PHY 113 General Physics I -- Section D

TR 9:30-10:45 AM	OPL 101	http://www.wfu.edu/~natalie/f03phy113/

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- General information about the class.
- Syllabus and homework assignments.
- Hints for solving some homework problems
- Information about WebAssign.
- Link to textbook student study guide
- Physics News.

- **On line quiz (due < 9:15 AM 09/02/03)**
- Physics welcoming "tea" -- Thurs. Aug. 28 at 4 PM
- Link to Vpython software

Materials needed for the course:

- Textbook – Halliday, Resnick, and Walker (shrink-wrapped in 2 volumes + WebAssign access code)
- Lab manual available from book store – Labs start Sept. 1st; bring your laptops
- Webassign – Interactive homework system – need login & password (enter access code within 2 weeks) (If you purchase your text book separately, you may obtain an access code from the WebAssign web site.
- Calculator

Course plan

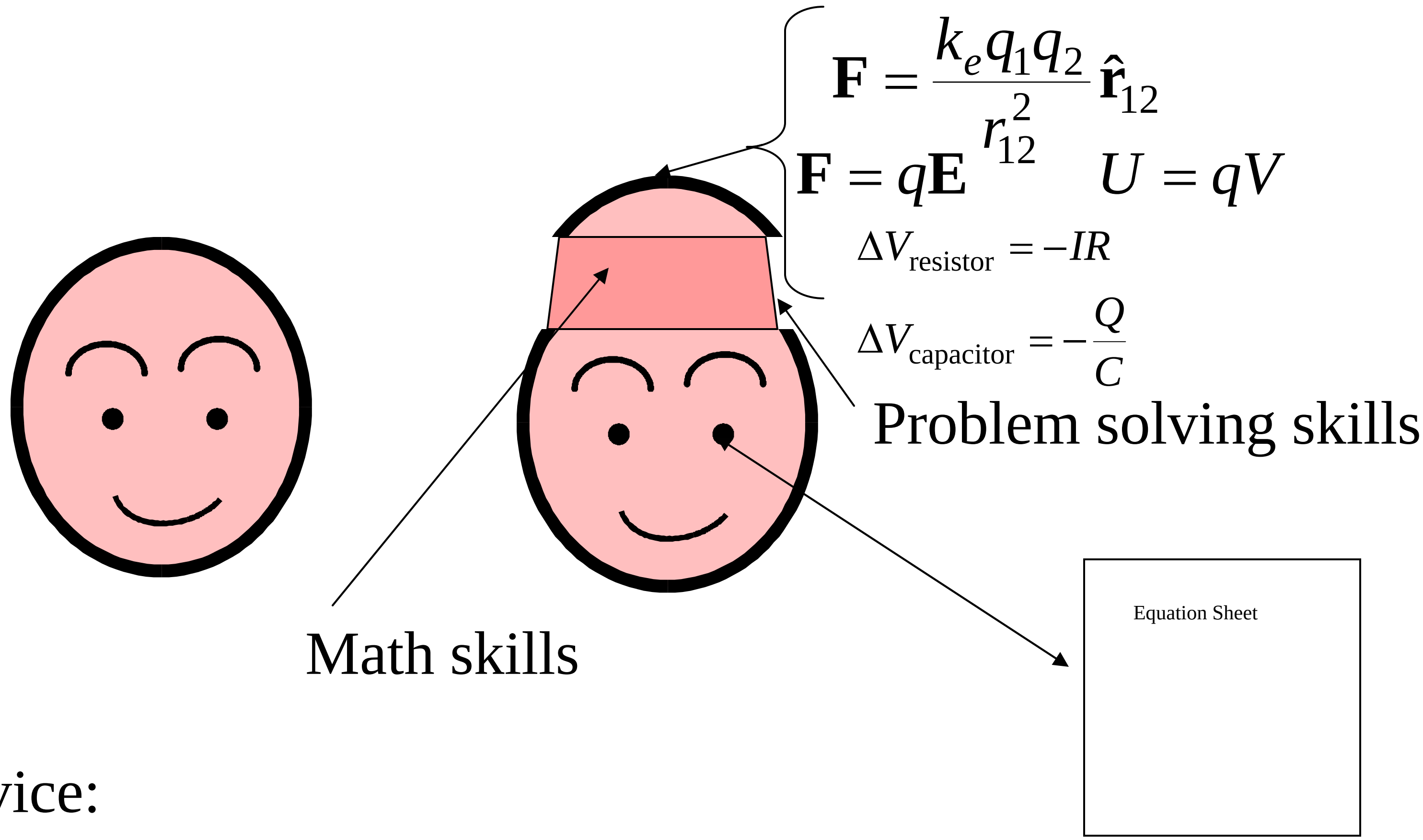
- Read text sections before lecture and take online quiz before lecture
- Lectures -- 9:30-10:45 AM T R (ask questions; make suggestions about format)
- Homework – tied to each lecture; due on the day of the following lecture – help available from instructor and tutors (scheduled office hours and tutorial sessions)
- Exams – 3 + final
- Extra credit opportunities

