the object's acceleration vector?

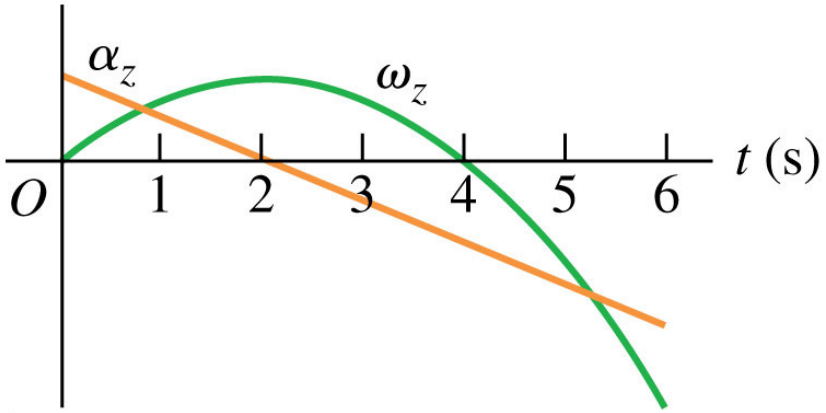
   a. #1 (directly away from *O*)
   b. #2 (perpendicular to the track)
   c. #3 (in the direction of motion)
   d. #4 (directly toward *O*)
   e. #5 (perpendicular to the track)



Explanation:

8. The graph shows the angular velocity ω and angular acceleration α versus time *t* for a rotating body. At which of the following times is the rotation speeding up at the greatest rate?

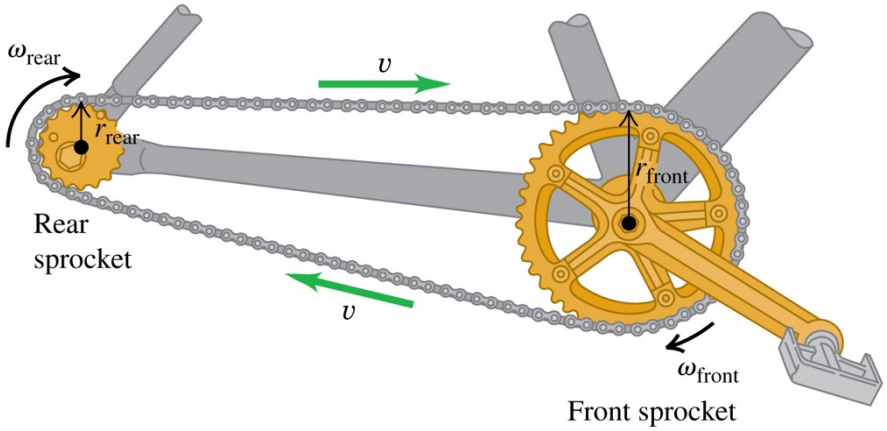
   a. $t = 1$ s.
   b. $t = 2$ s.
   c. $t = 3$ s.
   d. $t = 4$ s.
   e. $t = 5$ s.



Explanation:

9. Compared to a gear tooth on the rear sprocket (on the left, of small radius) of a bicycle, a gear tooth on the *front* sprocket (on the right, of large radius) has
    a. a faster linear speed and a faster angular speed.
    b. the same linear speed and a faster angular speed.
    c. a slower linear speed and the same angular speed.
    d. the same linear speed and a slower angular speed.
    e. none of the above.

Explanation:



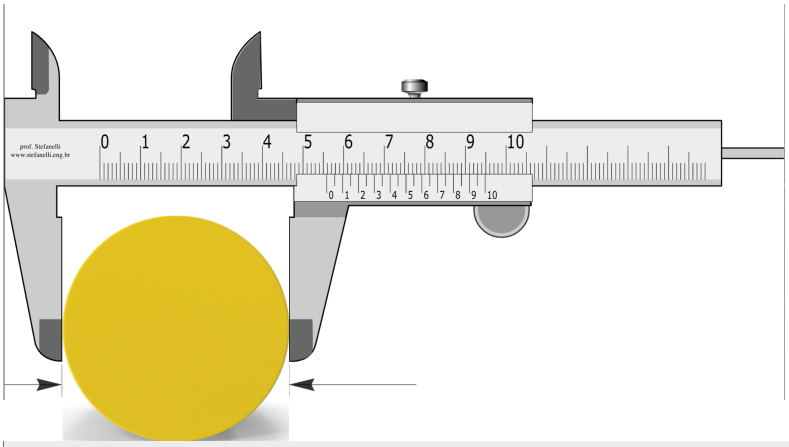
10. A roller coaster car moves around a vertical circle. At the bottom of the circle, the car experiences four times as much radial acceleration as at the top of the circle. Compared to its speed at the top of the circle, the speed of the car at the bottom of the circle is
    a. $\sqrt{2}$ times as great.
    b. twice as great.
    c. $2\sqrt{2}$ times as great.
    d. 4 times as great.
    e. 16 times as great.

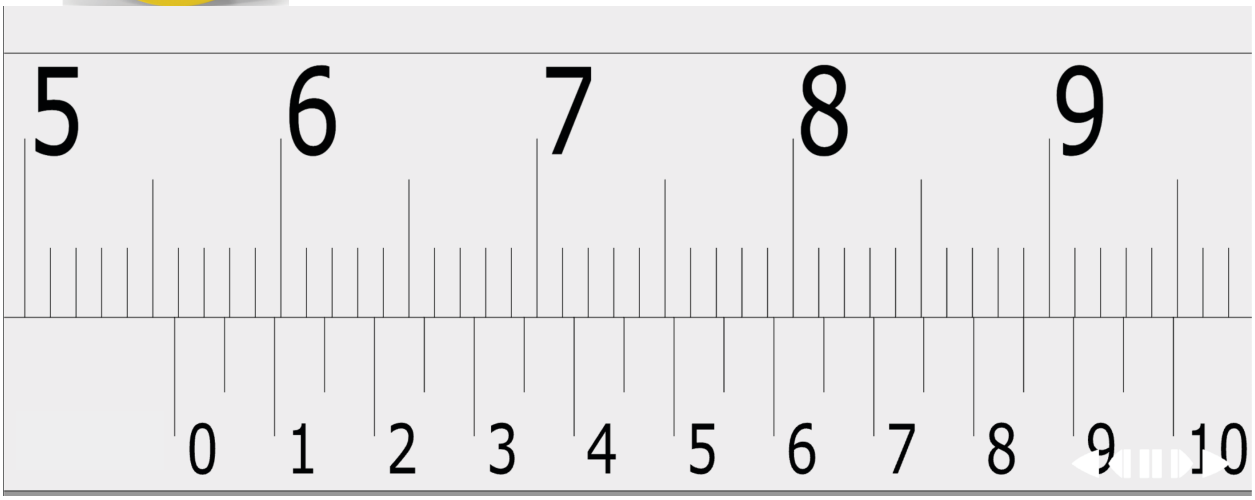
Explanation:

1. Consider the measurements of a circular cylinder using vernier calipers and a triple beam balance. (Diagrams on next page)
    a. What are the measurements for the diameter, length, and mass (include uncertainties)
    b. Find the volume of the cylinder.
    c. The density of the cylinder.

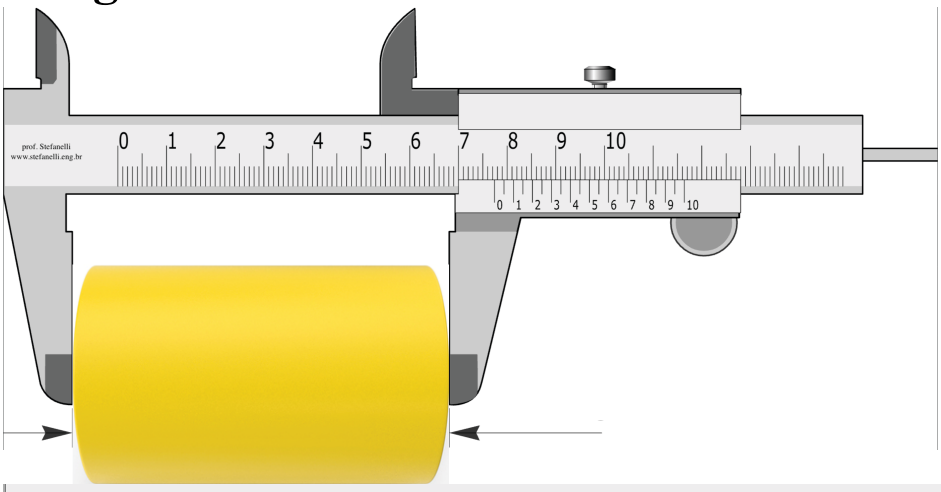
Make sure to propagate uncertainty for the derived values in (b), (c), and (d) (like in the lab) and round to the correct number of significant figures. The main scale on the calipers is centimeters and the main scale on the triple-beam balance scale is grams.

Diameter:





Length:


prof. Stefanelli
www.stefanelli.eng.br
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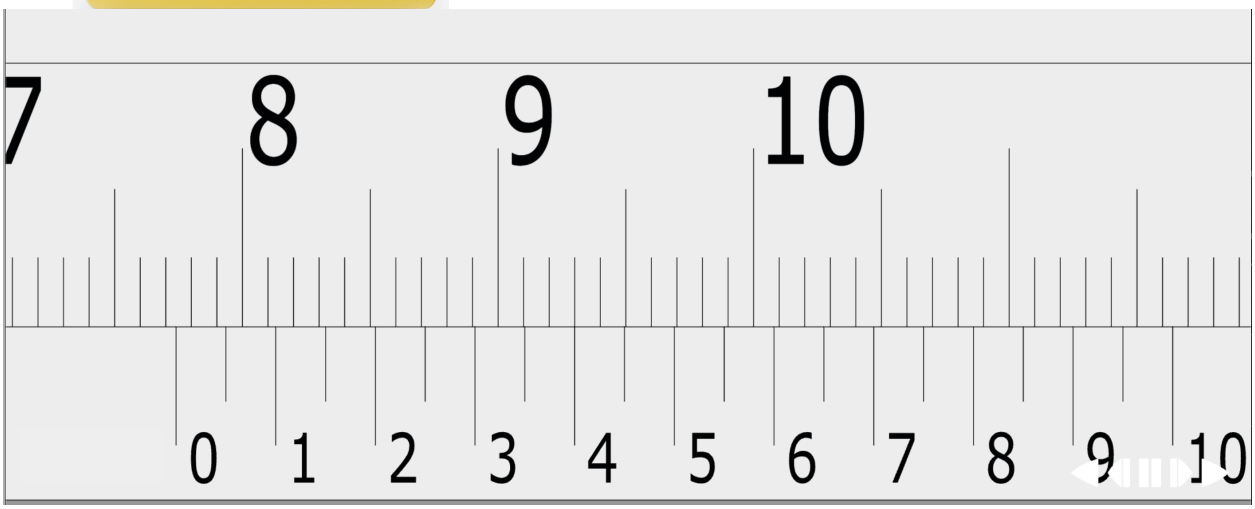
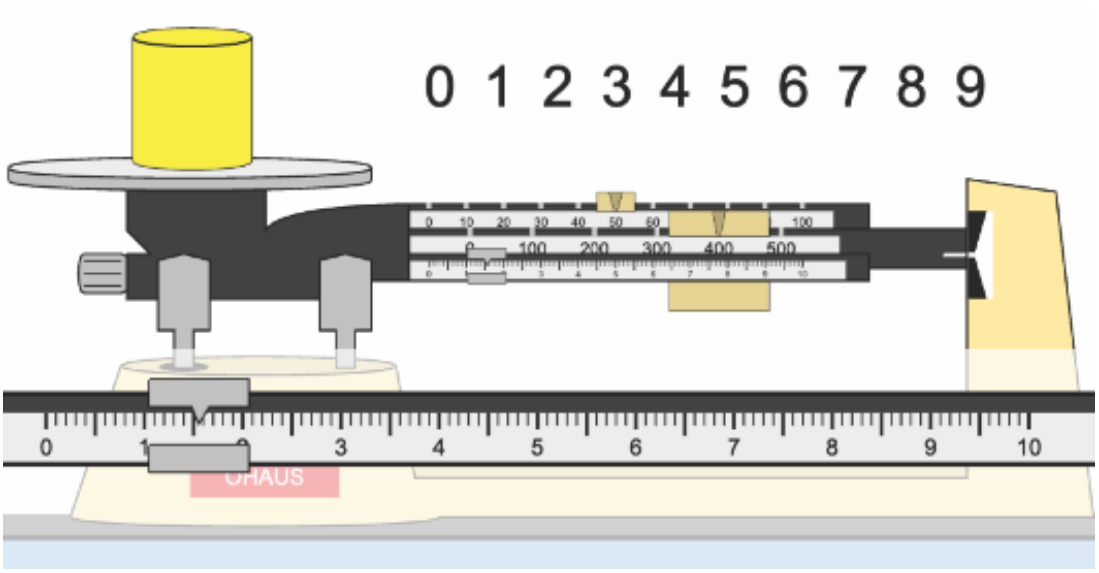
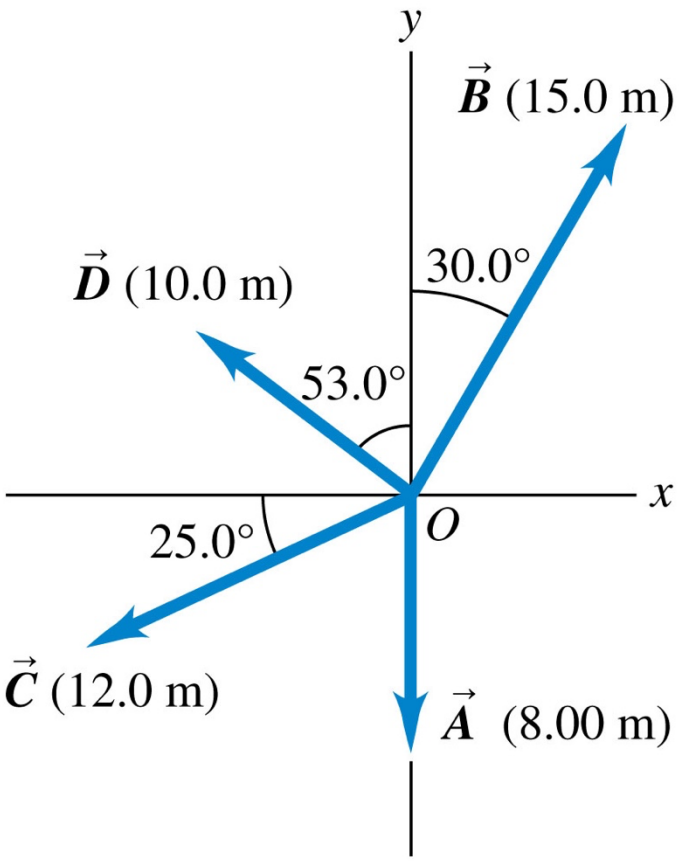

7 8 9 10
0 1 2 3 4 5 6 7 8 9 10

Mass


0 1 2 3 4 5 6 7 8 9
0 10 20 30 40 50 60 100
0 100 200 300 400 500
0 1 2 3 4 5 6 7 8 9 10
OHAUS

Scratch Work

2. Consider the 5 vectors in the diagram. Find the vector sum $\vec{\boldsymbol{R}} = \vec{\boldsymbol{A}} + \vec{\boldsymbol{B}} + \vec{\boldsymbol{C}} + \vec{\boldsymbol{D}} + \vec{\boldsymbol{E}}$ in the following steps:
    a. Break each vector into components along that coordinate axis.
    b. What are the components R_x and R_y
    c. Find the magnitude and direction of R.

