Lab: AP Review Sheets AP Physics

Background

One very useful learning technique involves preparing review materials for other people to use. In this long-term assignment, you'll be preparing a series of Review Documents, each one 4-pages in length, ostensibly for others to use in preparing for the AP exam. You'll almost certainly find, however, that preparing *your own* document is a far better review than reading a document prepared by someone else.

Objective

Te prepare a series of 4-page Review Documents summarizing the material covered in given units of the AP Physics C course.

Equipment

Textbook, calculator, paper, pencil, sample Review Document

Procedure

1. Examine the sample Review Document, and use it as a general model of what you'll be presenting on your own review document. Your review document should include:
   a. the **title** of the unit you're document is covering
   b. your **name**, as well as the name of any people who may have helped you listed as assistants
   c. a brief **background** or summary of the topic you'll be reviewing
   d. a few of the **major topics** covered in that unit
   e. a summary of important key phrases or **vocabulary** terms covered in the unit
   f. a collection of important **formulae**, perhaps with information regarding situations when each formula might be useful
   g. **diagrams**, pictures, and graphs
   h. at least 3 free-response **problems**, *with well-blurbed solutions* written out in detail
   i. **four** pages exactly of content--not three, not five.
2. You may choose to type out or hand-write your review sheet, but it must be legible.
3. As already stated, the Review Document must be four pages in length, ie. more than three, and less than five. If you find that you haven't filled four pages, include additional pertinent information to your Document. If you find that you're going to need five pages, write smaller or use your space more efficiently!
4. If you work with someone else on your Review Document--and you're encouraged to--be sure to give them credit. Each person is responsible for his or her own Documents, and each person's Document needs to be *completely different* from other Documents (from other people) covering that same unit.
5. Choose a topic in which you have experienced some challenges: you'll get the chance to better learn material that is difficult for you.
6. Your physical Review Document, on two double-sided pieces of paper or four single-sided pieces of paper, is due on the date given in class. Optional digital copies of your document are due at the same time.
7. For the subject of your Review Document, you'll choose/be assigned a chapter from each of the groups here, one group every week.

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Group 1	Group 2	Group 3	Group 4
Ch 2 - Vectors	Ch 10 - Rotation of a Rigid Object About a Fixed Axis	Ch 5 - Electric Forces and Fields	Ch 11 - Magnetic Forces and Fields
Ch 4 - Motion in Two Dimensions	Ch 11 - Angular Momentum	Ch 6 - Gauss's Law	Ch 12 - Sources of Magnetic Field
Ch 5 - The Laws of Motion	Ch 12 - Static Equilibrium	Ch 7 - Electric Potential	Ch 13 - Faraday's Law
Ch 6 - Circular Motion	Ch 13 - Universal Gravitation	Ch 8 - Capacitance	Ch 14 - Electromagnetic Induction
Ch 7 - Energy and Energy Transfer	Ch 15 - Oscillation	Ch 9 - Current and Resistance	
Ch 8 - Potential Energy		Ch 10 - DC Circuits	
Ch 9 - Momentum			

Additional Notes

1. If you wish to type up your solutions using Google Docs, LibreOffice Writer, or Microsoft Word, you'll need to figure out how to include diagrams and equations with your digital document.

2. If you'd like to receive a small amount of extra credit for, in addition to your physical document, submitting a digital version of your work, create a PDF version of the file and deliver a copy to your teacher as instructed in class. Your filename should have the following format:

`lastnamefirstinitial-chXX-review.pdf`

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Chapter 2: Motion in One Dimension

(Example)

AP Physics

by Richard White

with the assistance

of J. Bush & K. Marcotte

Background / Summary

In the study of classical mechanics, the first step is carefully describing *motion*. This unit discusses the fundamentals of single-dimensional motion, including displacement, time, velocity, and acceleration.

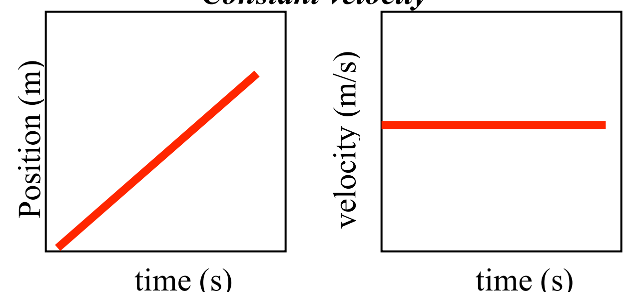
Five Key Points to Keep in Mind!

