Density & Buoyancy Web Quest

Link to the Colorado Education PhET Website by holding the control key and clicking with the mouse on the link below:

http://phet.colorado.edu/sims/density-and-buoyancy/density_en.html

1. You should see a screen with a tank of water, a scale, and a floating block
2. Click on the "Mystery" radio button in the upper right corner of the screen
3. You should now see 5 coloured mystery blocks added to the screen.
4. Re-create the table below in a Word document.
5. For each block, carry the block to the scale and measure the mass. Record in the table.
6. For each block, drop into the tank and measure the volume using the displacement method. Record in the table. Remember to hold the block underwater to get an accurate volume.
7. Calculate the density of each block. Record in the table.
8. Observe the buoyancy in the tank, and label as rising, sinking, or floating.

Block	Mass (kg)	Volume (L)	Density (kg/L)	Buoyancy
A				
B				
C				
D				
E				

9. Answer the analysis questions (red) IN COMPLETE SENTENCES. Write the answers in your Word document. (Questions A through E are the block observations in the table.)
   - *F. How many grams are in 1 kilogram?*
   - *G. Do density calculations work ONLY when measured in grams and milliliters?*
   - *H. If two blocks have the same density, why do they react differently when placed in water? (Hint: think of Bill Nye's clay boats.)*

10. Next, click on the "Same Density" radio button. Drag all of the blocks to the tank at the same time and observe what happens.
    - *I. If the blocks all have different masses, why do they float at the same height?*

11. Now click on the "Same Volume" radio button.
    - *J. Record your observations in complete sentences.*

12. Click on the "Custom" radio button. Experiment with the various materials, make observations, make calculations, etc.
    - *K. Explain why ice cubes float in water.*
    - *L. If equal size (volume) blocks of ice and wood are dropped into water, which one will have greater displacement?*

13. Click on the "My Block" radio button in the upper left corner. Create a block with neutral buoyancy (just underwater.)
    - *M. What is the density of your block?*

14. Read through the following historical information about the Gold Rush of 1847. Answer the questions which follow.

Mercury Madness

By Sarah Phelan (edited) Photo by Christopher Gardner

The entrance to Quicksilver Park in New Almaden warns of the toxic mercury mines that remain there. Some environmentalists think the warnings are not enough and that the state's relaxed restrictions on mercury contamination in water will only lead to illness and death.

IN THE OAK-STUDDED HILLS of San Jose's Almaden Quicksilver County Park, hikers and joggers puff their way along 29 miles of zigzagging trails; passing grasslands, Manzanita-fringed chaparral (a type of vegetation) and occasional remnants of mining structures along the way. These remnants, along with a nearby museum and gift shop, are there because this romantic-sounding recreational area was once the site of one of the largest mercury mines in the West.

Ever since miners swarmed to the frontier in the hope of hitting the mother lode, California has been called the Golden State. But beneath the glitzy surface, from the Hollywood Hills to Silicon Valley, lies a more upsetting landscape--a haunting legacy of abandoned mercury mines.

Mercury--the most toxic of all natural metals--was a key element in the Gold Rush. The freight wagons that rolled into camps back in 1847 didn't only provide fortune-hungry miners with beef, beans and whiskey; they also supplied thousands of flasks of mercury, used to extract gold from stream gravel and background rock.

When a nugget was found, it would be dropped into the liquid mercury to determine if it was real gold or merely pyrite (Fool's gold). Real gold has a density of about 19.3 g/mL and pyrite has a density of about 5 g/mL. Mercury has a density of about 13.5 g/mL. Having a flask of mercury handy often meant not making wasted trips into town to trade gold for money.

As the Gold Rush peaked, eager businessmen built more than 100 mercury mines in California, unwittingly opening a poisonous Pandora's Box. When the federal government recognized the danger and stopped mercury amalgamation in the early 1970s, these same mines became unprofitable and were abandoned, often in close **proximity** to waterways, residential communities and recreational facilities.

Meanwhile, more than a million flasks of mercury--74 million pounds--had been removed from the New Almaden Mining District, which was opened in 1850. As early as 1863, *Harper's New Monthly Magazine* had already noted dead trees, salivating cattle and polluted water in the area. These are all symptoms of what is now known as mercury poisoning.

For the whole story check out: http://www.metroactive.com/papers/metro/12.04.97/mercury-9749.html

N. *Why is California called "The Golden State"?*
O. *What does the blue word "proximity" mean?*
P. *How would "having a flask of mercury handy" prevent wasted trips to the bank?*
Q. *It is now known that mercury causes damage to the brain and nervous system. Why do you think many miners "went mad" during the Gold Rush days?*