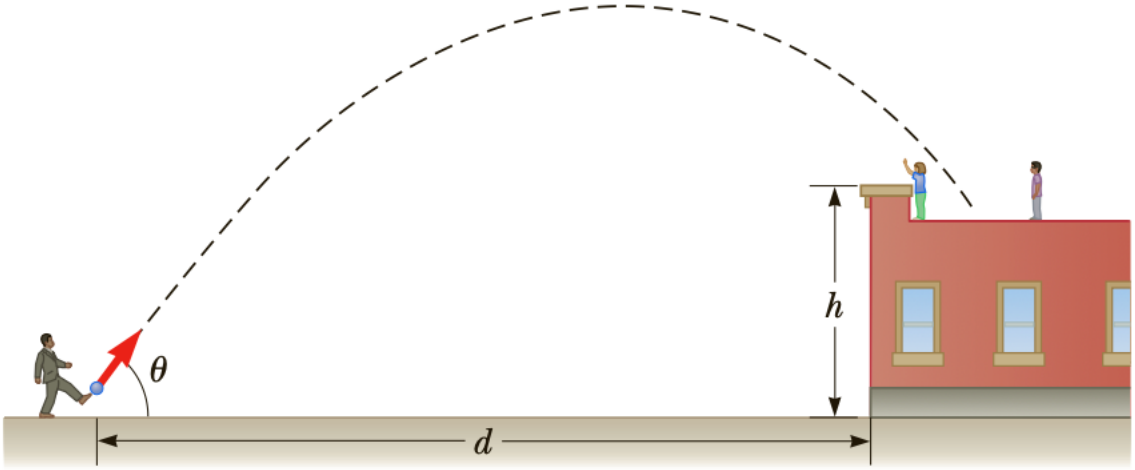


3. Speedy Sue, driving at 30.0 m/s, enters a one-lane tunnel. She then observes a slow-moving van 155 m ahead traveling at 5.00 m/s. Sue applies her brakes but can accelerate only at $-2.00\ m/s^2$ because the road is wet.
    a. Will there be a collision? State how you decide.
    b. If yes, determine how far into the tunnel and at what time the collision occurs. If no, determine the distance of closest approach between Sue's car and the van.
    a. On a single x-vs-t graph, sketch the positions of the front Speedy Sue's car and the back of the moving van.

Workspace for problem 3.

4. An airplane pilot sets a compass course due west and maintains an airspeed of 220 km/h. After flying for 0.500 h, she finds herself over a town 120 km west and 20 km south of her starting point.
    a. Find the wind velocity (magnitude and direction).
    b. If the wind velocity is 40 km/h due south, in what direction should the pilot set her course to travel due west? Use the same airspeed of 220 km/h.

5. A playground is on the flat roof of a city school, 6.00 m above the street below. The vertical wall of the building is $h = 7.00$ m high, to form a 1-m-high railing around the playground. A ball has fallen to the street below, and a passerby returns it by launching it at an angle of $\theta = 53.0°$ above the horizontal at a point $d = 24.0$ m from the base of the building wall. The ball takes 2.20 s to reach a point vertically above the wall.
    a. Find the speed at which the ball was launched.
    b. Find the vertical distance by which the ball clears the wall.
    c. Find the horizontal distance from the wall to the point on the roof where the ball lands.



Extra Space/Scratch work

6. A particle's velocity is described by the function $v_x(t) = 1\frac{\text{m}}{\text{s}^3}t^2 - 7\frac{\text{m}}{\text{s}^2}t + 10\ \frac{m}{s}$ where t is in seconds. The initial position of the particle at $t = 0$ s is 20 m.
    a. At what times does the particle reach its turning points?
    b. What is the particle's acceleration at each of the turning points?
    c. Draw graphs of $x(t)$, $v_x(t)$, and $a_x(t)$.

Graphing Space/Scratch work

7. A 45.0-cm diameter disk rotates with a constant angular acceleration of 2.50 rad/s^2. It starts from rest at $t = 0$, and a line drawn from the center of the disk to a point P on the rim of the disk makes an angle of 57.3° with the positive x-axis at this time. At $t = 2.30$ s, find:
    a. the angular speed of the wheel,
    b. the linear speed and tangential acceleration of P, and
    c. the position of P (in degrees, with respect to the positive x-axis).

8. Consider the following diagrams:
    a. Figure A shows the angular-velocity-versus-time graph for a particle moving in a circle. How many revolutions does the object make during the first 4 s?
    b. Figure B shows A wheel initially rotating at 60 rpm experiences the angular acceleration. What is the wheel's angular velocity, in rpm, at t = 3.0 s?

Figure A

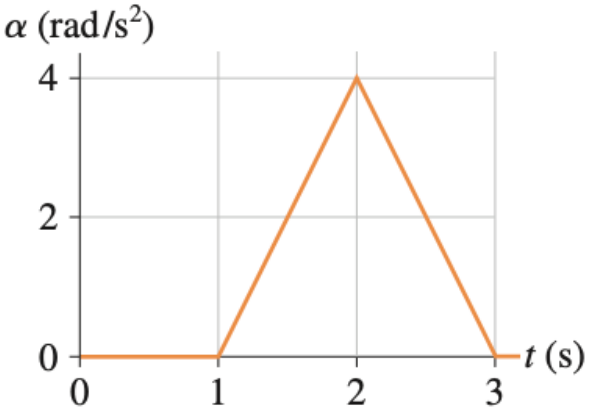


Figure B

Scratch work

Exam 2
Physics 21

Version A

Chapters 4 – 6

Name:

_____

Student ID:

_____

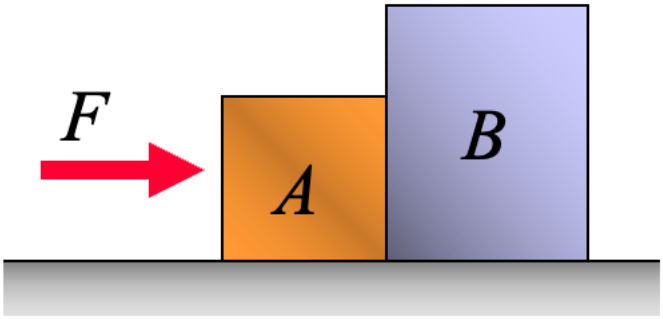
Your test has 10 multiple-choice and 8 free-response problems, for a total of 100 points.

Some useful constants:

Acceleration due to gravity: $g = 9.80\ m/s^2$

Multiple Choice (1.2 points each):

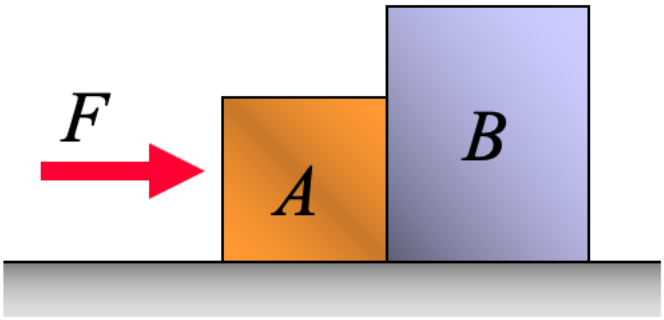
1. A lightweight crate (A) and a heavy crate (B) are side-by-side on a horizontal floor. You apply a horizontal force F to crate A. There is friction between the crates and the floor. If the two crates are *accelerating to the right*,



   a. crate A exerts more force on crate B than B exerts on A.
   b. crate A exerts less force on crate B than B exerts on A.
   c. crate A exerts as much force on crate B as B exerts on A.
   d. answer depends on the details of the friction force.
   e. answer depends on the magnitude of the acceleration.

Explanation:

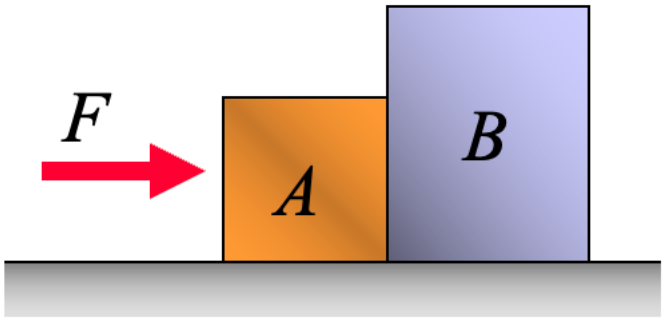
2. A lightweight crate (A) and a heavy crate (B) are side-by-side on a frictionless horizontal surface. You apply a horizontal force F to crate A, causing A and B to accelerate together to the right. How do the magnitudes of the following forces compare: (i) the force F, (ii) the net force on A, and (iii) the net force on B?



   a. F = net force on A = net force on B
   b. F > net force on A = net force on B
   c. F > net force on A > net force on B
   d. F > net force on B > net force on A
   e. none of the above

Explanation:

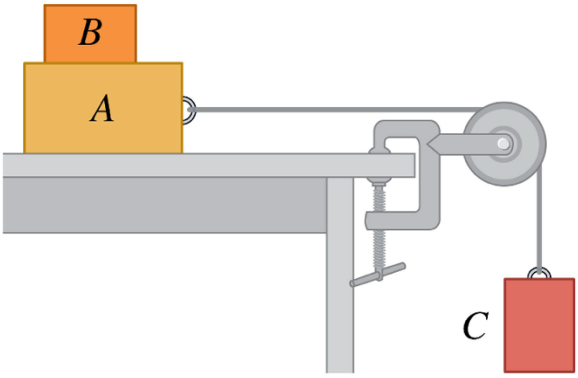
3. A lightweight crate (A) and a heavy crate (B) are side-by-side on a frictionless horizontal surface. If you apply a horizontal force F to crate A,



   a. the acceleration is greater than if B were on the left and A were on the right.
   b. the acceleration is less than if B were on the left and A were on the right.
   c. the crates will not move if F is less than the combined weight of A and B.
   d. two of the above are correct.
   e. none of the above is correct.

Explanation:

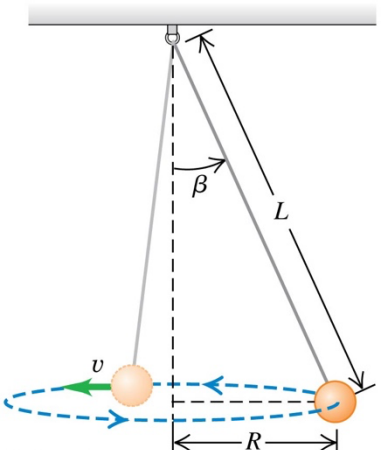
4. Blocks A and C are connected by a string as shown. When released, block A accelerates to the right and block C accelerates downward. There is friction between blocks A and B, but not enough to prevent block B from slipping. If you stood next to the table during the time that block A is accelerating to the right and block B is slipping on top of block A, you would see



   a. block B remaining at rest.
   b. block B moving at constant speed to the left.
   c. block B moving at constant speed to the right.
   d. block B accelerating to the left.
   e. block B accelerating to the right.

Explanation:

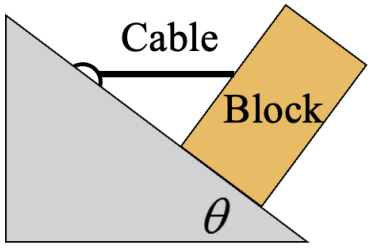
5. A pendulum bob of mass m is attached to the ceiling by a thin wire of length L. The bob moves at constant speed in a horizontal circle of radius R, with the wire making a constant angle β with the vertical. The tension in the wire
    a. is greater than mg
    b. is equal to mg
    c. is less than mg
    d. could be two of the above, depending on the values of m, L, R, and β
    e. could be all three of the above, depending on the values of m, L, R, and β



Explanation:

6. A block is held in place on a frictionless incline by a horizontal cable, as shown. The block has weight w and the angle of the incline is $\theta = 37°$

$(\sin 37° = 3/5, \cos 37° = 4/5, \tan 37° = 3/4)$



Rank the following forces in order of their magnitude, from largest to smallest.

a. the gravitational force that earth exerts on the block
b. the normal force that the incline exerts on the block
c. the force that the string exerts on the block

Explanation:

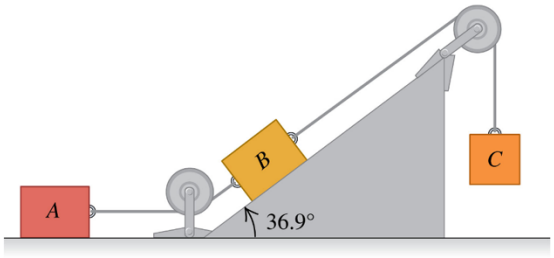
7. An object is initially at rest. A net force (which always points in the same direction) is applied to the object so that the *power* of the net force is constant. As the object gains speed,
    a. the magnitude of the net force remains constant.
    b. the magnitude of the net force increases.
    c. the magnitude of the net force decreases.
    d. the magnitude of the net force first increases, then remains the same.
    e. Not enough information is given to decide.

Explanation:

8. **Rank** the following objects in order of their kinetic energy, from largest to smallest.
    a. 2.00-kg object moving at 1.00 m/s
    b. A 1.00-kg object moving at 2.00 m/s
    c. A 4.00-kg object that was initially at rest, then had 8.00 J of total work done on it
    d. A 4.00-kg object that was initially moving at 2.00 m/s, then had –8.00 J of total work done on it

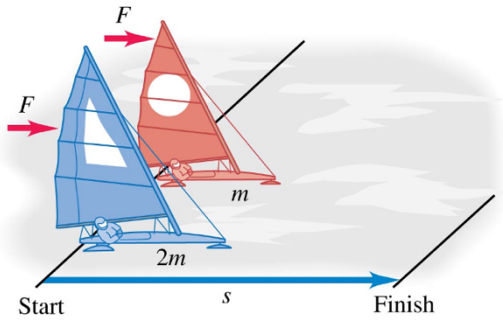
Explanation:

9. Three blocks are connected as shown. The ropes and pulleys are of negligible mass. When released, block *C* moves downward, block *B* moves up the ramp, and block *A* moves to the right. After each block has moved a distance *d*, the force of gravity has done



a. positive work on *A*, *B*, and *C*.
b. positive work on *A* and *B*, and negative work on *C*.
c. zero work on *A,* positive work on *B*, and negative work on *C*.
d. zero work on *A,* negative work on *B*, and positive work on *C*.
e. none of these.