Why take this course?

- Learn fundamentals of physics
- Learn quantitative problem solving strategies

Problem solving steps

1. Visualize problem – labeling variables
2. Determine which basic physical principle(s) apply
3. Write down the appropriate equations using the variables defined in step 1.
4. Check whether you have the correct amount of information to solve the problem (same number of knowns and unknowns).
5. Solve the equations.
6. Check whether your answer makes sense (units, order of magnitude, etc.).



Advice:

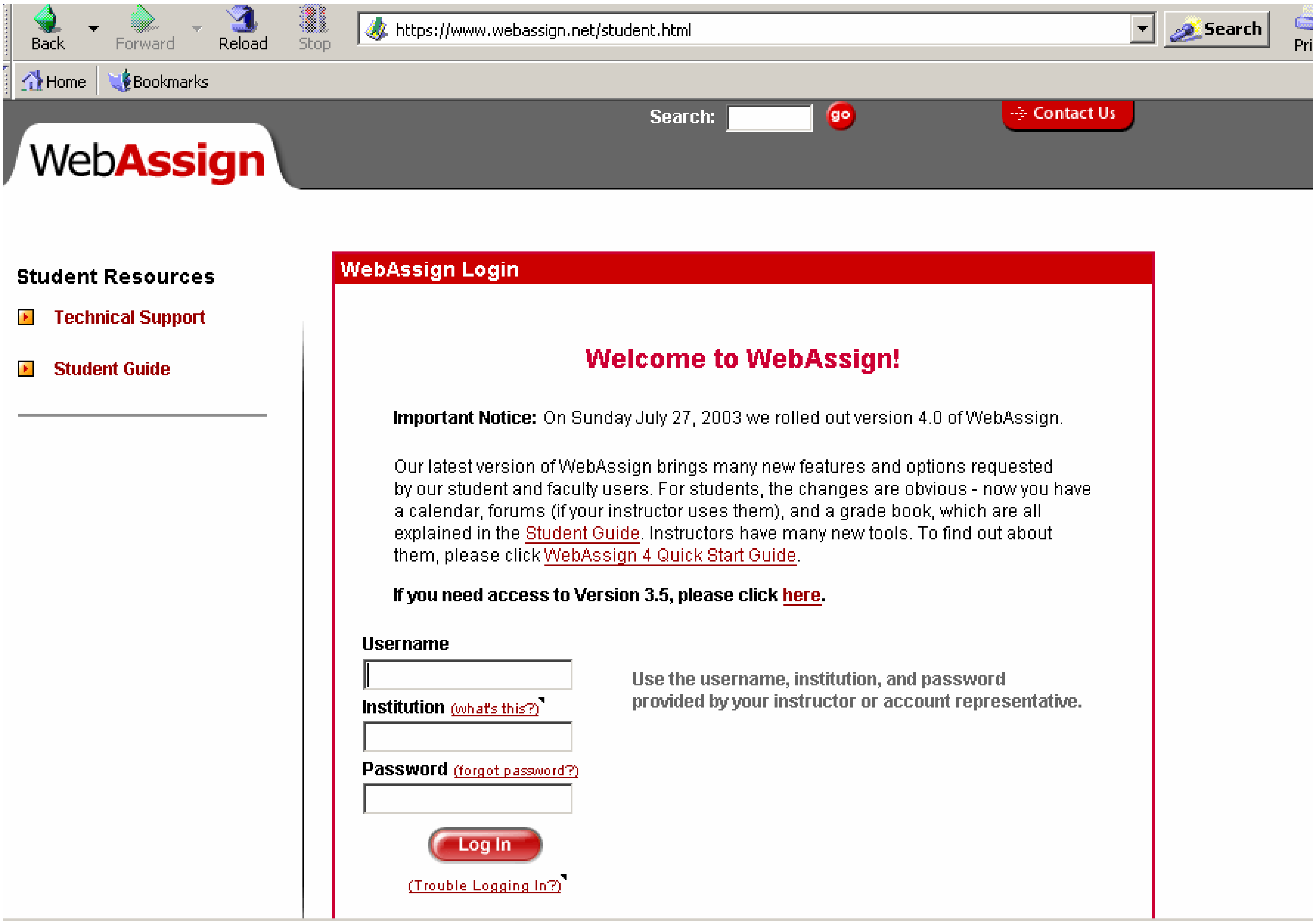
1. Keep basic concepts and equations at the top of your head.
2. Practice problem solving and math skills
3. Develop an equation sheet that you can consult.

