

Order-of-Magnitude Physics – Lab 1

Guidelines:

- Break up into groups of 1, 2, or 3 people.
- At any given moment, there should be ≤ 1 “scribe” (person with marker/pen).
- The scribe has complete control over what to write down (and what not to write down).
- Please change scribes when switching to another problem, but not within a given problem.
- When you have an answer, write it down on the “Answer Board” where everyone’s answers will be collected.
- If you are done, feel free to leave, or you can observe other groups.

Problem 1. Making It in the World Today Takes Everything You’ve Got

NB: This problem is not meant to presume, intimidate, or discourage in any way, shape, or form. Please have fun with it.

Select an academic discipline (e.g., astronomy, physics, mechanical engineering, electrical engineering, or ...).

What percentage of people who graduate with Ph.D.’s in this academic discipline take up faculty positions in 1 of the top 10 largest research universities in the United States?

You may repeat this question to cover the academic disciplines of interest to your small group.

Problem 2. BP Oil Spill

This is a transcription of a real-life email. The footnote is mine.

Obtain an estimate of the spill rate in barrels per day. There are 42 gallons in 1 barrel, and 4 liters in 1 gallon.

Subject: PBS Newshour

Date: Wed, 12 May 2010 16:13:37 -0700

From: Sarah Yang <scyang@berkeley.edu>

To: mstacey@berkeley.edu, pmarcus@me.berkeley.edu, hunt@ce.berkeley.edu, tinakc@berkeley.edu, savas@me.berkeley.edu, fluids_faculty@lists.berkeley.edu

Apologies for the group email, but the NewsHour is wondering if it's possible to estimate from video footage how much oil is spilling (and how fast) from the Deep Horizon well in the Gulf of Mexico. The footage was recently uploaded to YouTube and can be seen here:

<http://www.youtube.com/watch?v=WYFYVNvvgg-A>.[†]

Apparently, it has been hard to get a grip on the exact rate of oil being spilled in the Gulf at this point, and estimates have ranged widely. It's not clear if this video footage can shed some light on the matter.

I'm emailing you all because of your expertise in fluid dynamics. If you can help, please contact Hari Sreenivasan, the producer at NewsHour, directly at hsreenivasan@newshour.org.

Thanks,

Sarah

Berkeley Office of Public Affairs

[†]There is no scale bar to indicate length on the video. There is, however, a clock read-out.

Problem 3. Water, Water Everywhere

Estimate in gallons/yr how much water is used in California for:

- (a) residential use (excluding lawns and landscaping)
- (b) agricultural use
- (c) lawns and landscaping