Explanation:

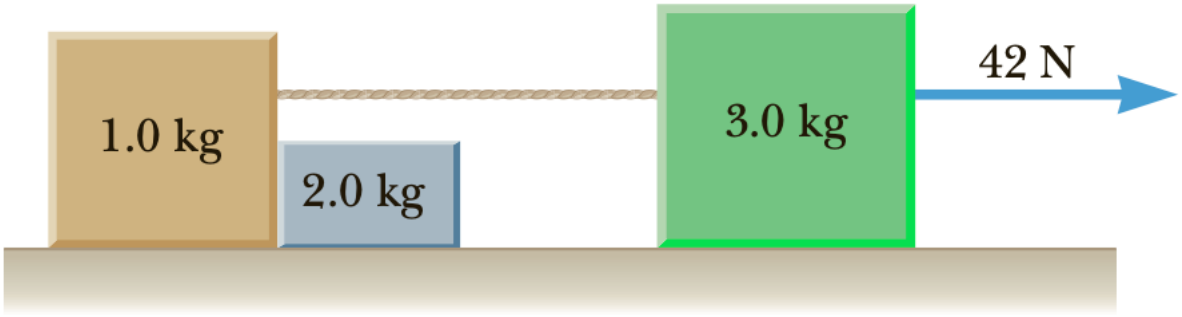


10. Two iceboats (one of mass *m,* one of mass 2*m*) hold a race on a frictionless, horizontal, frozen lake. Both iceboats start at rest, and the wind exerts the same constant force on both iceboats. Which iceboat crosses the finish line with more kinetic energy (KE)?

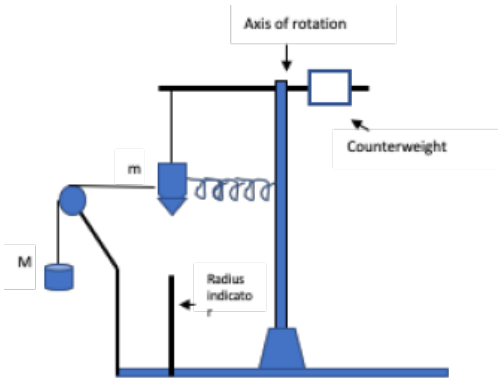
a. The iceboat of mass *m*: it has twice as much KE as the other.
b. The iceboat of mass *m*: it has four times as much KE as the other.
c. The iceboat of mass 2*m*: it has twice as much KE as the other.
d. The iceboat of mass 2*m*: it has four times as much KE as the other.
e. They both cross the finish line with the same kinetic energy.

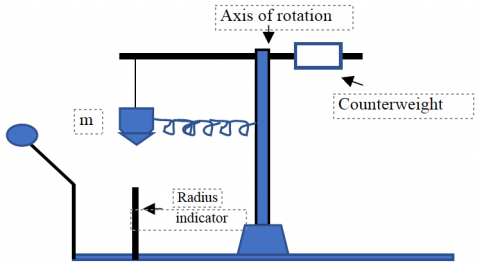
Explanation:

1. (10 points) Assume the three blocks in the figure move on a frictionless surface and a 42-N force acts as shown on the 3.0-kg block.
    a. Determine (a) the acceleration given this system.
    b. Find the tension in the cord connecting the 3.0-kg and the 1.0-kg blocks.
    c. Find the force exerted by the 1.0-kg block on the 2.0-kg block.



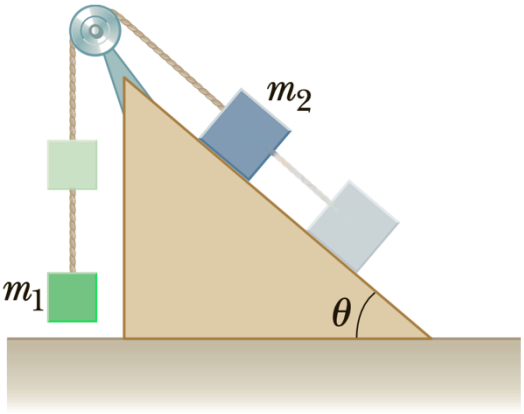
2. (12 points) Consider the centripetal force apparatus in the static configuration to the right. At this moment, a hanging mass M, perfectly balances out the spring's force pulling on m, that mass that will be swung in a circle at radius R, matching the radius indicator. At this moment, the string holding m is perfectly vertical to the horizontal cross bar.



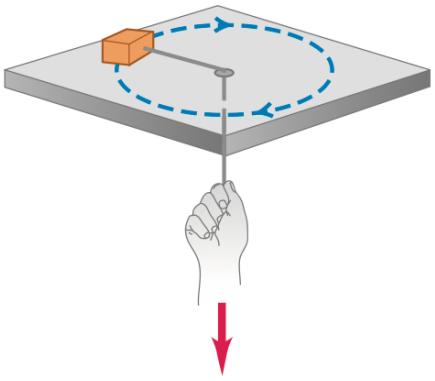


   a. Approximating the spring as massless, (and $g = 9.8$ m/s^2 exactly) we measure the following values: M = 420 g ± 20 g, R = 19 ± 1 cm, and m = 365 g ± 1 g. What is the value of the spring force, with the uncertainty propagated?
   b. Now we remove M and the string that attached it. We then spin m so that string on the cross bar remains vertical at the radius R. We will measure a total time T_{total} for N revolutions. Derive a relationship for theoretical centripetal force and its uncertainty.
   c. If we measure a time T_{total} = 85 ± 0.5 s for exactly N = 100 revolutions, what is the centripetal force and its uncertainty? Are the two measurements consistent? What is the percent error between the measurements?

3. (12 points) Objects of masses $m_1 = 4.00$ kg and $m_2 = 9.00$ kg are connected by a light string that passes over a frictionless pulley as shown. The object m_1 is held at rest on the floor, and m_2 rests on a fixed incline of $\theta = 40.0°$. The objects are released from rest, and m_2 slides 1.00 m down the incline in 4.00 s. Determine:
    a. the acceleration of each object.
    b. the tension in the string.
    c. the coefficient of kinetic friction μ_k between m_2 and the incline.

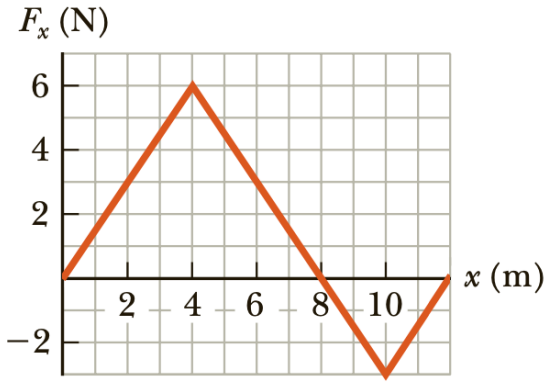


4. (12 points) A small block with a mass of 0.0600 kg is attached to a cord passing through a hole in a frictionless, horizontal surface. The block is originally revolving at 0.40 m from the hole with a speed of 0.70 m/s. The cord is then pulled from below, shortening the radius of the circle in which the block revolves to 0.10 m. At this new distance, the speed of the block is 2.80 m/s.



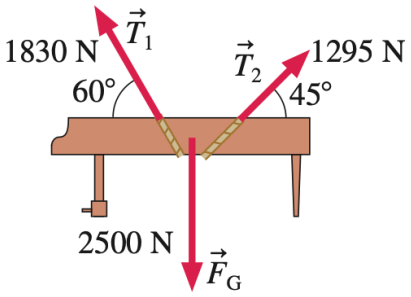
   a. What is the tension in the cord in the original situation, when the block has speed v = 0.70 m/s?
   b. What is the tension in the cord in the final situation, when the block has speed v = 2.80 m/s?
   c. How much work was done by the person who pulled on the cord?

5. (10 points) The force acting on a particle varies as in the figure. Find the work done by the force as the particle moves from
   a. $x = 0$ m to $x = 8$ m
   b. $x = 8$ m to $x = 10$ m
   c. $x = 0$ m to $x = 10$ m



6. (12 points) A small block sits at one end of a flat board that is 3.00 m long. The coefficients of friction between the block and the board are $\mu_s = 0.600$ and $\mu_k = 0.400$. The end of the board where the block sits is slowly raised until the angle the board makes with the horizontal is α_0, and then the block starts to slide down the board. If the angle is kept equal to α_0 as the block slides, what is the speed of the block when it reaches the bottom of the board?

7. (10 points) The two ropes are used to lower a 255 kg piano 5.00 m from a second-story window to the ground. How much work is done by each of the three forces?



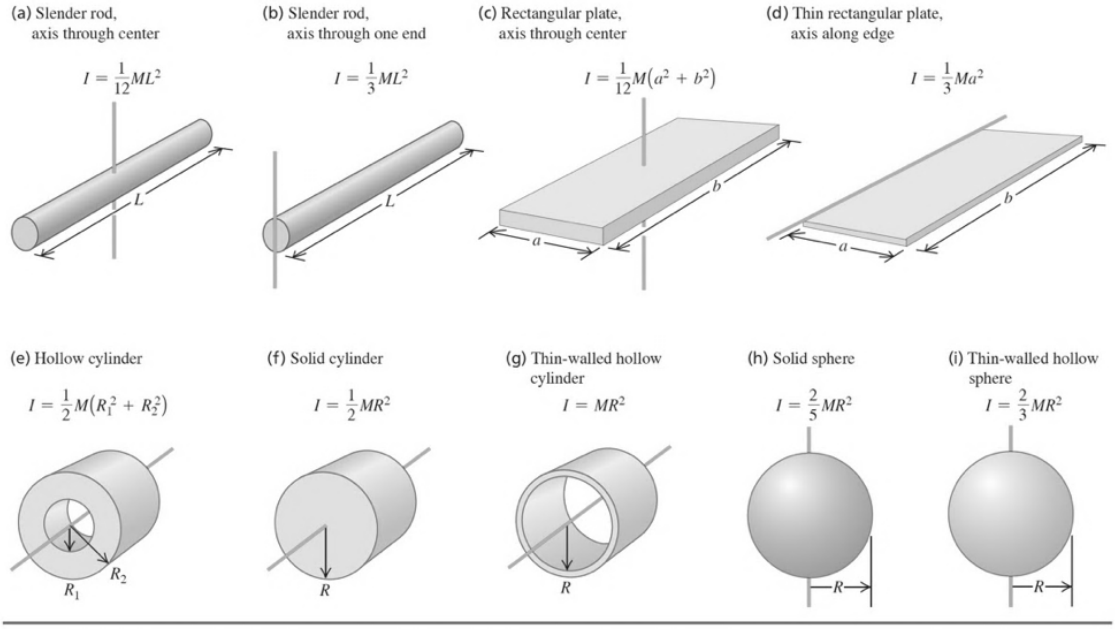
8. (10 points) A 1.50×10^3- kg car starts from rest and accelerates uniformly to 18.0 m/s in 12.0 s. Assume that air resistance remains constant at 4.00×10^2 N during this time. Find:
    a. the average power developed by the engine and
    b. the instantaneous power output of the engine at $t = 12.0$ s, just before the car stops accelerating.

Exam 3
Physics 21
Version A
Chapters 7 – 10
Name:

Student ID:

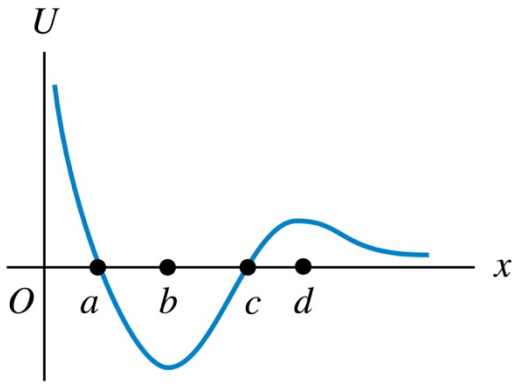
Your test has 10 multiple-choice and 8 free-response problems, for a total of 100 points.
Acceleration due to gravity: $g = 9.80\ m/s^2$

TABLE 9.2 Moments of Inertia of Various Bodies



Multiple Choice (1.2 points each):

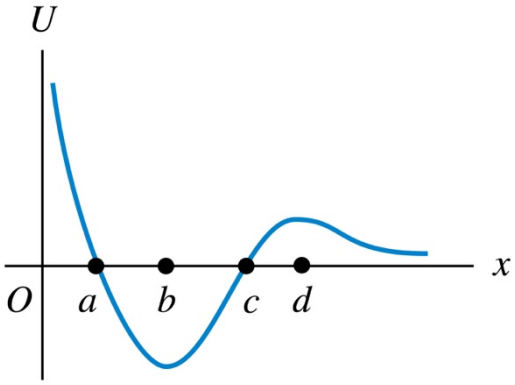
1. The graph shows the potential energy U for a particle that moves along the x-axis. The only force that acts on the particle is the force associated with U. The particle is initially at $x = d$ and moves in the negative x-direction. At which of the labeled x-coordinates does the particle have the greatest *speed*?



   a. $x = a$
   b. $x = b$
   c. $x = c$
   d. $x = d$
   e. More than one above

Explanation:

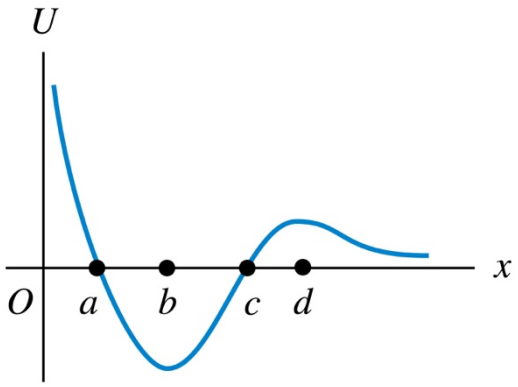
2. The graph shows the potential energy U for a particle that moves along the x-axis. The only force that acts on the particle is the force associated with U. The particle is initially at $x = d$ and moves in the negative x-direction. At which of the labeled x-coordinates is the particle *slowing down*?



   a. $x = a$
   b. $x = b$
   c. $x = c$
   d. $x = d$
   e. More than one above

Explanation:

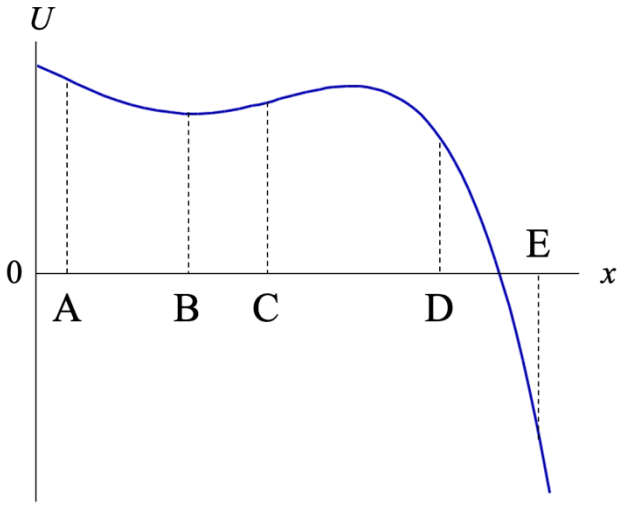
3. The graph shows the potential energy U for a particle that moves along the x-axis. The only force that acts on the particle is the force associated with U. At which of the labeled x-coordinates is there *zero* force on the particle?
    a. At $x = a$ and $x = c$
    b. At $x = b$ only
    c. At $x = d$ only
    d. At $x = b$ and $x = d$
    e. Misleading question—there is a force at all values of x.