1. *Displacement* along the x-axis is defined as $\Delta x = x_f - x_i$.
2. *Velocity* is defined as change in position over time. It may be an average velocity, $v=\Delta x/\Delta t$, or an instantaneous velocity, $v=dx/dt$.
3. *Acceleration* is a defined as change in velocity over time: $a=\Delta v/\Delta t$, or $a=dv/dt$. In this course, we mostly deal only with constant acceleration.
4. The *kinematic equations* are used to describe the relationships between position, time, velocity, and acceleration.
5. Objects free-falling near the surface of the earth accelerate at 9.80 m/s^2 toward the earth. Free-fall problems assume the absence of air friction.

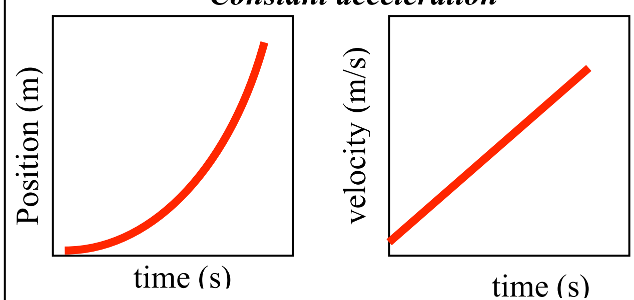
Did you know?

The instructor insists that you draw a picture for every single stupid problem you ever do in these chapters.

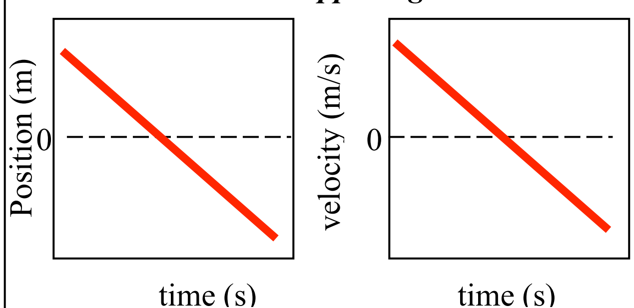
Constant velocity



Constant acceleration



What's happening here?



For this one, the object appears to be traveling in the negative direction with a negative velocity (you can tell from the slope).

This object initially has a positive velocity (above the x-axis), but that velocity is decreasing: the object is slowing down. It comes to a stop, and then begins accelerating in the negative direction.

The Kinematics Formulae

$$v = \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

$$v_f = v_i + at$$

$$\bar{v} = \frac{v_i + v_f}{2}$$

$$\Delta x = v_i t + \frac{1}{2}at^2$$

$$v_f^2 = v_i^2 + 2a\Delta x$$

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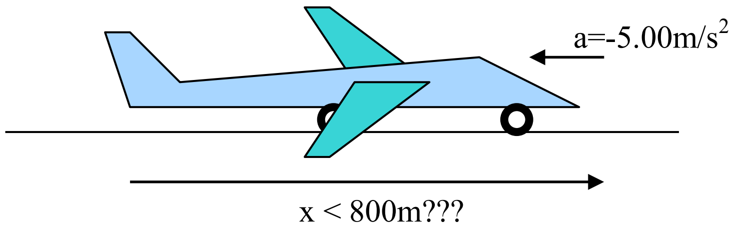
Let's Do Some Problems!

1. [Easy] A jet plane lands with a speed of 100 m/s and can accelerate at a maximum rate of -5.00 m/s^2 as it comes to rest. What is the minimum time interval needed before it can come to rest? Can it land on a runway that is only 0.800 km long?

2. [Medium] A ball starts from rest and accelerates at 0.500 m/s^2 while rolling down an inclined plane 9.00 m long. When it reaches the bottom, the ball rolls up another plane were, after moving 15.0m, it comes to rest. What is the speed of the ball at the bottom of the first plane? How long does it take to roll down the first plane? What is the acceleration along the second plane? What is ball's speed 8.00 m along the second plane?

3. [Hard!] A rock is dropped from rest into a well. The sound of the splash is heard 2.40 s after the rock is released from rest. How far from the top of the well is the surface of the water? (The speed of sound in air at the ambient temperature is 336 m/s.)

Solutions:



1. First , let's write down some known values and see where that leads us:
   v_i=100m/s, v_f=0 m/s, a=-5.00 m/s^2.
   t=?
   $v_f=v_i+at$, so $t=(v_f-v_i)/a$
   t=(0-100)/-5.00
   t=20.0s

   So apparently the plane is going to need to have 20.0 seconds to come to a complete halt. Now, the question becomes, how far does the plane travel during that 20.0s?

   Δx=?
   $v_f^2=v_i^2+2a\Delta x$
   $\Delta x=(v_f^2-v_i^2)/(2a)$
   $\Delta x=((0^2-100^2)/(2\cdot -5.00)$
   Δx=1000m

   No, it won't be able to land on the 0.800 km (=800m) long runway.

*For the sake of brevity, this sample document only contains a single example problem. Your assignment will need to include **three** sample problems.*