

Physics 9/10

Final Summary

General. Remember that every piece of paper you received during the year, except in-class exams and quizzes, has been scanned and appears at the web site for this class. I will also add copies of the quizzes and exams to that resource.

The best time to start reviewing is now. Cover a little every day up to the day before the final, then get a good night's sleep the night before your exam.

The ideas and skills that you will use on the final exam are those that you have used in doing homework, quizzes, and exams. Thus, all homework, quizzes, and exams are an excellent source of review material.

Questions that occur to you as you review will be the highest priority in class. If you have a question, it will be answered, even if that means not fully covering the day's material.

Formulae sheet. As a class, you may specify formulae that you would like me to put onto a nicely typeset page. As soon as the class has all the formulae that it wishes on the formulae sheet, I will print and distribute it. Additional copies will be available during the exam for anyone who forgets to bring the formulae sheet.

Exam notes. On the final exam, you will be allowed to use whatever notes you wish to bring. Good advice: condense your notes into a well organized and easily readable outline that contains essential formulae and key ideas. If you bring a big binder of poorly organized information, you will find your notes a hindrance rather than a help during the exam. The value of your exam notes to you is directly proportional to the time, thought, and care you put into its preparation.

Calculator. You may use a calculator during the exam.

■ Triangle trigonometry.

You will be expected to use the trigonometric ratios sine, cosine, and tangent in working many of the problems on the final exam.

■ Measurement. Halliday & Resnick, Chapter 1, pps. 1-12

In working many of the exam problems, you need to handle units of mass, length, time, and derived units such as those for velocity, acceleration, force, work, and energy; you will need to convert units. You need be familiar only with the SI system of units.

■ One dimensional motion. Halliday & Resnick, Chapter 2, pps. 13-37. Ignore sections 2-8 and 2-10.

[1] The equations for motion with constant acceleration, summarized in Table 2-4 on page 23, are very important.

[2] Recall that you learned how to find the derivative (instantaneous rate of change) of a polynomial function and that it was easy to do. This means that you can find instantaneous acceleration when you

know the velocity as a function of time, and that you can find instantaneous velocity when you know the displacement as a function of time.

[3] You will have to work problems involving free fall. You will be asked to determine the maximum height attained by a particle projected straight up, the time at which the maximum height it attained, and the total time the particle spends in the air.

■ **Vectors. Halliday & Resnick, Chapter 3, pps. 38-49. Also, [08-04-29-HH-Phy].**

All material that we studied concerning vectors is important and will be covered on the final exam. There will be questions specifically about vectors. And, there will be problems that are not specifically about vectors, but whose solution will require understanding of vectors and skill in working with them. The two handouts from the HH book included explanatory material in addition to the problem. If your notes are in any way lacking, the explanation found in this handout will help you.

You will be expected to work in any of the three notational systems that we used in class. Examples of each system are $\vec{v} = x\vec{i} + y\vec{j}$, $\vec{v} = \langle x, y \rangle$, $\vec{v} = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$.

■ **Two dimensional motion. Halliday & Resnick, Chapter 4, pps. 58-70, 74-86. Ignore problems on sections 4-7, 4-8, 4-9. We did not cover: uniform circular motion, relative motion in one dimension, relative motion in two dimensions.**

[1] Projectile motion

■ **Force. Halliday & Resnick, Chapter 5, pps. 87-107**

Remember that our treatment of this was very qualitative. The one equation that we used was $F = ma$. Other than using this equation, the final exam will treat this topic qualitatively. You will be expected to understand and reason using Newton's Laws, especially Newton's Third Law. Thinking through the problem posed by Mr. Ed the talking horse will help you.

■ **Work and energy, March, Chapter 5**

You will be expected to understand the relationships between potential and kinetic energy, and the relationship of work and energy. You will be asked to compute the gravitational potential energy of a body. Assuming an elevated body falls, you will be asked to compute the body's kinetic energy, velocity, and height at various times during its fall, and the time duration of the fall. Expect to determine the work done by a constant force acting in the direction of motion, opposite the direction of motion, and perpendicular to the direction of motion. The example of the squirrel and the tree that we discussed in class will be helpful. The sample computations that we did in class concerning work and energy will help you

■ Modern physics

[1] Michelson-Morley experiment (March, Chapter 8)

- a. Explain the experiment. What was the experimental apparatus like? How was it used?
- b. What did Michelson expect to determine from this experiment?
- c. What was the result of the experiment?
- d. What were the implications of the experimental result?

[2] Special Relativity (March, Chapter 9-10.) (Einstein, pps. 1-47 (only as covered in class))

- a. Be able to explain the thought experiments discussed at March pps 101-106. These are the "Ships That Pass in the Night", "An Unbreakable Speed Limit", "The Elastic Train".
- b. Be able to explain the thought experiments discussed at Einstein pps 21-24 "VII The Apparent Incompatibility of the Law of the Propagation of Light with the Principle of Relativity" and at pps 30-33 "IX The Relativity of Simultaneity".
- c. Einstein on pps 9-33 essentially makes an argument the two well established principles of physics, "The Principle of Relativity" and the "Law of the Transmission of Light" cannot both be true in light of the thought experiment at pps 21-24. Be prepared to explain these two principles of physics, explain how the thought experiment shows them to be mutually inconsistent, and explain Einstein's way out of this difficulty that Einstein offers to physics.

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