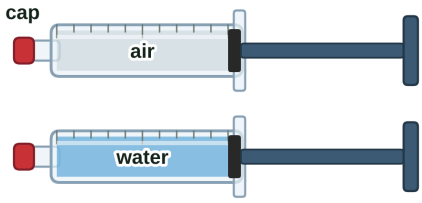
# Predict, observe, explain: squashing and weighing air

Names: Class: Date:

Work with a partner. In each test, predict first, then do the test and write what you saw, then explain it using particles.

## TEST 1 Can you squash air? Can you squash water?

**You need:** Two plastic syringes with no needles, 10 mL or bigger, and a cup of water.



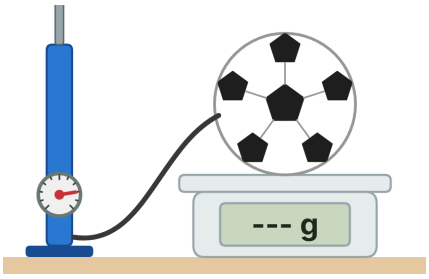

> **Safety.** Use syringes with no needles. Keep the tips pointing down at the table, away from faces. Wipe up spills.

1. Pull the plunger of one syringe out to its top mark, so it is full of air. Fill the other syringe with water, with no bubbles.
2. Put a cap on the tip of each syringe, or hold a finger firmly over it.
3. Push each plunger as hard as you can. Read where it gets to.
4. Let go of each plunger and watch what it does.

| | |
|---|---|
| **Predict** | Which can you squash? Circle one:<br>**the air** **the water** **both** **neither**<br>Because: |
| **Observe** | **Air.** The plunger went from ___ mL to ___ mL. When I let go, it _____<br>**Water.** The plunger went from ___ mL to ___ mL. When I let go, it _____ |
| **Explain** | Why can you squash one and not the other? Use the word particles. |

## TEST 2 Does air have mass?

**You need:** A soccer ball or a basketball, a ball pump and its needle, and kitchen scales that show 1 g.




> **Safety.** Ask an adult to push the pump needle into the ball's valve. Don't pump the ball harder than the pressure printed on it.

1. Ask an adult to put the pump needle into the valve with no pump on it, and let the air out until no more comes out. Weigh the ball.
2. Pump the ball up until it is firm. Weigh it again.

| | |
|---|---|
| **Predict** | When you pump the ball up, the scales will show:<br>**more** **less** **the same**<br>Because: |
| **Observe** | **Soft ball:** _____ g **Pumped-up ball:** _____ g **Difference:** _____ g |
| **Explain** | Why did the mass change, or not change? Use the word particles. |

## PART 3 Draw the particles

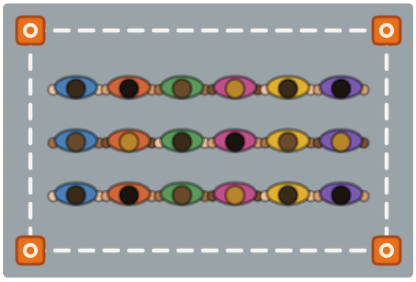
Draw the particles in each box. Show how they are arranged, and add arrows to show how they move. In the gas box, label the space between the particles.

| Solid | Liquid | Gas |
|---|---|---|
| | | |

## PART 4 Act it out

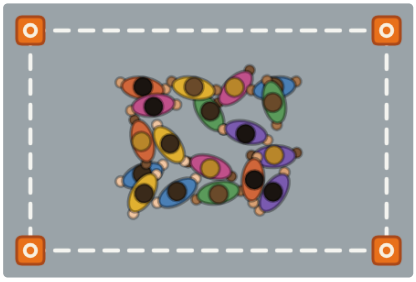
With your class, in a space marked out with cones, try each rule while your teacher calls out solid, liquid or gas.

**Safety.** Walk, don't run. Keep your hands by your sides.



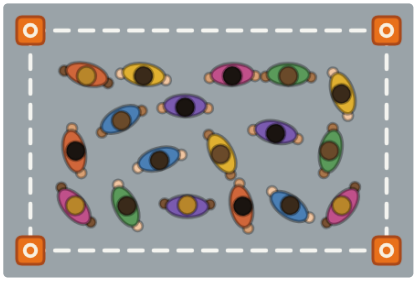
**Solid**

Stand close together in rows and jiggle on the spot.



**Liquid**

Stay touching, but move slowly past each other.



**Gas**

Walk fast in straight lines, far apart. Turn just before you bump into someone.

**Write one thing the role-play gets wrong about real particles.**

**Answers (turn the page round). Test 1:** you can squash the air, and its plunger springs back out when you let go; the water's plunger hardly moves. Air's particles are far apart with empty space between them, so a push moves them closer together. Water's particles already touch. **Test 2:** the pumped-up ball has more mass, because the air pumped in is made of particles and each has a tiny mass. A soccer ball gains about 5 g; your numbers depend on your ball and how hard you pump it. **Draw the particles:** a solid's particles touch, in rows, jiggling on the spot; a liquid's touch but are jumbled and slide past each other; a gas's are far apart, moving fast in all directions, with nothing between them. **Act it out:** the children are far bigger than particles, there is air between the children but nothing between particles, and children choose where to go.