Online quiz -- example

Online Quiz for Lecture 2
Motion in One Dimension -- Sept. 2, 2003

1. Suppose that you have 2 minutes before class begins and you are 300 *m* from Olin 101. What is should be your average velocity (in *m/s*) in order to get to class on time?
(a) 150 (b) 15 (c) 5 (d) 2.5 (e) 1
2. Suppose you begin and end your trip at rest (v=0 m/s) and have a constant acceleration *a* for 1 minute followed by a constant negative acceleration -*a* for 1 minute. What is the value of *a* in m/s^2?
(a) 15 (b) 5 (c) 2.5 (d) 0.3333 (e) 0.0833
3. What is your maximum velocity (in *m/s*) during the trip?
(a) 150 (b) 15 (c) 5 (d) 2.5 (e) 1

Example for WebAssign



Assignment Summary - Mozilla

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Home Bookmarks

WebAssign.net
Thursday, August 28, 2003 09:07 AM EDT

Logged in as natalie@wfu.
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Calendar | Assignment Summary | Grades | Communication

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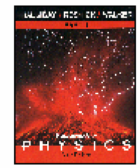
Course: PHY 113, section D, Fall 2003
Instructor: Natalie Holzwarth

Natalie Holzwarth
Wake Forest University

Important Announcements



According to our records you have not registered for this class. The grace period for registration will end Thursday, September 11, 2003 at 09:00 AM EDT. After that date you will no longer be able to see your WebAssign assignments or grades, until you register.

- Register now using your WebAssign Student Access Code. [Enter Access Code]
- Register now online using a credit card. [Credit Card Registration]

Current Assignments | Past Due Assignments | All Assignments

Assignment	Description	Due Date & Time
HW 2	This assignment introduces the notions of displacement, velocity, and acceleration. Please read Chapter 2 of HRW and work the following problems from the end of the chapter. Also, start reading Chapter 3 before Thursday's lecture as well as working the on-line quiz.	Thu Sep 4 2003 07:38 PM EDT

Submissions	0	out of 30
Score	0	0

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Draw AutoShapes

Slide 8 of 14 Default Design

Start wfu.edu - ... E:\Shared... f03phy113... Assignme... PHY 113 D ... 97% 9:08 AM

. [HRW6 1.P.003.] A space shuttle orbits the Earth at an altitude of 295 km. What is this altitude in

(a) miles and

[0.125] ______ mi

(b) millimeters?