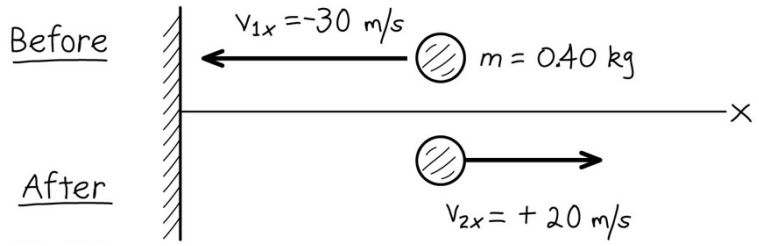
Explanation:

4. The graph below shows the potential energy U of a particle moving along the x-axis. **Rank the points** A, B, C, D, and E in order of the x-component F_x of the associated conservative force on the particle at those points, from most positive to most negative.

Explanation:



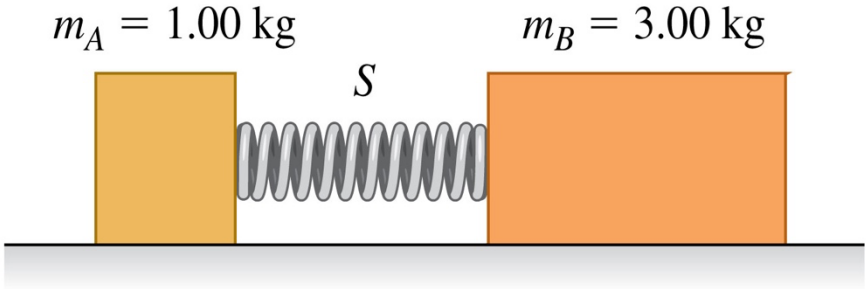
5. A ball (mass 0.40 kg) is initially moving to the left at 30 m/s. After hitting the wall, the ball is moving to the right at 20 m/s. What is the impulse of the net force on the ball during its collision with the wall?
   a. 20 kg • m/s to the right
   b. 20 kg • m/s to the left
   c. 4.0 kg • m/s to the right
   d. 4.0 kg • m/s to the left
   e. none of the above



Explanation:

6. Block *A* on the left has mass 1.00 kg. Block *B* on the right has mass 3.00 kg. The blocks are forced together, compressing the spring. Then the system is released from rest on a level, frictionless surface.

I: After the blocks are released, how does p_A (the magnitude of momentum of block *A*) compare to p_B (the magnitude of momentum of block *B*)?

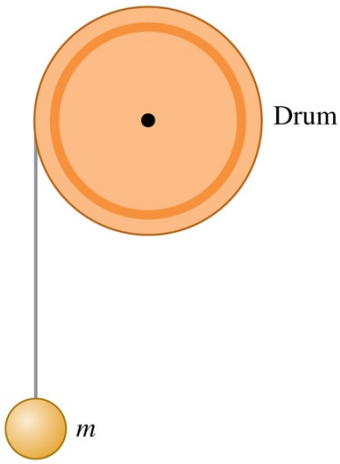


   a. $p_A = p_B/9$
   b. $p_A = p_B/3$
   c. $p_A = p_B$
   d. $p_A = 3p_B$
   e. $p_A = 9p_B$

II: How does K_A (the kinetic energy of block *A*) compare to K_B (the kinetic energy of block *B*)?
   a. $K_A = K_B/9$
   b. $K_A = K_B/3$
   c. $K_A = K_B$
   d. $K_A = 3K_B$
   e. $K_A = 9K_B$

Explanation:

7. A thin, very light wire is wrapped around a drum that is free to rotate. The free end of the wire is attached to a ball of mass m. The drum has the same mass m. Its radius is R and its moment of inertia is $I = (1/2)mR^2$. As the ball falls, the drum spins. At an instant that the ball has translational kinetic energy K, what is the rotational kinetic energy of the drum?

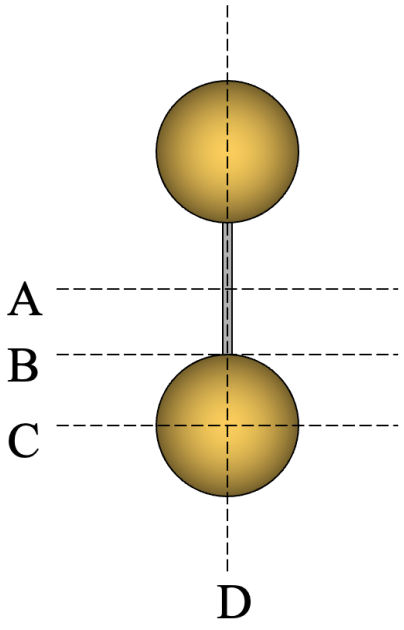


   a. K
   b. $2K$
   c. $K/2$
   d. $K/4$
   e. None of these

Explanation:

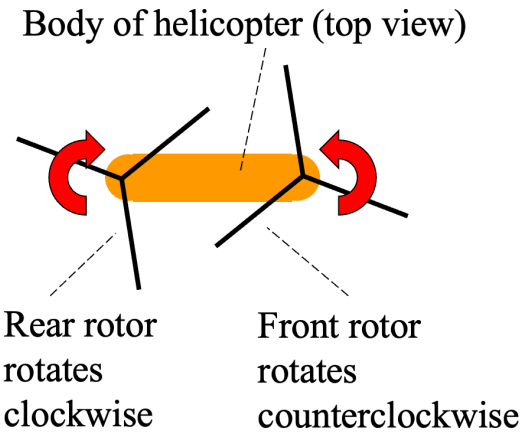
8. Two identical uniform solid spheres are attached by a solid uniform thin rod. The rod lies on a line connecting the centers of mass of the two spheres. Axes A, B, C, and D are in the same plane as the centers of mass of the spheres and of the rod.

   For the combined object of two spheres plus rod, **rank** the object's *moments of inertia* about the four axes, from largest to smallest.



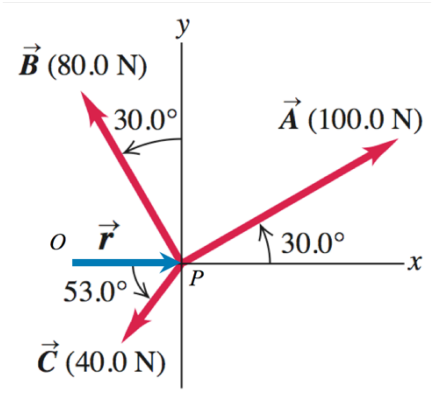
Explanation:

9. Some helicopters have two large rotors that rotate in opposite directions as shown. If instead they both rotated in the clockwise direction as seen from above, what would happen to the body of the helicopter if the pilot increased the rotation speed of both rotors?



   a. The body would rotate clockwise.
   b. The body would rotate counterclockwise.
   c. Nothing—there would be no effect on the body.
   d. The answer depends on how fast the rotors rotate.

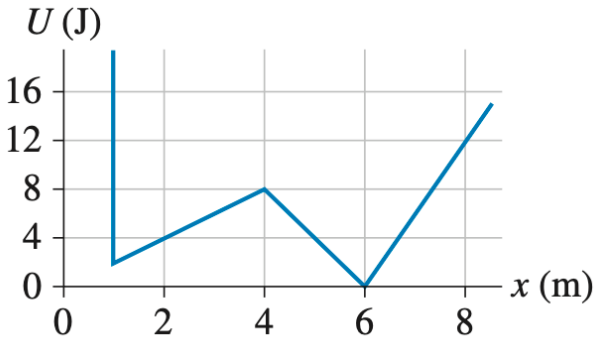
Explanation:



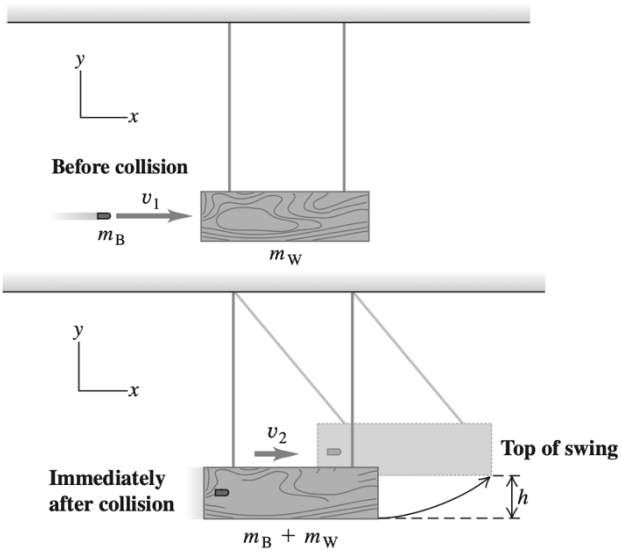
10. Three force vectors are shown in the figure above. All three forces act at point *P*. **Rank** the three forces in order of the magnitude of the torque that they produce about point *O*, a distance $r = 0.500$ m from point *P*. Rank them from largest torque to smallest torque.

Explanation:

1. (12 points) The graph shows the potential energy of a 500 g particle as it moves along the x-axis. Suppose the particle's total mechanical energy is 12 J.
    a. Where are the particle's turning points?
    b. What is the particle's speed when it is at $x = 4.0$ m?
    c. What is the particle's maximum speed? At what position or positions does this occur?
    d. Suppose the particle's total energy is lowered to 4.0 J. Can the particle ever be at $x = 2.0$ m? At $x = 4.0$ m?
    e. What is the maximum speed a 200 g particle could have at x = 2.0 m and never reach x = 6.0 m?

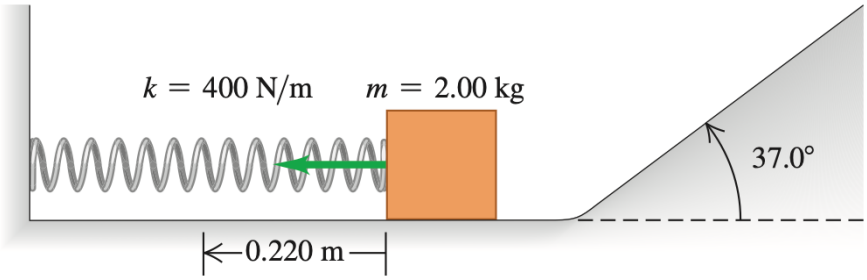


2. (12 points) Consider a ballistic pendulum. We want to see if two methods of checking the velocity of a fired projectile are consistent.
    a. Let's say the projectile is fired through a set of photogates that measure the length of time the laser is block. Using calipers, the projectile's diameter measured as 2.410 cm ± 0.005 cm. The photogate measures time blocked of 4.9±0.1 ms = 0.0049±0.0001 s. What the speed of the projectile and its uncertainty?
    b. Now we fire the projectile (mass m_B) into a pendulum (mass m_W). After the projectile embeds in the pendulum and both swing up a height h. Derive a relationship for speed of the projectile v_1 in terms of m_B, m_W, and h.
    c. What is the uncertainty of this speed from this method? (Hint: the equation is simpler if you write it terms of the total mass $M = m_B + m_W$).
    d. On a scale we measure: $m_B = 50$ g ± 1 g, $m_W = 255$ g ± 1 g. We observe the pendulum to swing up a height of $h = 3.2 \pm 0.1$ cm. What is the speed of the projectile from this method with its uncertainty? Is this consistent with part a?



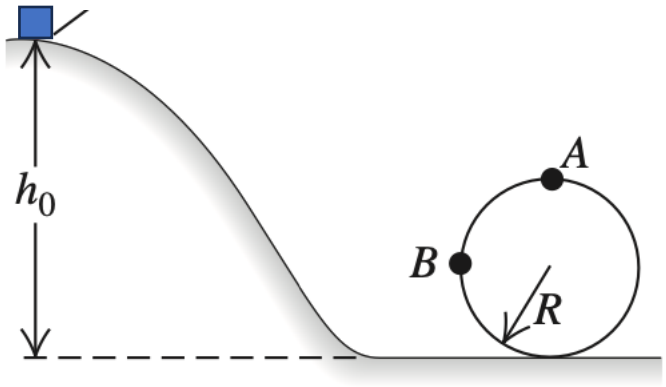
Scratch work for 2

3. (10 points) A 2.00 kg block is pushed against a spring with negligible mass and force constant $k = 400$ N/m, compressing it 0.220 m. When the block is released, it moves along a frictionless, horizontal surface and then up a frictionless incline with slope 37.0°.
    a. What is the speed of the block as it slides along the horizontal surface after having left the spring?
    b. How far does the block travel up the incline before starting to slide back down?

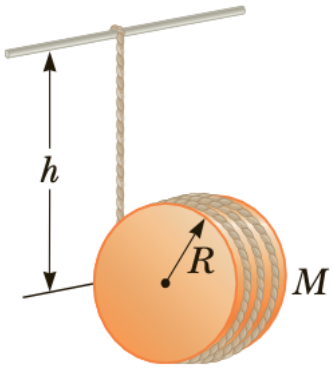


4. (12 points) A package of mass m is released from rest at a warehouse loading dock and slides down the 3.0-m-high, frictionless chute to a waiting truck. Unfortunately, the truck driver went on a break without having removed the previous package, of mass 2m, from the bottom of the chute.
    a. Suppose the packages stick together. What is their common speed after the collision?
    b. Suppose the collision between the packages is perfectly elastic. To what height does the package of mass m rebound?

