

## Air & Water Compression Experiment Kit - Model D Worksheet

### Introduction: Let's collect some air

☆Write down what you have learnt about air

<example>  
Air is invisible, but it can be trapped using a bag.  
The air trapped in the bag feels like it is trying to return  
to its original state when restrained.

- Fill the plastic bag with air and check how it feels when holding it down.

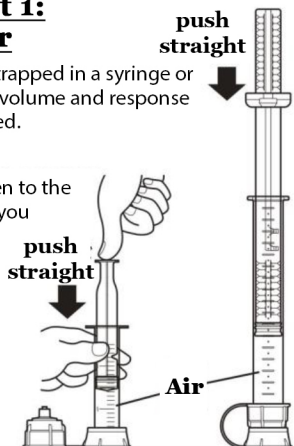


\*Do not get on top of the vinyl bag. It is dangerous if the bag is torn or bag clip is broken.

### Experiment 1: Trapped air

- When the air is trapped in a syringe or tube, check the volume and response when it is pressed.

- What will happen to the push rod when you release your hand?

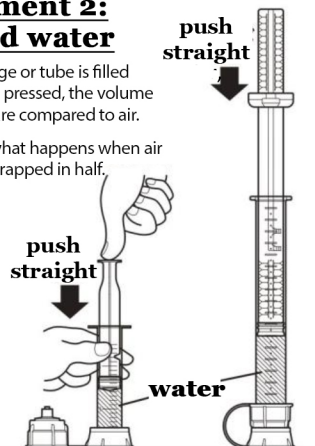


☆ Let's summarize the trapped air in the table below.

pushing force	It gets bigger and bigger.
position of push rod	
volume of air	It gets smaller and smaller.
response to touch	It gets bigger and bigger.
state when push rod is released	As soon as it is released, it returns to its original position.

### Experiment 2: Trapped water

- When a syringe or tube is filled with water and pressed, the volume and response are compared to air.
- Investigate what happens when air and water are trapped in half.

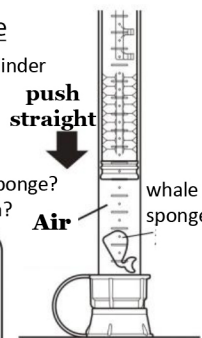


☆ Let's summarize the trapped water in the table below.

pushing force	It gets bigger and bigger.
position of push rod	
volume of water	I don't know.
response to touch	It feels firmer and firmer.
☆When air and water are both entrapped half and half, what happens when you push down?	<example> Only the part of the air is reduced by the push rod, so the air volume is reduced, and the volume of the water is not known.

### Let's try! Shrinking whale

- Put a whale sponge into cylinder and push the compressor.

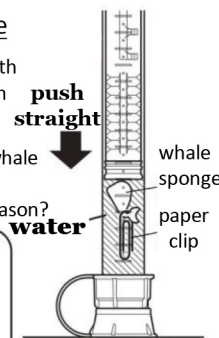


What happened to the whale sponge?  
What do you think is the reason?

<example>  
The more you push, the more it shrinks. The reason is that the air inside the whale sponge also shrinks.

### Let's try! Sinking whale

- Put the whale sponge with paper clip into cylinder with water inside.



☆What happened to the whale sponge and paper clip?  
What do you think is the reason?

<example>  
When you push it, it shrinks. The reason for this is that the air in the whale sponge shrinks, reducing the buoyancy and increasing the weight of the paper clip.

「Trivia」In the world of science, the "Sinking Whale" experiment is called a "Cartesian diver." The cartesian diver is an experiment that uses the pulling force of an object to move (buoyancy) and fall (gravity).

### Let's try! air compressor, water compressor

- Assemble an air compressor as shown in the figure, change the position of the balls in the back, and compare how the ball flies.

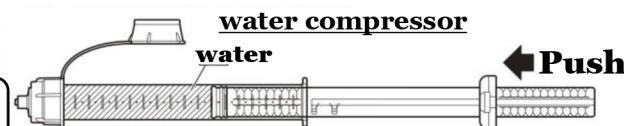
☆What was the difference in how the sponge bullets flew?

<example>When the ball is behind, it flies forward more strongly; when it is in front, it flies weakly.



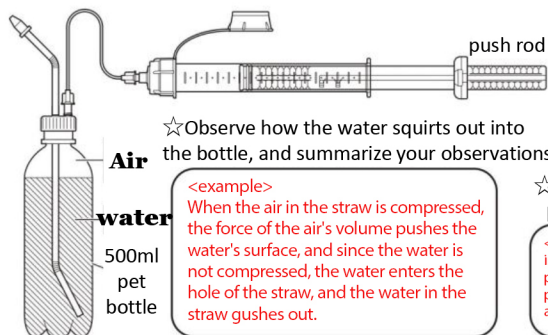
☆ What was the difference in the way the water squirted out compared to the air compressor?

<example>The air compressor takes a long time before the ball shoots out, while the water compressor shoots out water as soon as you push it.



### Let's try! make use of the property of air and water fountain

- Assemble a device like the one shown in the figure, push and pull the push rod, and investigate the mechanism of water fountains.

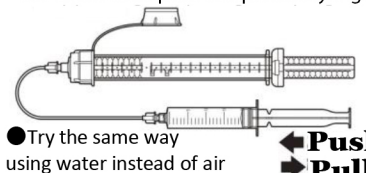


☆Observe how the water squirts out into the bottle, and summarize your observations

<example>  
When the air in the straw is compressed, the force of the air's volume pushes the water's surface, and since the water is not compressed, the water enters the hole of the straw, and the water in the straw gushes out.

### movement of air and water

- Connect the syringe to the water compressor with a tube and push and pull the syringe.



●Try the same way using water instead of air

☆ What happened to the air and water when you pushed or pulled the syringe, respectively?

<example>When the syringe is pushed, the air inside goes into the tube, and the push rod moves. When the syringe is pulled, the air in the tube returns to the syringe, and the push rod returns to its original position. Water is the same as air, but the push and pull force must be more substantial.