Unit 1 – Day 1 Activity 2
Thinking about a gas in a syringe.
Vandenbout/LaBrake
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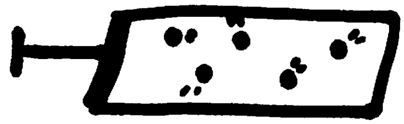
CH301

Name: KEY

UT EID:

In the absence of a syringe, run this as a thought experiment. Pick up a 60 mL plastic syringe (with no needle). Pull the plunger NEARLY out of the back of the syringe.

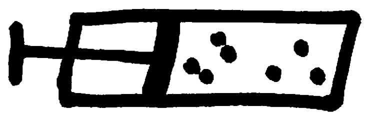
1. Draw a model of the air inside the syringe.



Put your finger over the opening of the syringe, and push the plunger in as far as you can.

2. Can you push it in all the way? NO

3. Draw a model of the air inside the syringe in this **STATE**.



4. Compared to the first drawing, what has changed? $\downarrow V$, $\uparrow P$

5. Compared to the first drawing, what has stayed the same? # molecules, T

6. Now take the plunger out of the syringe and stick a small marshmallow in the syringe. Push the plunger down half way. Now put your finger over the end of the syringe, and push in on the plunger. Note your observations of the marshmallow.

squished

7. Now start with the plunger at the halfway point, put your finger over the end, and pull the plunger toward the back of the syringe, but not all the way out. Note any observations here.

puffed up

8. Summarize here the observed changes in the marshmallow when the plunger is forced in compared to pulled out. Include in your summary a model of what is going with the air inside the syringe and within the marshmallow. (You may use the back of this page, but don't write too much! Short and to the point will be appreciated. Commenting on balanced versus unbalanced forces will impress us☺ Another impressive comment would be explaining the macroscopic observations in terms of what is going on on the molecular level.)

8. Summarize here the observed changes in the marshmallow when the plunger is forced in compared to pulled out. Include in your summary a model of what is going with the air inside the syringe and within the marshmallow. (You may use the back of this page, but don't write too much! Short and to the point will be appreciated. Commenting on balanced versus unbalanced forces will impress us☺ Another impressive comment would be explaining the macroscopic observations in terms of what is going on on the molecular level.)

The marshmallow squished down when the plunger was pushed in while the finger closed the opening at the other end. The marshmallow puffed up when the plunger was pulled out while the finger closed the opening at the other end.

This change in "size" of the marshmallow can be explained by the change in air pressure inside the syringe. Pressure is defined as force/area. As long as the air pressure is balanced inside and outside the marshmallow (there are air pockets in the marshmallow) the size of the marshmallow does not change. The fact that the marshmallow was squished and then puffed up is evidence of unbalanced forces. If you apply a force to an object greater than the force of the object pushing back on you, you will cause the object to move. So true, when the external air pressure was greater that inside the marshmallow, the "walls" of the marshmallow were pushed inward. The opposite occurred when the plunger was pulled out. In that case, the external air pressure decreased, and so the air pressure inside the marshmallow was greater and it forced the walls of the marshmallow outward until the internal (inside the marshmallow) and external (outside the marshmallow) air pressure was the same, or the forces were balanced.

Air pressure is a macroscopic measure of a force of a sample of gas applied over an area. On the microscopic scale, we can explain this as the impulse applied to the walls of the container as the individual air particles collide with the surfaces (walls of syringe, outside marshmallow, inside marshmallow)