Classroom Activity

10 Big Question: How does the earth work?

Why does it float?

Why does an iceberg float? Because the ice is less dense than the liquid water it is sitting in. The density of an object relative to the density of water will determine if it will float in water. In this activity we will explore this a little further.

For this activity you will need:

- A graduated cylinder or two clear plastic cups (one small and one large is best)
- A permanent marker
- Ruler
- Water
- Kitchen scales
- Objects to measure density (preferably waterproof)

Before you begin, watch this video on how to measure density:
http://youtu.be/SimFy9wOMXY

Now it is your turn. If you have a graduated cylinder or beaker you can use this for the activity. If not, follow the steps below to make your own using the clear plastic cups and a permanent marker.

Make a graduated cup

1. To make the graduated cup, take the smaller of the two cups and measure one centimetre up from the base of the cup and place a mark.
2. Now fill the smaller cup up to this line and pour all the water into the larger cup. Be precise as that will makes our measurements more accurate. Now place a mark at the waterline on the bigger cup. Repeat this step until the larger cup is marked to a centimetre from the top.
3. You now have a graduated cup!

Density of water

1. Weigh your empty graduated cup (or measuring cylinder) on the kitchen scale. Record this number.
2. Add water until the cup is 1/2 to 2/3 full of water (make sure you stop at a graduated mark and be precise).
3. Measure the new mass on the kitchen scale. Record this number.

4. Subtract the mass of the full cup from the empty cup to give you the mass of water.
5. The volume of your water is given by the height of the mark (note the units are irrelevant since we'll make our measurements relative to water). You can then compute the density of the water by dividing the mass by its volume. Record this number.

Density of an object

1. Place a waterproof object (such as a rock) into the water. Measure the new height of the water (make a guess if the water line falls between marks). Record the volume.
2. Subtract the original height of the water from this new height. This is the volume of water displaced by your object.
3. Now place the cup with the water and object on the scale. Record the mass.
4. Subtract the mass of the full cup from this newest measurement. This is the mass of your object when wet (this is important as rocks have pores that can fill with water).
5. Divide your wet mass by its volume. This is the density of your object.
6. Now take the density of your object and divide it by the density you obtained from the water. This is the specific gravity of the object.
7. If your object is a rock, what type of rock might you have? A table is listed below with several common rock types and their specific gravities.

Record sheet – density

To determine the density of your water:	
Mass of your empty cup	A =
Mass of your cup ½ to 2/3 full	B =
Subtract A from B to get the mass of your water	C =
Volume of your water (from the graduation on the cup)	D =
Divide C by D to get the density of your water	E =

To determine the density of your object:	
Volume of cup with object	F =
Subtract D from F to find the amount of water displaced by your object	G =
Mass of your cup with object	H =
Subtract B from H to get the mass of your wet object	I =
Divide I by G to find the density of your object	J =

If your object is a rock:	
Divide J by E to get the specific gravity of your object	K =
What type of rock could you have? (Use the table over the page. You may need to list more than one.)	

Rock Type	Specific Gravity		
sedimentary rocks			
soil	1.2	to	2.4
clay	1.63	to	2.6
gravel	1.7	to	2.4
sand	1.7	to	2.3
sandstone	1.61	to	2.67
shale	1.77	to	3.2
limestone	1.93	to	2.9
dolomite	2.28	to	2.9
igneous rocks			
tuff	1	to	2.4
rhyolite	2.35	to	2.7
granite	2.5	to	2.81
granodiorite	2.67	to	2.79
andesite	2.4	to	2.8
diorite	2.72	to	2.99
basalt	2.7	to	3.3
diabase	2.5	to	3.2
gabbro	2.7	to	3.5
peridotite	3.2	to	3.37
pyroxenite	3.2	to	3.37
metamorphic rocks			
graywacke	2.6	to	2.7
slate	2.7	to	2.9
quartzite	2.5	to	2.7
marble	2.6	to	2.9
schist	2.39	to	2.9
amphibolite	2.9	to	3.04
gneiss	2.59	to	3
eclogite	3.2	to	3.54
serpentine	2.4	to	3.1