[0.125] ______ mm

1 mi = 1.61 km

D = 295 km x 1mi/1.61km = 183.22981 km

(answer with 3 significant digits: 183 km)

1 mm = 10^{-3} m   1 km = 10^{3} m ➔ 1 mm = $10^{-3}/10^{3}$ km

= 10^{-6} km

D = 295 km x 1 mm/10^{-6} km = 295 x 10^{6} mm

(answer in WebAssign notation 295E^{6})

must have no space;
could be lower case

Units & measure

1. SI units
2. Orders of magnitude
3. Problem solving techniques
4. Error analysis

1. SI units
    mass = kg   (1 kg = 1000 g)
    time = sec
    length = m

Common abreviations

c = centi = 10^{-2}

k = kilo = 10^3

M = mega = 10^6

m = milli = 10^{-3}

G = giga = 10^9

T = tera = 10^{12}

Terrible example:

10^{12} bull

2. Orders of magnitude

Diameter of a nucleus ~10^{-15} m

Diameter of an atom ~10^{-10} m

Distance of earth to Sun ~10^{11} m

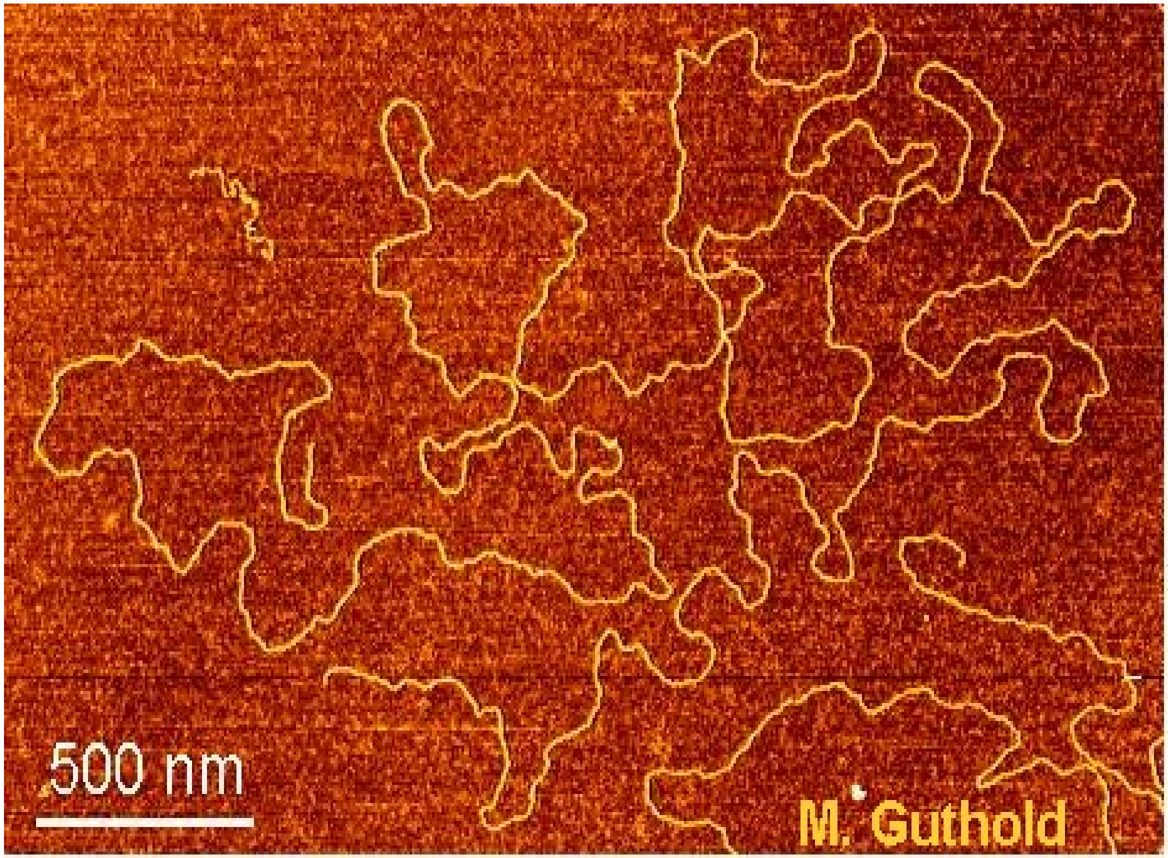
Mass of electron ~10^{-30} kg

Mass of earth ~10^{24} kg

Vibration time of a molecule ~10^{-13} s

Age of Earth ~10^{17} s

Example of molecular lengths visible with scanning tunning microscope as measured by Martin Guthold.



λ-DNA

500 nm = 500 x 10^{-9} m

3. Problem solving steps

1. Visualize problem – labeling variables
2. Determine which basic physical principle applies
3. Write down the appropriate equations using the variables defined in step 1.
4. Check whether you have the correct amount of information to solve the problem (same number of knowns and unknowns.
5. Solve the equations.
6. Check whether your answer makes sense (units, order of magnitude, etc.).

August 27, 2002

PHY 113 – Additional notes for Chapter 1 (Problem Set # 1)

Here are some notes about error analysis. This will be discussed also in your laboratory work. Some helpful comments follow:

Some degree of error is associated with any measurement. For example, Suppose your ruler has centimeter and millimeter markings. If you measured one side of your text you could say that its length is $l_1 \pm \delta l_1$ (for example 22.2 ± 0.2 cm). Suppose the second length is measured as $l_2 \pm \delta l_2$ (for example 26.2 ± 0.2 cm), while the thickness is $t \pm \delta t$ (for example 6.3 ± 0.2 cm). If you now wanted to compute the expected volume of your text, that would be