5. (10 points) A block of mass m **slides** down a frictionless track, then around the inside of a circular loop-the-loop of radius R. From what minimum height h_0 must the block start to make it around without falling off? Give your answer as a multiple of R.



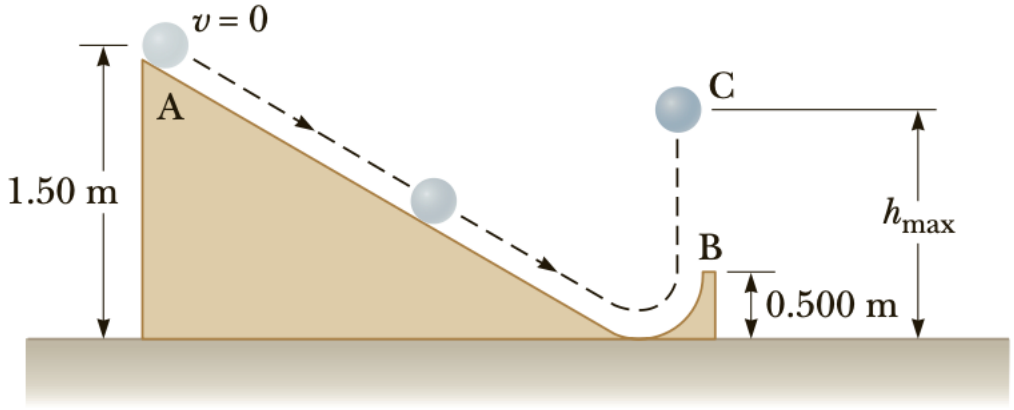
6. (10 points) A string is wrapped around a uniform cylinder of mass M and radius R. The cylinder is released from rest with the string vertical and its top end tied to a fixed bar. As the cylinder descends:
    a. Find the tension in the string.
    b. Find the magnitude of the acceleration of the center of mass.
    c. Find the speed of the center of mass after the cylinder has descended through distance h.



7. (10 points) A 2.00-kg solid, uniform ball of radius 0.100 m is released from rest at point A in the figure below, its center of mass is 1.50 m above the ground. The ball **rolls without slipping** to the bottom of an incline and back up to point B where it is launched vertically into the air. The ball rises to its maximum height h_{max} at point C. At point B, find the ball's
    a. translational speed v_B and
    b. rotational speed ω_B.

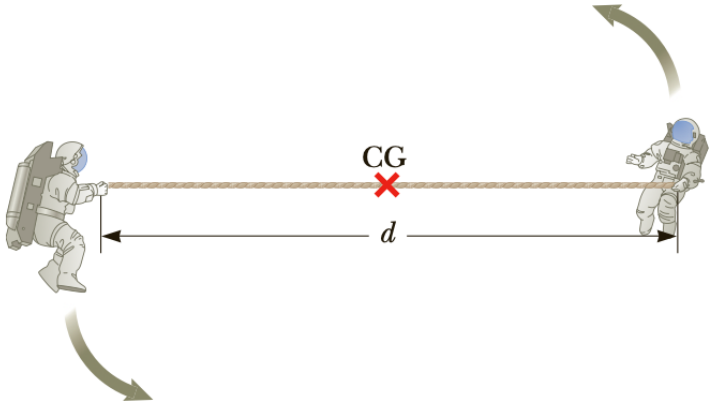
At point C, find the ball's

    c. rotational speed ω_C and
    d. maximum height h_{max} of its center of mass.



8. (12 points) Two astronauts, each having a mass of 75.0 kg, are connected by a 10.0-m rope of negligible mass. They are isolated in space, moving in circles around the point halfway between them at a speed of 5.00 m/s. Treating the astronauts as particles, calculate
    a. the magnitude of the angular momentum and
    b. the rotational energy of the system.

By pulling on the rope, the astronauts shorten the distance between them to 5.00 m.



    c. What is the new angular momentum of the system?
    d. What are their new speeds?
    e. What is the new rotational energy of the system?
    f. How much work is done by the astronauts in shortening the rope?

Scratch work

Exam 1
Physics 23
Fall 2025

Chapters 12, 15, 16

Your test has 10 multiple-choice and 8 free-response problems, for a total of 100 points.

Name:

_____

Student ID:

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Some useful constants:
Atmospheric pressure at sea level: 101,325 Pa
Density of Fresh Water: ~1000 kg/m^3
Density of air at sea level: 1.204 kg/m^3
Speed of sound in air 343 m/s

Multiple Choice (1.2 points each):

1. **Rank** the following objects in order from highest to lowest average density.

A. Mass = 8.00×10^3 kg, volume = 3.20 m^3

B. Mass = 40.0 kg, volume = 0.0240 m^3

C. Mass = 4.00×10^3 kg, volume = 3.00×10^3 m^3

D. Mass = 6.00×10^{24} kg, volume = 1.00×10^{21} m^3

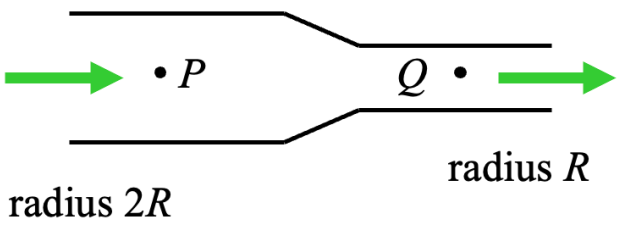
E. Mass = 2.00×10^{-25} kg, volume = 9.00×10^{-43} m^3

Explanation:

2. A completely submerged object always displaces its own
    a. weight of fluid.
    b. volume of fluid.
    c. density of fluid.
    d. All of these.

Explanation:

3. An incompressible fluid with zero viscosity flows through a pipe of varying radius (shown in cross-section). Compared to the fluid at point P, the fluid at point Q has
    a. four times the fluid speed.
    b. twice the fluid speed.
    c. the same fluid speed.
    d. half the fluid speed.
    e. one-quarter the fluid speed.



Explanation:

4. You hear a sound with a frequency of 256 Hz. The amplitude of the sound increases and decreases periodically: It takes 2 seconds for the sound to go from loud to soft and back to loud. This sound can be thought of as a sum of two waves with frequencies
    a. 256 Hz and 2 Hz.
    b. 254 Hz and 258 Hz.
    c. 255 Hz and 257 Hz.
    d. 255.5 Hz and 256.5 Hz.
    e. 255.75 Hz and 256.25 Hz.

Explanation:

5. Four sinusoidal sound waves propagate in the same region of our atmosphere. Rank the waves in order of their displacement amplitude, from largest to smallest.
    a. Intensity = 2.0 10^{-5} W/m^2, frequency = 100 Hz
    b. Intensity = 2.0 10^{-5} W/m^2, frequency = 200 Hz
    c. Intensity = 4.0 10^{-5} W/m^2, frequency = 200 Hz
    d. Intensity = 8.0 10^{-5} W/m^2, frequency = 800 Hz

Explanation:

6. Four strings, each made of the same material and of the same diameter, each carry a sinusoidal wave of frequency 10 Hz. The string tension and wave amplitude are different for different strings. **Rank** the following strings in order from highest to lowest value of the *average wave power*.

a. Tension 10 N, amplitude 1.0 mm
b. Tension 40 N, amplitude 1.0 mm
c. Tension 20 N, amplitude 2.0 mm
d. Tension 10 N, amplitude 4.0 mm

Explanation:

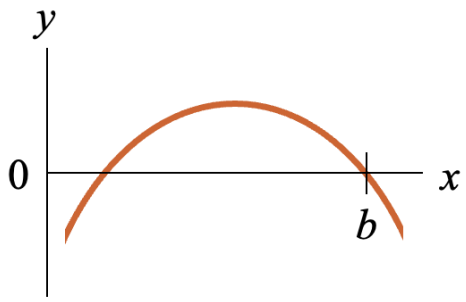
7. On a day when there is no wind, you are at rest and a source of sound waves is moving toward you. Compared to what you would hear if the source were not moving, the sound that you hear has
    a. a higher frequency and a shorter wavelength.
    b. the same frequency and a shorter wavelength.
    c. a higher frequency and the same wavelength.
    d. the same frequency and the same wavelength.
    e. none of the above.

Explanation:

8. On a day when there is no wind, you are moving toward a stationary source of sound waves. Compared to what you would hear if you were not moving, the sound that you hear has
    a. a higher frequency and a shorter wavelength.
    b. the same frequency and a shorter wavelength.
    c. a higher frequency and the same wavelength.
    d. the same frequency and the same wavelength.
    e. none of the above.

Explanation:

9. A wave on a string is moving to the right. This graph of $y(x,t)$ versus coordinate x for a specific time t shows the shape of part of the string at that time. Currently, what is the velocity of a particle of the string at $x = b$?



   a. The velocity is upward.
   b. The velocity is downward.
   c. The velocity is zero.
   d. Either A or B is possible.
   e. Any of A, B, or C is possible.

Explanation:

10. While a guitar string is vibrating, you gently touch the midpoint of the string *to ensure that the string does not vibrate at that point*. The lowest frequency standing wave that could be present on the string vibrates at
   a. the fundamental frequency.
   b. twice the fundamental frequency.
   c. three times the fundamental frequency.
   d. four times the fundamental frequency.
   e. There is not enough information given to decide.

Explanation:

1. A large rock that weighs 164.0 N is suspended from the lower end of a thin wire that is 3.00 m long. The density of the rock is 3200 kg/m^3. The mass of the wire is small enough that its effect on the tension in the wire can be ignored. The upper end of the wire is held fixed. When the rock is in air, the fundamental frequency for transverse standing waves on the wire is 42.0 Hz. When the rock is totally submerged in a liquid, with the top of the rock just below the surface (the wire completely in air), the fundamental frequency for the wire is 28.0 Hz. What is the density of the liquid? Draw diagrams of the rock suspended in air and in the liquid.

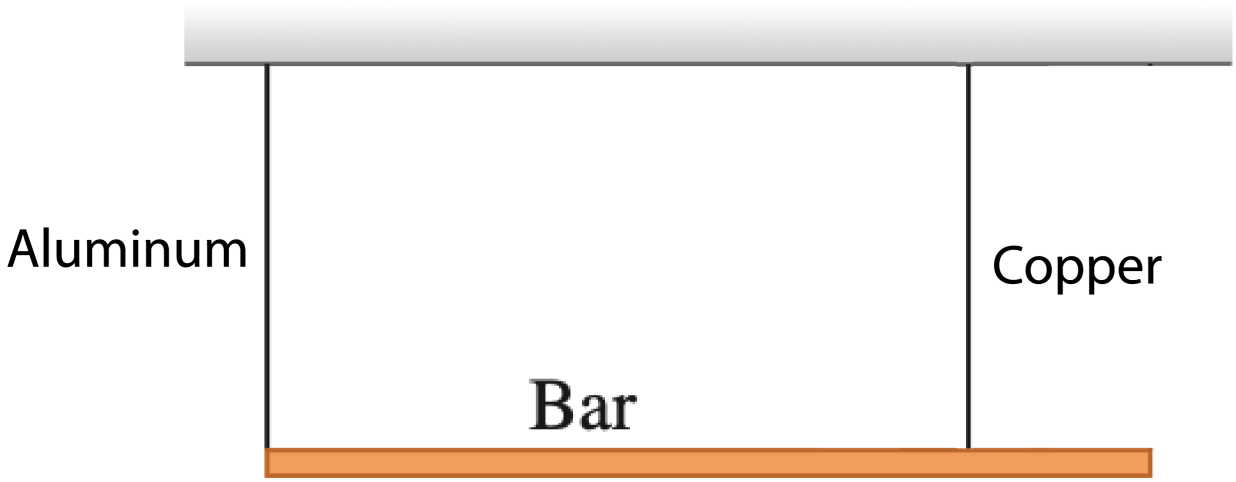
2. The Environmental Protection Agency is investigating an abandoned chemical plant. A large, closed cylindrical tank contains an unknown liquid. You must determine the liquid's density and the height of the liquid in the tank (the vertical distance from the surface of the liquid to the bottom of the tank). To maintain various values of the gauge pressure in the air that is above the liquid in the tank, you can use compressed air. You make a small hole at the bottom of the side of the tank, which is on a concrete platform—so the hole is 50.0 cm above the ground. The table gives your measurements of the horizontal distance R that the initially horizontal stream of liquid pouring out of the tank travels before it strikes the ground and the gauge pressure p_g of the air in the tank.

p_g (atm)	0.50	1.00	2.00	3.00	4.00
R (m)	5.4	6.5	8.2	9.7	10.9

   a. Graph R^2 as a function of p_g. Explain why the data points fall close to a straight line. Use any two points (or full regression if you prefer) to find the slope and y-intercept.
   b. Use the slope and intercept found in (a) to calculate the height h (in meters) of the liquid in the tank and the density of the liquid (in kg/m^3). Use $g = 9.80\ m/s^2$. Assume that the liquid is nonviscous and that the hole is small enough compared to the tank's diameter so that the change in h during the measurements is very small.

