**Purpose** To investigate solubility of gases based on temperature.

**Materials** 2 - 250 ml beakers 12 oz. Root Beer or Cola Hot Plate

2 Large Test Tubes Ice Beaker Tongs

Test Tube Rack 2 1-holed Rubber Stoppers (#4) 100 ml Grad Cylinder

### Procedures Video: <http://somup.com/cYnuoGhtBq>

### Obtain two 250 ml beakers (*or similar containers*) & two large test tubes.

1. Add water to ONE of the 250 ml beakers up to the 150 ml mark (*2/3 full*).
2. Add ice to the other 250 ml beaker up to the 100 ml mark and then add water up so that the ice/water mixture will have a volume at the 150 ml mark (*2/3 full*).
3. Place the beaker containing 150 ml of water on the hot plate (*or stove*) and set the hot plate on the highest setting in order to bring the water to or near boiling. Get a heat resistant pad or cloth to put this beaker on after heating. While waiting for the water to boil:
4. Place two large test tubes next to each other in a test tube rack or container.
5. BY THE SINK add **40 ml** of **root beer** (*or dark colored soda pop*) to each test tube using a graduated cylinder (*or fill to the same level in each test tube 2/3 to ¾ full*).
6. Place a 1-holed rubber stopper (*or cover with a hole*) ono each of the test tubes.
7. Place the ice/water beaker nearby your “lab station” and once the 250 ml beaker on the hot plate is near a full boil, use the beaker tongs and set the beaker on a heat resistant surface next to the ice/water beaker.
8. Quickly INVERT one test tube of root beer into each 250 ml beaker and hold the test tube as vertical as possible. Do NOT rest the inverted test tube on the bottom of the 250 ml beaker (*just so the hole in the test tube remains unblocked*).
9. Observe each test tube until there are NO bubbles formed or released inside one of them. Then, take both test tubes out of the water and set them right side up to observe.
10. Set the test tubes back in the test tube rack next to each other.

|  |  |
| --- | --- |
| Ice  Water | Boiling Water |
|  |  |

### Calculations and Data

1. Shade in the table to the right, showing the level of root beer remaining in each test tube.
2. Which beaker produced the most bubbles?

### Conclusions and Questions

1. What gas do you think is bubbling in the water when the test tubes are inverted?

2. What does the term “solubility” mean?

1. What is the relationship between the temperature and the solubility of a gas (*if the temperature increases, what happens to the solubility of the gas in the soda pop*)? What **evidence** do you have for this?
2. Real life application: If the temperature of bodies of water increases, how will this affect the amount of oxygen in the ocean, lakes and water supplies?
3. Circle the graph below that best shows the relationship you observed in this activity?

Temperature of water

Solubility

of a Gas

Temperature of water

Solubility

of a Gas

Temperature of water

Solubility

of a Gas

6. Would you call this a direct or inverse relationship?

Answer Key

##### Calculations and Data

|  |  |
| --- | --- |
| Ice  Water | Boiling Water |
|  |  |

1. Shade in the table to the right, showing the level of root beer remaining in each test tube.

2. Which beaker produced the most bubbles?

### The boiling water beaker produced the most bubbles, showing that gases dissolve more in colder solutions (less bubbles) and less in warmer solutions (more bubbles).

### Conclusions and Questions

1. What gas do you think is bubbling in the water when the test tubes are inverted?

**Carbon dioxide gas (basic form of “carbonation”)**

2. What does the term “solubility” mean?

**The ability of something (solute) to dissolve in something else (solvent)**

3. What is the relationship between the temperature and the solubility of a gas (*if the temperature increases, what happens to the solubility of the gas in the soda pop*)? What **evidence** do you have for this?

**As temperature increases, solubility decreases. The evidence for this was seen in the boiling water beaker where the gas bubbled much more (dissolved less … came out of solution) than in the ice water (dissolved more … stayed in solution)**

4. Real life application: If the temperature of bodies of water increases, how will this affect the amount of oxygen in the ocean, lakes and water supplies?

**As the water bodies warm up, less oxygen will remain in them (dissolves less … comes out of solution) and therefore, fish & other life will have less oxygen to live by**.

5. Graph of solubility and temperature

Temperature of water

Solubility

of a Gas

6. Would you call this a direct or inverse relationship? **inverse**