 Name: _____

How Squishable?

Key Question: Solids, liquids, and gases are all made of particles. Are these particles *close together? far apart?*

Draw: Draw the boxes below in your science notebook. In each box, **make a drawing** to show how particles might be spaced if you could take greatly magnify them. In your pictures, make each particle about as big as this circle: ○

SOLID	LIQUID	GAS

Discuss: With your group you will draw the same pictures on the **top half of your whiteboard**. If the group does not agree on how to draw any of the pictures, the recorder will draw ALL of the group's ideas inside the appropriate box.

Get this: You need **a syringe,** a small **drinking cup,** and a **cup of BBs.**

IMPORTANT: Every person in your group must push or pull the syringe for himself/herself. It is important that everyone gets to feel the forces and movement of the plunger in every step. You cannot simply let your lab partners tell you how it feels; you need to feel it for yourself every time.

Step 1: **AIR in the Syringe**

a) Open the nozzle and ***let some air into the syringe*** by pulling the plunger back to the **30 mL** mark.

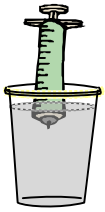
b) Now ***plug the nozzle*** tightly so air cannot escape. There are two ways you can plug it: (1) Plug it tightly with your thumb, or (2) press it down against a large flat eraser on the table.

c) Now, with the nozzle tightly plugged, try ***pushing*** the plunger in as far as you can.

d) Make sure every member of your group gets to push the plunger and feel the forces.

Observations: Write down what you observed and felt when you pushed the plunger. Make sure all members of your group agree on what you observed and felt.

Step 2: **WATER in the Syringe**



a) Open the nozzle and push the plunger all the way to ***push out all of the air***.

b) When the syringe is empty, hold the nozzle downward in a cup of water (see the upper picture), and then pull the plunger back to suck up the water to the **30 mL** mark.

c) Get out all remaining air bubbles. Here is how: Over a sink or tub, hold the syringe vertically with the tip up. Tap it lightly to dislodge any air bubbles, and then slowly push in the plunger until all the air is expelled and a few drops of water squirt out. (See the lower picture.)

d) Now ***plug the nozzle*** tightly so water cannot escape. (Plug it with your thumb, or plug it by pressing it down against a large flat eraser on the table.)

e) With the nozzle tightly plugged, try ***pushing*** the plunger in as far as you can.

f) Make sure every member of your group gets to pull and push the plunger and feel the forces.

Observations: Write down what you observed and felt when you pulled and pushed the plunger. Make sure all members of your group agree on what you observed and felt.

Step 3: **SOLID PELLETS in the Syringe**

For this step, pour the BBs from the paper cup into the syringe. Do this inside your basket so the BBs don't escape.

a) Plug the nozzle tightly so the pellets and the air cannot escape.

b) Now, with the nozzle tightly plugged, try *pushing* the plunger in as far as you can.

c) Make sure every member of your group gets to push the plunger and feel the forces.

Observations: Write down what you observed and felt when you pushed the plunger. Make sure all members of your group agree on what you observed and felt.

Redraw: Based on what you have just done, your group will make a new drawing on **the bottom half of your whiteboard** to show how particles might be spaced if you could take a picture of them and greatly magnify them. In your pictures, make each particle about as big as this circle: ○

When your group is satisfied with your pictures, all group members will draw the revised picture in your science notebook.

Reflection: In your science notebook, answer these questions:

- Where did you get your original model of the spacing of particles in solids, liquids and gases? What were you thinking of or remembering when you drew that first picture?
- Describe how your original model was or was not supported by the evidence you saw today.
- How did you change your model of the spacing of particles in solids, liqiuds and gases?

Apply: **Now apply your new model in these situations:**

1. When you blow air into a balloon, at first it is easy, but then you have to work harder and blow with more force to completely fill up the balloon.
2. When you push down on your brake pedal in your car, it pushes on a plunger in a tube that you call the brake line. Brake fluid in the brake line pushes on the calipers so they close on the brake disk. If you get air in the brake line, your brakes do not work.
3. When you cast anything in metal, you pour molten metal into a mold all the way up to the top of the mold. After the metal cools into a solid, the top has a tiny dip in it.