$$V = l_1 \cdot l_2 \cdot t. \tag{1}$$

To get an idea of the error in your calculation you need to think about the error in each length measurement. Symbollically you can write this as the difference between the possible values and the expected value given in Eq. 1,

$$\delta V \equiv (l_1 \pm \delta l_1) \cdot (l_2 \pm \delta l_2) \cdot (t \pm \delta t) - l_1 \cdot l_2 \cdot t. \tag{2}$$

Expanding this, we find

$$\delta V \approx \pm \delta l_1 \cdot l_2 \cdot t \pm l_1 \cdot \delta l_2 \cdot t \pm l_1 \cdot l_2 \cdot \delta t \pm \ldots, \tag{3}$$

$$\delta V \equiv (l_1 \pm \delta l_1) \cdot (l_2 \pm \delta l_2) \cdot (t \pm \delta t) - l_1 \cdot l_2 \cdot t. \tag{2}$$

Expanding this, we find

$$\delta V \approx \pm \delta l_1 \cdot l_2 \cdot t \pm l_1 \cdot \delta l_2 \cdot t \pm l_1 \cdot l_2 \cdot \delta t \pm \ldots, \tag{3}$$

where the terms we have omitted, such as $\delta l_1 \cdot \delta l_2 \cdot t$ are expected to be much smaller than the terms we kept. If we want an estimate of the maximum possible error, then we can we should replace $\pm$ with $+$ and it is convenient to divide the estimate of the error in V by the the estimated value of V so that the expression becomes the very compact result:

$$\frac{\delta V}{V} = \frac{\delta l_1}{l_1} + \frac{\delta l_2}{l_2} + \frac{\delta t}{t}. \tag{4}$$

For the particular numbers quoted above, the fractional error is

$$\frac{\delta V}{V} = \frac{0.2}{22.2} + \frac{0.2}{26.2} + \frac{0.2}{6.3} = 0.048 \equiv \%4.8, \tag{5}$$

or $V = 3664 \pm 177$ cm^3.

In this case, the fractional error is equal to the sum of the fractional errors in each of the length measurements. This is not a general result, but frequently the error analysis simplifies to a compact result when expressed in terms of the fractional error of each measurement.