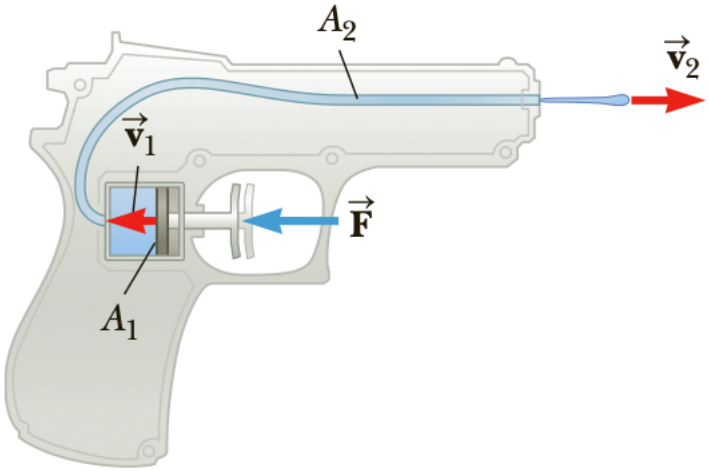
      Recall slope = Δrise/Δrun and use R2 = (slope) p_g + intercept

3. A 1.80-m-long uniform bar that weighs 638 N is suspended in a horizontal position by two vertical wires that are attached to the ceiling. One wire is aluminum ($\rho_{Al} = 2.70 \times 10^3\ kg/m^3$) and the other is copper ($\rho_{Cu} = 8.90 \times 10^3\ kg/m^3$). The aluminum wire is attached to the left-hand end of the bar, and the copper wire is attached 0.40 m to the left of the right-hand end. Each wire has length 0.600 m and a circular cross section with radius 0.280 mm. What is the fundamental frequency of transverse standing waves for each wire?
(Hint: the tension in each wire is different and the metal bar is in equilibrium)

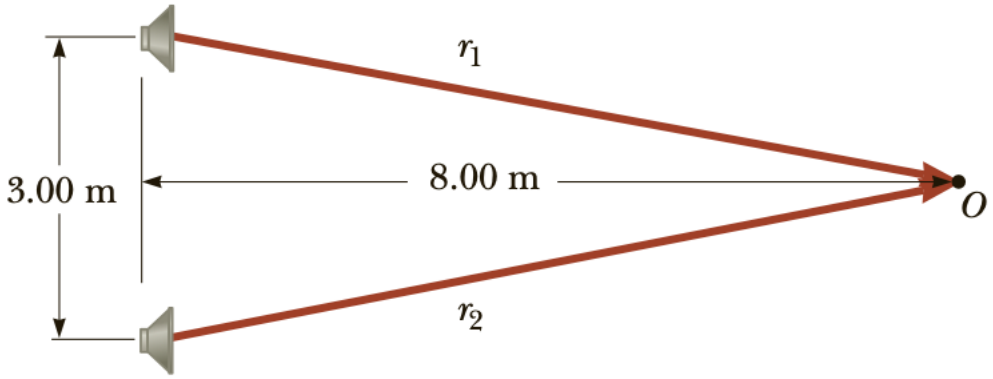


4. The pattern of displacement nodes N and antinodes A in a pipe is NANANANANA when the standing-wave frequency is 1710 Hz. The pipe contains air at 20°C. (use speed of sound in air as 344 m/s)
    a. Is it an open or a closed (stopped) pipe?
    b. Which harmonic is this?
    c. What is the length of the pipe?
    d. What is the fundamental frequency?
    e. Draw a diagram of the pipe.

5. In a water pistol, a piston drives water through a larger tube of radius 1.00 cm into a smaller tube of radius 1.00 mm.
    a. If the pistol is fired horizontally at a height of 1.50 m, use ballistics to determine the time it takes water to travel from the nozzle to the ground. (Neglect air resistance and assume atmospheric pressure is 1.00 atm.)
    b. If the range of the stream is to be 8.00 m, with what speed must the stream leave the nozzle?
    c. Calculate the speed at which the plunger must be moved.
    d. What is the pressure at the nozzle?
    e. Find the pressure needed in the larger cylinder. Can gravity terms be neglected?
    f. Calculate the force that must be exerted on the trigger to achieve the desired range. (The force that must be exerted is due to pressure over and above atmospheric pressure.)



6. Two loudspeakers are placed above and below each other, as in the figure and driven by the same source at a frequency of 4.50×10^2 Hz. An observer is in front of the speakers (to the right) at point O, at the same distance from each speaker. What minimum vertical distance upward should the top speaker be moved to create destructive interference at point O?



7. A bat flying at 5.00 m/s is chasing an insect flying in the same direction. If the bat emits a 40.0-kHz chirp and receives back an echo at 40.4 kHz,
    a. what is the speed of the insect?
    b. Will the bat be able to catch the insect? Explain.

8. A family ice show is held at an enclosed arena. The skaters perform to music playing at a level of 80.0 dB. This intensity level is too loud for your baby, who yells at 75.0 dB.
    a. What total sound intensity engulfs you?
    b. What is the combined sound level?

Scratch Work

Exam 2
Physics 23
Fall 2025

Chapters 17–20
Your test has 10 multiple-choice and 8 free-response problems, for a total of 100 points.
Name:

Student ID:

Acceleration due to gravity: g = 9.80 m/s^2
1 atm = 1.013×10^5 Pa
Gas constant: $R = 8.314\ 462\ 618\ 153\ 24 \frac{J}{K \cdot mol}$
$N_A = 6.022 \times 10^{23}$ particles/mole
Speed of Light: $c = 299\ 792\ 458$ m/s
Boltzmann constant: $k_B = 1.380\ 649 \times 10^{-23}$ J/K
One tropical year: 365.2425 days = $3.155\ 7 \times 10^7$s
1 L = $10^{-3} m^3$
Stefan-Boltzmann: $\sigma = 5.670374419 \times 10^{-8} \frac{w}{m^2 K^4}$
0°C = 273.15 K

Tables of Constants

TABLE 19.1 Molar Heat Capacities of Gases at Low Pressure

Type of Gas	Gas	C_V (J/mol · K)	C_p (J/mol · K)	$C_p - C_V$ (J/mol · K)	$\gamma = C_p/C_V$
Monatomic	He	12.47	20.78	8.31	1.67
	Ar	12.47	20.78	8.31	1.67
Diatomic	H_2	20.42	28.74	8.32	1.41
	N_2	20.76	29.07	8.31	1.40
	O_2	20.85	29.17	8.32	1.40
	CO	20.85	29.16	8.31	1.40
Polyatomic	CO_2	28.46	36.94	8.48	1.30
	SO_2	31.39	40.37	8.98	1.29
	H_2S	25.95	34.60	8.65	1.33

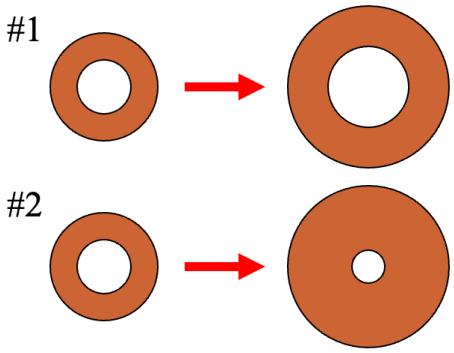
The latent heat of fusion for water is $3.33 \times 10^5 \frac{J}{kg}$.

The heat capacity of liquid water is $4190 \frac{J}{kg \bullet K}$ (assumed to be constant)

The heat capacity of ice is $2108 \frac{J}{kg \bullet K}$ (assumed to be constant)

Multiple Choice (1.2 points each):

1. A solid object has a hole in it. Which of these illustrations more correctly shows how the size of the object and the hole change as the temperature increases?



   a. illustration #1
   b. illustration #2
   c. The answer depends on the material of which the object is made.
   d. The answer depends on how much the temperature increases.
   e. Both C and D are correct.

Explanation:

2. A chair has a wooden seat but metal legs. The chair legs feel colder to the touch than does the seat. Why is this?

   a. The metal is at a lower temperature than the wood.
   b. The metal has a higher specific heat than the wood.
   c. The metal has a lower specific heat than the wood.
   d. The metal has a higher thermal conductivity than the wood.
   e. The metal has a lower thermal conductivity than the wood.

Explanation:

3. When you first step out of a swimming pool on a warm day, you feel cool. This is due primarily to
    a. conduction.
    b. convection.
    c. radiation.
    d. two of A, B, and C being equally important.
    e. all three of A, B, and C being equally important

Explanation:

4. Consider two specimens of ideal gas at the same temperature. Specimen #1 has the same total mass as specimen #2, but the molecules in specimen #1 have greater molar mass than the molecules in specimen #2. In which specimen is the *total translational kinetic energy of the entire gas* greater?
    a. A. specimen #1
    b. B. specimen #2
    c. C. The answer depends on the particular mass of gas.
    d. D. The answer depends on the particular molar masses.
    e. E. Both C and D are correct.

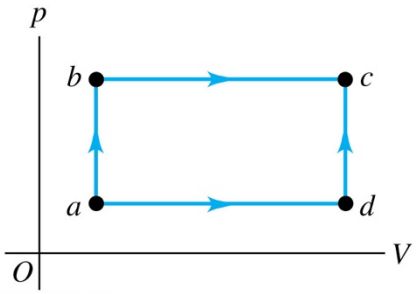
Explanation:

5. If the pressure of the atmosphere is below the triple-point pressure of a certain substance, that substance can exist (depending on the temperature)

    a. as a liquid or as a vapor, but not as a solid.
    b. as a liquid or as a solid, but not as a vapor.
    c. as a solid or as a vapor, but not as a liquid.
    d. as a solid, a liquid, or a vapor.
    e. Not enough information is given to decide.

Explanation:

6. This *p*-*V* diagram shows two ways to take a system from state *a* (at lower left) to state *c* (at upper right):
    • via state *b* (at upper left), or
    • via state *d* (at lower right)
    For which path is $W > 0$?



a. path *abc* only
b. path *adc* only
c. both path *abc* and path *adc*
d. neither path *abc* nor path *adc*
e. The answer depends on what the system is made of.

Explanation:

7. In an isothermal expansion of an ideal gas, the amount of heat that flows into the gas

    a. is greater than the amount of work done by the gas.
    b. equals the amount of work done by the gas.
    c. is less than the amount of work done by the gas, but greater than zero.
    d. is zero.
    e. is negative (heat flows *out of* the gas).

Explanation:

8. An ideal gas begins in a thermodynamic state *a*. When the temperature of the gas is raised from T_1 to a higher temperature T_2 at a constant *volume*, a positive amount of heat Q_{12} flows into the gas. If the same gas begins in state *a* and has its temperature raised from T_1 to T_2 at a constant *pressure*, the amount of heat that flows into the gas is

    a. A. greater than Q_{12}.
    b. B. equal to Q_{12}.
    c. C. less than Q_{12}, but greater than zero.
    d. D. zero.
    e. E. negative (heat flows *out of* the system).

Explanation:

9. During one cycle, an automobile engine with an efficiency of 20% takes in 10,000 J of heat. How much work does the engine do per cycle?

    a. 8000 J
    b. 6400 J
    c. 2000 J
    d. 1600 J
    e. 400 J

Explanation:

10. A Carnot engine takes heat in from a reservoir at 400 K and discards heat to a reservoir at 300 K. If the engine does 12,000 J of work per cycle, how much heat does it take in per cycle?

    a. 48,000 J
    b. 24,000 J
    c. 16,000 J
    d. 9000 J
    e. none of the above

Explanation:

1. A steel wire has density 7800 kg/m^3 and mass 2.50 g. It is stretched between two rigid supports separated by 0.400 m.
    a. When the temperature of the wire is 20.0°C, the frequency of the fundamental standing wave for the wire is 440 Hz. What is the tension in the wire?
    b. What is the temperature of the wire if its fundamental standing wave has frequency 460 Hz?
    For steel the coefficient of linear expansion is $\alpha = 1.2 \times 10^{-5}\ K^{-1}$ and Young's modulus is $Y = 20 \times 10^{10}$ Pa.
    Hint 1: if the steel wire is already under tension, would the temperature need to increase or decrease for the fundamental frequency to increase?
    Hint 2: The "F" in thermal stress equation is not the tension directly.
    This is why your favorite band needs to tune their instruments in every new venue.

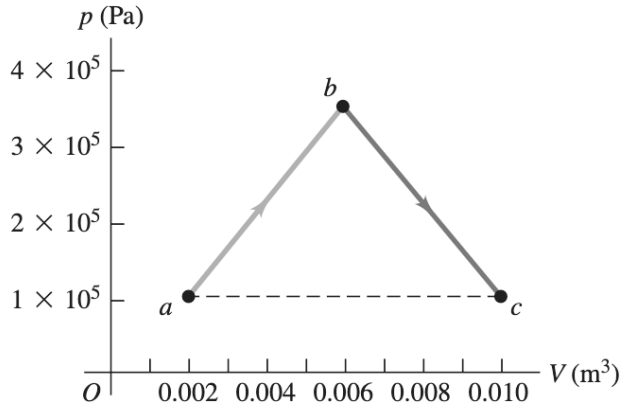
2. A carpenter builds an exterior house wall with a layer of wood 3.0 cm thick on the outside and a layer of Styrofoam insulation 2.2 cm thick on the inside wall surface. The wood has k = 0.080 W/m•K, and the Styrofoam has k = 0.027 W/m•K. The interior surface temperature is 19.0°C, and the exterior surface temperature is –10.0°C. The R-value of the stagnant air layer on either side of the wall is 0.030 $\frac{m^2}{\left(\frac{J}{s}\right)\bullet K}$
    a. What is the temperature at the plane where the wood meets the Styrofoam?
    b. What is the rate of heat flow per square meter through this wall?

3. A thirsty nurse cools a 2.00 L bottle of a soft drink (mostly water) by pouring it into a large aluminum mug of mass 0.257 kg and adding 0.120 kg of ice initially at –15.0°C. If the soft drink and mug are initially at 20.0°C, what is the final temperature of the system, assuming that no heat is lost?
   The specific heat of the aluminum c_a = 910 J/kg•K
   For liquid water c_w = 4190 J/kg•K
   For solid ice c_i = 2100 J/kg•K
   Latent heat of fusion of water: $L_f = 3.35 \times 10^5$ J/kg•K
   Density of water: $\rho = 1.00 \times 10^3$ kg/m^3

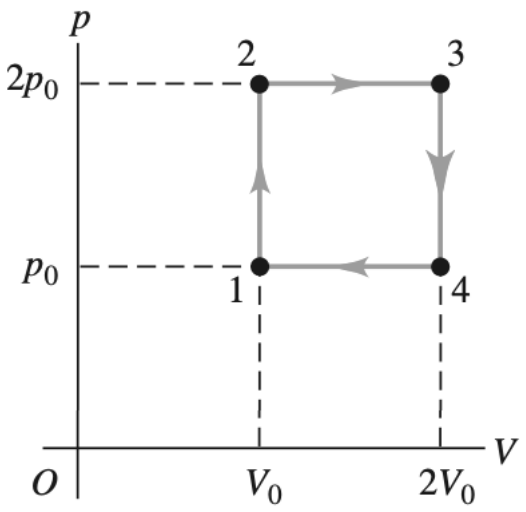
4. A player bounces a basketball on the floor, compressing it to 80.0% of its original volume. The air (assume it is pure N_2 gas, molar mass of 28.01 g/mol) inside the ball is originally at 20.0°C and 2.00 atm. The ball's inside **diameter** is 23.9 cm.
    a. What is the heat capacity at constant volume and the ratio of heat capacities?
    b. What temperature does the air in the ball reach at its maximum compression? Assume the compression is adiabatic and treat the gas as ideal.
    c. By how much does the internal energy of the air change between the ball's original state and its maximum compression?

R = 8.3145 $\frac{J}{K \bullet mol}$, 1 atm = 1.013×10^5 Pa, 0°C = 273.15 K

5. One-third of a mole of He gas is taken along the path abc shown in the figure. Assume that the gas may be treated as ideal.
    a. Along path abc, how much heat is transferred into or out of the gas?
    b. If the gas instead went directly from state a to state c along the horizontal dashed line, how much heat would be transferred into or out of the gas?
    c. How does Q in part (b) compare with Q in part (a)? Explain.



6. What is the thermal efficiency of an engine that takes n moles of *diatomic* ideal gas through the cycle $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$ as shown the figure?



