**Biochemistry - Dry Ice Bubbles Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Dry ice is the solid form of carbon dioxide. You can use dry ice to freeze bubbles solid so that you can pick them up and examine them closely. You can use this project to demonstrate several scientific principles, such as density, interference, semi-permeability, and diffusion.

**Materials**

* Bubble Solution (from the store or make your own)
* Dry Ice
* Gloves (for handling the dry ice)
* Plastic Box or Cardboard Box
* Phone or camera to capture photos of the bubble

**Part I**

**Procedure**

1. Using gloves to protect your hands, place a chunk of dry ice in the bottom of glass bowl or cardboard box. Glass is nice because it's clear.

2. Allow about 5 minutes for carbon dioxide gas to accumulate in the container.

3. Using a large straw, blow bubbles down into the container. The bubbles will fall until they reach the layer of carbon dioxide. They will hover at the interface between air and carbon dioxide. The bubbles will start to sink as the bubbles cool and the carbon dioxide replaces some of the air within them. Bubbles that come into contact with the dry ice chunk or fall into the cold layer at the bottom of the container will freeze! You can pick them up for closer examination (no gloves needed). The bubbles will thaw and eventually pop as they warm.

4. As the bubbles age, their color bands will change and they will become more transparent. The bubble liquid is light, but it is still affected by gravity and is pulled to the bottom of a bubble. Eventually, the film at the top of a bubble becomes so thin that it will open and the bubble will pop.

**Explanation**

Carbon dioxide (CO2) is heavier than most of the other gases present in air (normal air is mostly nitrogen, N2, and oxygen, O2), so most of the carbon dioxide will settle to the bottom of the aquarium. Bubbles filled with air will float on top of the heavier carbon dioxide. Here's a tutorial for calculating molecular mass, just in case you want to prove this for yourself!

Is it really cold outside? If so, it's the perfect time to go outdoors and blow bubbles! All you need is bubble solution, a bubble wand, and really cold (well-below freezing) temperatures. It helps if you blow the bubbles close to a cold surface, so they don't freeze in the air and break upon landing. You can catch bubbles on mittens/gloves or on snow or ice. A frost pattern forms on the bubble surface. The bubbles will eventually pop, but with a bit of practice you should be able to pick them up and examine them first.

**Part II**

Once you can complete freezing bubbles with cold carbon dioxide gas you can use this gas to make giant fog filled bubbles.

**To the plastic container add 500 mls of water**. This will cause a very vigorous reaction with the dry ice producing a fog of gas composed of water vapor and carbon dioxide gas.

As the fog spills over the sides of the container you can capture it in a large dome shaped bubble.

1. Get a strip of cotton cloth
2. Soak the cloth and a mixture of dish washing detergent and water, squeeze out the excess liquid but not too much.
3. Rub the top edge of the container with the detergent mixture.
4. Stretch out the cloth and drag it across the top of your container.
5. A thin film should spread over the fog, if not moisten the cloth and try again moving slowly but not to slow.
6. The pressure from the sublimation of the dry ice with produce a large dome of gas.
7. Repeat the process to see how big a bubble you can get. You can add a little Karo syrup to the detergent mixture to see if it improves the results.

**Analysis** - Please write your answers on a separate sheet of paper also attach any photos you take to your write-up.

1. Why can’t you blow bubbles with plain water but you can when soap is added to it? What is the structure of a detergent molecule?
2. CO2 is non-polar, why is it so soluble in water?
3. Carbon Dioxide doesn’t melt but is sublimes, what does that mean?

At what temperature does this happen?

1. Is carbon dioxide an organic compound? Explain
2. Why does CO2 stay on the container, compare the molar mass of CO2, O2 and N2
3. Draw the structural formula for a water molecule , carbon dioxide molecule and carbonic acid
4. Are global warming and ozone depletion related topics? Explain