Name: _____ **Date:** _____ **Class:** _____

Compressing Fluids

Learner Outcomes:

- Investigate an compare the compressibility of liquids and gases

Key Terms:

Particle model of matter	Compressible
Pressure	Incompressible

Background Information:

When a force pushes an object, the object is said to be under compression. Objects under compression tend to deform in shape. How a substance responds to compression forces, or pressure, depends upon the properties of the substance. Fluid substances react differently to pressure depending upon the type of fluid.

Research Question: What happens to air as it is compressed? Does water react the same way?

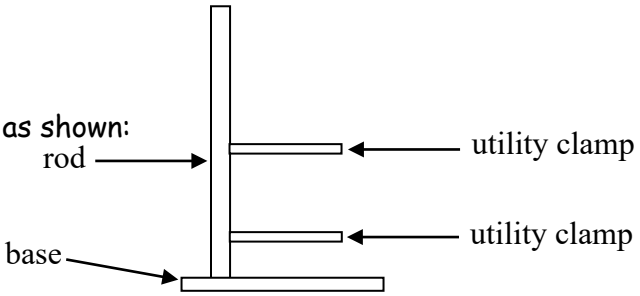
Hypothesis: (Answer the two questions above.)

Materials:

rod and base support stand	Modified syringe with	Masses of different
2 utility clamps	platform and rubber	weights
250 mL beaker	stopper	Water
Funnel		

Procedure:

1. Set up the apparatus as shown:



2. Pull the plunger to the 50mL mark, filling the syringe with air. Place the stopper firmly on the end of the syringe.

3. Place the syringe apparatus with the rubber stopper resting on the base of the support stand. Use the 2 utility clamps to secure the syringe in place. Record the volume of air in the syringe.

4. Place one 50 g mass on the centre of the platform. Measure and record the mass used and volume of air in the syringe.

5. Repeat step 5 by adding another mass each time for a total of 4 measurements.

6. Remove all the masses.

7. Remove the syringe from the clamps and place it in a beaker of water. Fill the syringe with 50mL of water – pull on the plunger, not the platform! Ensure there is no air in the syringe.

8. Reattach the syringe to the support stand and repeat steps 4 & 5.

9. Clean and return all materials.

Observations:

Force exerted by masses:
Mass 1 _____ Mass 2 _____ Mass 3 _____ Mass 4 _____

Force acting on the fluid in the syringe (N)	Volume of Air (mL)	Volume of Water (mL)
0		

Analysis:

1. Which fluid compressed more? Why does this happen?

2. How did your hypothesis compare with your results?

3. How does the addition of more force affect the compression of air **and** water?

4. Draw ONE line graph of the compression of the air and water, using a different color for each. Place volume on the vertical axis and force on the horizontal axis.

Conclusion: Using the particle theory of matter, draw two diagrams illustrating the difference in compressibility between air and water.

Extension:

1. Decompression sickness, also known as "The Bends" is a condition that occurs most commonly in SCUBA divers, making diving dangerous. Research decompression sickness to find out what causes it, how to prevent it, how it is treated, and the role fluid pressure has to play in this disease. Present the results of your research in a public information pamphlet.
2. Investigate what causes your ears get "plugged" while flying or travelling at increasing elevations up a mountain and then to "pop" when you descend. Create a public information pamphlet describing what happens and offer some solutions to prevent potential discomfort.
3. Investigate at least one animal that uses compressibility of fluids to function and explain how.
4. Find out why compression is important in a car's engine and explain what happens and what must be done if the engine loses compression.