7. One mole of neon gas is heated from 300. K to 420. K at constant pressure.
    a. Calculate the energy Q transferred to the gas.
    b. Calculate the change in the internal energy of the gas.
    c. Calculate the work done on the gas.
    d. Calculate the change in entropy of the gas.

    Note that neon has a molar specific heat of $C_p = 20.79 \frac{J}{mol \bullet K}$ for a constant-pressure process.

8. Every second at Niagara Falls, approximately 5.00×10^3 m^3 of water falls 50.0 m. What is the increase in entropy per second due to the falling water? Assume the mass of the surroundings is so great that its temperature and that of the water stay nearly constant at 20.0°C. Also assume a negligible amount of water evaporates.

Scratch Work

Scratch Work

Exam 3
Physics 23
Fall 2025

Name:

Your test has 8 multiple-choice and 6 free-response problems, for a total of 100 points.

Some useful constants:

Acceleration due to gravity: g = 9.80 m/s^2

1 atm = 1.013×10^5 Pa

Gas constant: $R = 8.314\ 462\ 618\ 153\ 24 \frac{J}{K \cdot mol}$

$N_A = 6.022 \times 10^{23}$ particles/mole

Speed of Light: $c = 299\ 792\ 458$ m/s

Boltzmann constant: $k_B = 1.380\ 649 \times 10^{-23}$ J/K

One tropical year: 365.2425 days = $3.155\ 7 \times 10^7$s

1 L = $10^{-3} m^3$

Stefan-Boltzmann: $\sigma = 5.670374419 \times 10^{-8} \frac{W}{m^2 K^4}$

0°C = 273.15 K

Multiple Choice (1.2 points each):

1.

Light passes from a medium of index of refraction n_a into a second medium of index of refraction n_b. The angles of incidence and refraction are θ_a and θ_b, respectively. If $n_a < n_b$,

A. $\theta_a > \theta_b$ and the light speeds up as it enters the second medium.

B. $\theta_a > \theta_b$ and the light slows down as it enters the second medium.

C. $\theta_a < \theta_b$ and the light speeds up as it enters the second medium.

D. $\theta_a < \theta_b$ and the light slows down as it enters the second medium.

E. none of the above are true.

Explanation:

2.

Three polarizing filters are stacked with the polarizing axes of the second and third filters oriented at 45° and 90°, respectively, relative to the polarizing axis of the first filter. Unpolarized light of intensity I_0 is incident on the first filter. The intensity of light emerging from the third filter is

A. I_0.

B. $I_0/\sqrt{2}$.

C. $I_0/2$.

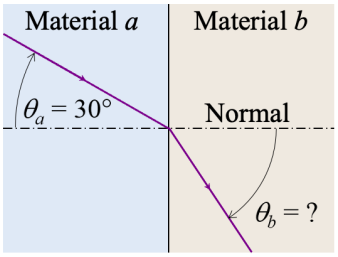
D. $I_0/4$.

E. $I_0/8$.

Explanation:

3.

A ray of light propagating in material a strikes the interface with material b at an angle $\theta_a = 30°$ measured from the normal. ***Rank*** the following situations in order of the angle θ_b of the refracted ray in material b, from greatest angle to smallest angle.



A. $n_a = 1.0, n_b = 1.5$

B. $n_a = 1.5, n_b = 1.0$

C. $n_a = 1.5, n_b = 2.0$

D. $n_a = 2.0, n_b = 1.5$

Explanation:

4.

A concave mirror with a radius of curvature of 20 cm has a focal length of

A. 40 cm.

B. 20 cm.

C. 10 cm.

D. 5 cm.

E. unknown, as answer depends on the index of refraction of the air around the mirror.

Explanation:

5.

An object is placed 1.5 m away from a concave mirror of focal length +1.0 m. The image formed by the mirror is

A. real and larger than the object.

B. real and smaller than the object.

C. real and the same size as the object.

D. virtual and larger than the object.

E. virtual and smaller than the object.

Explanation:

6.

An object is placed 0.5 m away from a concave mirror of focal length +1.0 m. The image formed by the mirror is

A. real and larger than the object.

B. real and smaller than the object.

C. real and the same size as the object.

D. virtual and larger than the object.

E. virtual and smaller than the object.

Explanation:

7.

When you look in a cosmetics mirror of focal length f, your reflection appears right-side up and enlarged. Complete the sentence: "For a cosmetics mirror to work, the mirror must be _____ and the distance from the mirror to your face must be _____."

A. concave, equal to $|f|$

B. concave, less than $|f|$

C. concave, greater than $|f|$

D. convex, less than $|f|$

E. convex, greater than $|f|$

Explanation:

8.

A thin diverging lens has focal length $f = -12$ cm. If an object 9 cm tall is placed 24 cm from the lens, what is the height of the image?

A. 27 cm tall

B. 18 cm tall

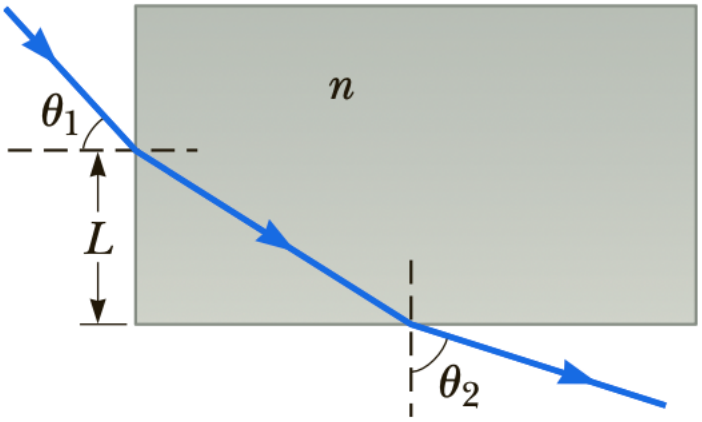
C. 9 cm tall

D. 4.5 cm tall

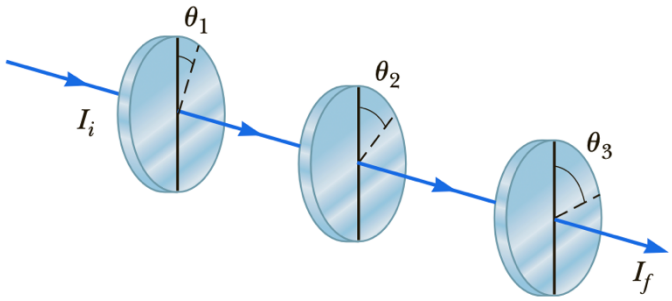
E. 3 cm tall

Explanation:

1. A light ray enters a rectangular block of plastic at an angle $\theta_1 = 45.0°$ and emerges at an angle $\theta_2 = 76.0°$, as shown.
    a. Determine the index of refraction of the plastic.
    b. If the light ray enters the plastic at a point L = 50.0 cm from the bottom edge, how long does it take the light ray to travel through the plastic?



2. Three polarizing plates whose planes are parallel are centered on a common axis. The directions of the transmission axes relative to the common vertical direction are shown. A linearly polarized beam of light with plane of polarization parallel to the vertical reference direction is incident from the left onto the first disk with intensity I_i = 10.0 units (arbitrary). Calculate the transmitted intensity I_f when $\theta_1 = 20.0°$, $\theta_2 = 40.0°$, and $\theta_3 = 60.0°$.



3. A diverging lens has a focal length of magnitude 20.0 cm.
    a. Locate the images for object distances of (i) 40.0 cm, (ii) 20.0 cm, and (iii) 10.0 cm.
    b. For each case, state whether the image is real or virtual.
    c. For each case, state whether the image is upright or inverted.
    d. For each case, find the magnification.
    e. Draw a ray diagram of each situation of the problem.

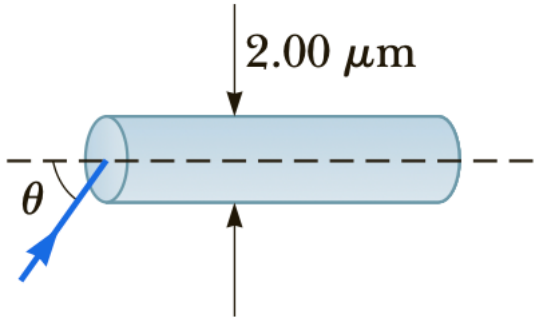
Diagrams

Diagrams

4. Suppose an astronomical telescope is being designed to have an angular magnification of 34.0. The focal length of the objective lens being used is 86.0 cm.
    a. Find the required focal length of the eyepiece
    b. Find the distance between the two lenses for a relaxed eye.
    Hint: For a relaxed eye, the image formed by the objective lens is at the focal point of the eyepiece.

5. A jellyfish is floating in a water-filled aquarium 1.00 m behind a flat pane of glass 6.00 cm thick and having an index of refraction of 1.50.
    a. Where is the image of the jellyfish located?
    b. Repeat the problem when the glass is so thin that its thickness can be neglected.
    c. How does the thickness of the glass affect the answer to part (a)?

6. Determine the maximum angle u for which the light rays incident on the end of the light pipe in the figure are subject to total internal reflection along the walls of the pipe. Assume the light pipe has an index of refraction of 1.36 and the outside medium is air.



Scratch work

Screenshots for Physics 21 (2918) - Fall 2025 [Roberts]

The following table lists screenshots of Prof. Roberts' Gradescope dashboard in chronological order for his Physics 21 (Section 2918) class for Fall 2025. Please refer to the subsequent page to see the screenshot for that date and time. Please especially note the lack of promptness in grading exams.

Page Number	Date	Time
2	10/07/25	5:47 PM
3	10/21/25	2:37 PM
4	10/23/25	12:20 PM
5	10/26/25	12:56 AM
6	10/28/25	2:59 PM
7	10:/30/25	4:39 PM
8	11/03/25	11:00 PM
9	11/04/25	3:08 PM
10	11/06/25	3:34 PM
11	11/10/25	9:30 PM
12	11/12/25	10:46 PM
13	11/16/25	11:27 PM
14	11/18/25	9:44 PM
15	11/20/25	3:02 PM
16	12/04/25	8:38 PM
17	12/07/25	2:48 PM
18	12/16/25	9:43 PM

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2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

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- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

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SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

Fall 2025

Course ID: 1114927

No Published Grades

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 1: Measurements
- Finish grading Lab 2: Free-Fall Acceleration
- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PDT)	Submissions	% Graded	Published	Regrades
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	1	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	21	0%		ON
Exam 1	Sep 24		26	60%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	23	0%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	24	4%		ON

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Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%		ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	0	0%		ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	0	0%		ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	OCT 31, 2025 11:59 PM	0	0%		ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	2	0%		ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%		ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	21	0%		ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	64%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	23	0%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	24	4%		ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

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Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	3	0%		ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%		ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	21	0%		ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	66%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	23	0%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	24	4%		ON

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In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	0%		ON
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Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%		ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%		ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

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Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%		ON
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SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

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Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%		ON
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Course ID: 1114927

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- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%	○	ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%	○	ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	0	0%	○	ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	1	0%	○	ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	OCT 31, 2025 11:59 PM	0	0%	○	ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%	○	ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	0%	○	ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%	○	ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%	○	ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%	○	ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%	○	ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%	○	ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%	○	ON

- Finish grading Lab 2: Free-Fall Acceleration
- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%		ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%		ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	0	0%		ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	1	0%		ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	OCT 31, 2025 11:59 PM	0	0%		ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%		ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	0%		ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%		ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%		ON
Exam 1 Ch 1-3, 9.1-9.3		Sep 24	26	78%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%		ON

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SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%		ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%		ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	0	0%		ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	1	0%		ON
In-class work 11/04	NOV 4, 2025 12:30 PM	NOV 5, 2025 4:06 PM	7	0%		ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	OCT 31, 2025 11:59 PM	0	0%		ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%		ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	0%		ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%		ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%		ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%		ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 1: Measurements
- Finish grading Lab 2: Free-Fall Acceleration
- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%		ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%		ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	0	0%		ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	16	0%		ON
In-class work 11/04	NOV 4, 2025 12:30 PM	NOV 5, 2025 4:06 PM	7	0%		ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	OCT 31, 2025 11:59 PM	0	0%		ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%		ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	0%		ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%		ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%		ON
Exam 1 Ch 1-3, 9.1-9.3		Sep 24	26	78%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%		ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 1: Measurements
- Finish grading Lab 2: Free-Fall Acceleration
- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%		ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%		ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	0	0%		ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	17	0%		ON
In-class work 11/04	NOV 4, 2025 12:30 PM	NOV 5, 2025 4:06 PM	7	0%		ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	OCT 31, 2025 11:59 PM	0	0%		ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%		ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	0%		ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%		ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%		ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%		ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

- Finish grading Lab 2: Free-Fall Acceleration
- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%		ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%		ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	NOV 16, 2025 11:59 PM	16	0%		ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	2	0%		ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	17	0%		ON
In-class work 11/04	NOV 4, 2025 12:30 PM	NOV 5, 2025 4:06 PM	7	0%		ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%		ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	0%		ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%		ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%		ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%		ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%		ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%		ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%		ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

- Finish grading Lab 2: Free-Fall Acceleration
- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%	○	ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%	○	ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	NOV 16, 2025 11:59 PM	17	0%	○	ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	2	0%	○	ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	17	0%	○	ON
In-class work 11/04	NOV 4, 2025 12:30 PM	NOV 5, 2025 4:06 PM	7	100%	✓	ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%	○	ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	100%	✓	ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%	○	ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%	○	ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%	○	ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%	○	ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%	○	ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%	○	ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

Fall 2025

Course ID: 1114927

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 1: Measurements
- Finish grading Lab 2: Free-Fall Acceleration
- Finish grading Lab 3: Projectile Motion

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	OCT 17, 2025 12:09 PM	NOV 28, 2025 11:59 PM	0	0%	○	ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	NOV 21, 2025 11:59 PM	0	0%	○	ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	NOV 16, 2025 11:59 PM	17	0%	○	ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	NOV 14, 2025 11:59 PM	2	0%	○	ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	17	0%	○	ON
In-class work 11/04	NOV 4, 2025 12:30 PM	NOV 5, 2025 4:06 PM	7	100%	✓	ON
Lab 6: Uniform Circular Motion	OCT 16, 2025 7:00 AM	OCT 24, 2025 11:59 PM	18	0%	○	ON
In-class work 10/24	OCT 15, 2025 12:30 PM	OCT 24, 2025 4:06 PM	6	100%	✓	ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	0%	○	ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	19	0%	○	ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	19	0%	○	ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	78%	○	ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	21	12%	○	ON
Lab 1: Measurements	SEP 1, 2025 2:12 PM	SEP 17, 2025 11:59 PM	22	3%	○	ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

Fall 2025

Course ID: 1114927

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 9: Torque, Moment of Inertia and Angular Acceleration
- Finish grading Exam 2 Ch 4-6
- Finish grading Exam 3

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	NOV 29, 2025 12:09 PM	DEC 12, 2025 11:59 PM	0	0%	○	ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	DEC 12, 2025 11:59 PM	2	0%	○	ON
In-class work 12/03	OCT 15, 2025 12:30 PM	DEC 3, 2025 4:06 PM	5	0%	○	ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	DEC 1, 2025 11:59 PM	12	0%	○	ON
Exam 3	Nov 26		23	0%	○	ON
Exam 2 Ch 4-6	Nov 26		25	0%	○	ON
Lab 7: Conservation of Momentum and Collisions	OCT 16, 2025 8:00 AM	NOV 16, 2025 11:59 PM	17	100%	✓	ON
Lab 8: Ballistic Pendulum	OCT 16, 2025 8:00 AM	NOV 7, 2025 11:59 PM	18	100%	✓	ON
Lab 5: Newton's Law's, Friction, and Simple Machines	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	20	100%	✓	ON
Lab 4: The Addition of Force Vectors	OCT 2, 2025 11:38 AM	OCT 10, 2025 11:59 PM	20	100%	✓	ON
Lab 3: Projectile Motion	SEP 17, 2025 7:41 PM	SEP 26, 2025 11:59 PM	20	100%	✓	ON
Exam 1 Ch 1-3, 9.1-9.3	Sep 24		26	100%	○	ON
Lab 2: Free-Fall Acceleration	SEP 11, 2025 7:33 PM	SEP 19, 2025 11:59 PM	22	100%	✓	ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

- Dashboard
- Assignments
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- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G) | Fall 2025

Course ID: 1114927

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Exam 2 Ch 4-6
- Finish grading Exam 3

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	NOV 29, 2025 12:09 PM	DEC 12, 2025 11:59 PM	0	0%	○	ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	DEC 12, 2025 11:59 PM	3	0%	○	ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	DEC 7, 2025 11:59 PM	13	0%	○	ON
In-class work 12/03	OCT 15, 2025 12:30 PM	DEC 3, 2025 4:06 PM	5	100%	✓	ON
Exam 3		Nov 26	23	0%	○	ON
Exam 2 Ch 4-6		Nov 26	25	0%	○	ON
Exam 1 Ch 1-3, 9.1-9.3		Sep 24	26	100%	○	ON

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G)

2025 Fall - PHYSCS 21 (2918) [1..17] - Roberts - (G)

- Dashboard
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- Course Settings

Instructor

Kevin Roberts

Course Actions

- Unenroll From Course

SMC 2025 Fall - PHYSCS 21 (2918) - Mechanics with Lab (G) | Fall 2025

Course ID: 1114927

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Exam 2 Ch 4-6
- Finish grading Exam 3

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 11: Physical Pendulum	NOV 29, 2025 12:09 PM	DEC 19, 2025 11:59 PM	5	0%	○	ON
Lab 10: Center of Mass and Rotational Equilibrium	OCT 16, 2025 8:00 AM	DEC 12, 2025 11:59 PM	14	100%	✓	ON
In-class work 12/10	OCT 15, 2025 12:30 PM	DEC 10, 2025 4:06 PM	4	100%	✓	ON
Lab 9: Torque, Moment of Inertia and Angular Acceleration	OCT 16, 2025 6:24 AM	DEC 7, 2025 11:59 PM	15	100%	✓	ON
Exam 3		Nov 26	23	0%	○	ON
Exam 2 Ch 4-6		Nov 26	25	0%	○	ON
Exam 1 Ch 1-3, 9.1-9.3		Sep 24	26	100%	✓	ON

Screenshots for Physics 23 (2927) - Fall 2025 [Roberts]

The following table lists screenshots of Prof. Roberts' Gradescope dashboard in chronological order for his Physics 23 (Section 2927) class for Fall 2025. Please refer to the subsequent page to see the screenshot for that date and time. Please especially note the lack of promptness in grading exams.

Page Number	Date	Time
2	10/07/25	5:48 PM
3	10/21/25	2:37 PM
4	10/23/25	12:19 PM
5	10/26/25	12:55 AM
6	10/28/25	3:00 PM
7	10:/30/25	4:39 PM
8	11/03/25	11:00 PM
9	11/04/25	3:08 PM
10	11/06/25	3:34 PM
11	11/10/25	9:30 PM
12	11/12/25	10:46 PM
13	11/16/25	11:28 PM
14	11/18/25	9:44 PM
15	11/20/25	3:03 PM
16	12/04/25	8:38 PM
17	12/07/25	2:48 PM
18	12/16/25	9:44 PM

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

Course ID: 1114924

Fall 2025

No Published Grades

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 01: Archimedes' Principle and Buoyancy
- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PDT)	Submissions	% Graded	PublishedRegrades
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	1	0%	ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%	ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%	ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%	ON
Exam 1			23	0%	ON
↳ Exam 1 ver A Version A	Sep 24		22	0%	ON
↳ Exam 1 ver B Version B	Sep 24		1	0%	ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%	ON

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

Dashboard
Assignments
Roster
Extensions
Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

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SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Active Assignments	Released	Due (PDT)	Submissions	% Graded	Published	Regrades
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	21	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1		Sep 24	23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 08: Ratio of Heat Capacities for Air	SEP 30, 2024 7:00 AM	DEC 21, 2024 11:59 PM	0	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 14, 2024 8:00 AM	NOV 29, 2024 11:59 PM	0	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 9: Heat Engine	OCT 9, 2023 8:00 AM	NOV 20, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

- Kevin Roberts

Course Actions

- Unenroll From Course

Account

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

Fall 2025

Course ID: 1114924

No Published Grades

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 01: Archimedes' Principle and Buoyancy
- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PDT)	Submissions	% Graded	Published	Regrades	
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%	○	ON	⋮
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%	○	ON	⋮
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%	○	ON	⋮
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%	○	ON	⋮
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%	○	ON	⋮
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%	○	ON	⋮
Exam 1	Sep 24		23	0%	○	ON	⋮
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%	○	ON	⋮
Lab 08: Ratio of Heat Capacities for Air	SEP 30, 2024 7:00 AM	DEC 21, 2024 11:59 PM	0	0%	○	ON	⋮
Lab 10: Entropy Statistical Interpretation	OCT 14, 2024 8:00 AM	NOV 29, 2024 11:59 PM	0	0%	○	ON	⋮
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%	○	ON	⋮

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SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Active Assignments	Released	Due (PDT)	Submissions	% Graded	Published	Regrades
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	9	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 14, 2024 8:00 AM	NOV 29, 2024 11:59 PM	0	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 9: Heat Engine	OCT 9, 2023 8:00 AM	NOV 20, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

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SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Active Assignments	Released	Due (PDT)	Submissions	% Graded	Published	Regrades
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	10	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 14, 2024 8:00 AM	NOV 29, 2024 11:59 PM	0	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 9: Heat Engine	OCT 9, 2023 8:00 AM	NOV 20, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

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SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Active Assignments	Released	Due (PDT)	Submissions	% Graded	Published	Regrades	
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 5, 2025 11:59 PM	7	0%		ON	
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	11	0%		ON	
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON	
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON	
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON	
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON	
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON	
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON	
Exam 1	Sep 24		23	0%		ON	
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON	
Lab 10: Entropy Statistical Interpretation	OCT 14, 2024 8:00 AM	NOV 29, 2024 11:59 PM	0	0%		ON	
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON	
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON	
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON	

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

Fall 2025

Course ID: 1114924

No Published Grades

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 01: Archimedes' Principle and Buoyancy
- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 5, 2025 11:59 PM	11	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	16	0%		ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	17	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

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SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 5, 2025 11:59 PM	11	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	16	0%		ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	17	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

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SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 5, 2025 11:59 PM	13	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	16	0%		ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	18	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Course ID: 1114924

No Published Grades

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 01: Archimedes' Principle and Buoyancy
- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 9, 2025 11:59 PM	14	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	17	0%		ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	18	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
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Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Course ID: 1114924

No Published Grades

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 01: Archimedes' Principle and Buoyancy
- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 9, 2025 11:59 PM	14	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	17	0%		ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	18	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON
Lab 12: Curved Mirrors and Lenses	OCT 30, 2023 8:00 AM	DEC 22, 2023 11:59 PM	0	0%		ON
Lab 11: Pfund Refraction	OCT 23, 2023 8:00 AM	DEC 8, 2023 11:59 PM	0	0%		ON
Lab 13: Thin Film Interference	NOV 6, 2023 6:24 AM	NOV 15, 2023 11:59 PM	0	0%		ON

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
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Instructor

Kevin Roberts

Course Actions

Unenroll From Course

- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 13: Thin Film Interference	NOV 13, 2025 6:24 AM	DEC 5, 2025 11:59 PM	0	0%		ON
Lab 12: Curved Mirrors and Lenses	NOV 13, 2025 8:00 AM	NOV 21, 2025 11:59 PM	1	0%		ON
Lab 11: Pfund Refraction	NOV 6, 2025 8:00 AM	NOV 16, 2025 11:59 PM	13	0%		ON
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 9, 2025 11:59 PM	14	0%		ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	17	0%		ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	18	0%		ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%		ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	0%		ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%		ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%		ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%		ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%		ON
Exam 1	Sep 24		23	0%		ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%		ON

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
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- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 13: Thin Film Interference	NOV 13, 2025 6:24 AM	DEC 5, 2025 11:59 PM	0	0%	○	ON
Lab 12: Curved Mirrors and Lenses	NOV 13, 2025 8:00 AM	NOV 21, 2025 11:59 PM	1	0%	○	ON
Lab 11: Pfund Refraction	NOV 6, 2025 8:00 AM	NOV 16, 2025 11:59 PM	14	0%	○	ON
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 9, 2025 11:59 PM	14	0%	○	ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	17	0%	○	ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	18	0%	○	ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%	○	ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	100%	✓	ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%	○	ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%	○	ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%	○	ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%	○	ON
Exam 1	Sep 24		23	0%	○	ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%	○	ON

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

Fall 2025

Course ID: 1114924

SMC 2025 Fall - PHYSCS 23 (2927) - Fluids Waves Thermodynamics Optics with Lab (G)

2025 Fall - PHYSCS 23 (2927) [1..17] - Roberts - (G)

- Dashboard
- Assignments
- Roster
- Extensions
- Course Settings

Instructor

Kevin Roberts

Course Actions

Unenroll From Course

Account

Description

Edit your course description on the Course Settings page.

Things To Do

- Finish grading Lab 01: Archimedes' Principle and Buoyancy
- Finish grading Lab 02: Torricelli's Equation and Equation on Continuity
- Finish grading Lab 03: Frequency of Transverse Standing Waves

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 13: Thin Film Interference	NOV 13, 2025 6:24 AM	DEC 5, 2025 11:59 PM	0	0%	○	ON
Lab 12: Curved Mirrors and Lenses	NOV 13, 2025 8:00 AM	NOV 21, 2025 11:59 PM	1	0%	○	ON
Lab 11: Pfund Refraction	NOV 6, 2025 8:00 AM	NOV 16, 2025 11:59 PM	15	0%	○	ON
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 9, 2025 11:59 PM	14	0%	○	ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	17	0%	○	ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	18	0%	○	ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	22	0%	○	ON
In-class work 10/15	OCT 15, 2025 12:30 PM	OCT 15, 2025 4:06 PM	6	100%	✓	ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	17	0%	○	ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	0%	○	ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	0%	○	ON
Lab 01: Archimedes' Principle and Buoyancy	SEP 1, 2025 2:12 PM	SEP 26, 2025 11:59 PM	22	0%	○	ON
Exam 1	Sep 24		23	0%	○	ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	20	0%	○	ON

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Things To Do

- Finish grading Exam 1
- Finish grading Lab 06: Thermal Expansion
- Finish grading Exam 2

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 13: Thin Film Interference	NOV 13, 2025 6:24 AM	DEC 12, 2025 11:59 PM	0	0%	○	ON
Exam 3	Nov 26		22	0%	○	ON
Exam 2	Nov 26		22	0%	○	ON
Lab 12: Curved Mirrors and Lenses	NOV 13, 2025 8:00 AM	NOV 21, 2025 11:59 PM	20	100%	✓	ON
Lab 11: Pfund Refraction	NOV 6, 2025 8:00 AM	NOV 21, 2025 11:59 PM	16	100%	✓	ON
Lab 09: Heat Engine	OCT 29, 2025 8:00 AM	NOV 9, 2025 11:59 PM	18	100%	✓	ON
Lab 10: Entropy Statistical Interpretation	OCT 17, 2025 8:00 AM	NOV 3, 2025 11:59 PM	18	100%	✓	ON
Lab 08: Ratio of Heat Capacities for Air	OCT 16, 2025 7:00 AM	OCT 31, 2025 11:59 PM	19	100%	✓	ON
Lab 07: Latent Heat of Fusion of Ice	OCT 9, 2025 8:00 AM	OCT 17, 2025 11:59 PM	21	100%	✓	ON
Lab 06: Thermal Expansion	OCT 2, 2025 8:00 AM	OCT 10, 2025 11:59 PM	19	89%	✓	ON
Lab 04: The Speed of Sound (with the resonance of longitudinal waves)	SEP 25, 2025 6:00 AM	OCT 3, 2025 11:59 PM	21	100%	✓	ON
Lab 03: Frequency of Transverse Standing Waves	SEP 18, 2025 6:10 AM	SEP 26, 2025 11:59 PM	19	100%	✓	ON
Exam 1	Sep 24		23	85%	○	ON
Lab 02: Torricelli's Equation and Equation on Continuity	SEP 11, 2025 11:38 AM	SEP 19, 2025 11:59 PM	21	100%	✓	ON

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- Finish grading Exam 1
- Finish grading Exam 2
- Finish grading Exam 3

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 13: Thin Film Interference	NOV 13, 2025 6:24 AM	DEC 12, 2025 11:59 PM	1	0%		ON
Exam 3	Nov 26		22	0%		ON
Exam 2	Nov 26		22	0%		ON
Exam 1	Sep 24		23	85%		ON

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Things To Do

- Finish grading Lab 13: Thin Film Interference
- Finish grading Exam 2
- Finish grading Exam 3

Active Assignments	Released	Due (PST)	Submissions	% Graded	Published	Regrades
Lab 14: Diffraction	NOV 13, 2025 6:24 AM	DEC 19, 2025 11:59 PM	0	0%	○	ON
Lab 13: Thin Film Interference	NOV 13, 2025 6:24 AM	DEC 12, 2025 11:59 PM	18	94%	✓	ON
In-class work 12/10	OCT 15, 2025 12:30 PM	DEC 10, 2025 4:06 PM	12	100%	✓	ON
Exam 3	Nov 26		22	0%	○	ON
Exam 2	Nov 26		22	0%	○	ON
Exam 1	Sep 24		23	100%	✓	ON

2025.3 FT Evaluation, Physical Sciences - Roberts_Kevin

Final Audit Report 2025-12-17

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