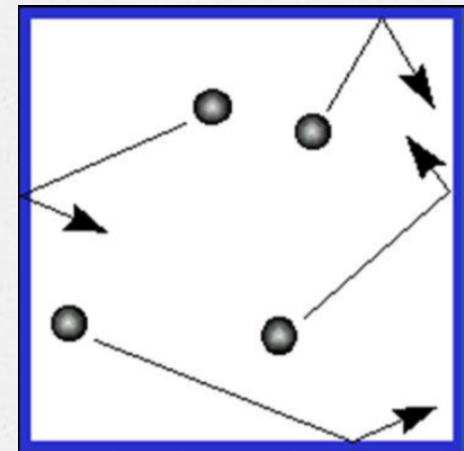




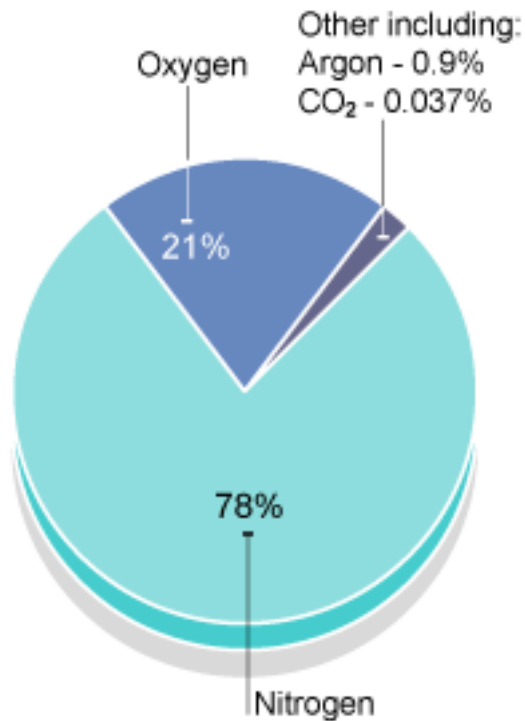
Gases

Particle Arrangement and Behavior

- o Gases are composed of individual particles. (Particles are the smallest piece of any substance.)
- o The particles are not connected to one another, and they move through space freely, traveling in straight lines until they run into something.
- o When gas particles collide with something, like the side of a syringe or another gas particle, they bounce off and keep going in a different direction, but still in straight lines.



Composition of Air



- o Air is the name of a mixture of gases that forms Earth's atmosphere.
- o It is mostly nitrogen particles (N₂).
- o There are also oxygen (O₂) particles, a few argon (Ar) particles, and a few carbon dioxide (CO₂) and water (H₂O) particles.

Size of Gas Particles

- o Gas particles are really, really small. TINY!
- o A cubic centimeter of air-a volume about the size of the little blue cubes-contains 27 million million million particles. That's 27 quintillion particles. The number 27 followed by 18 zeros.



Size of Gas Particles

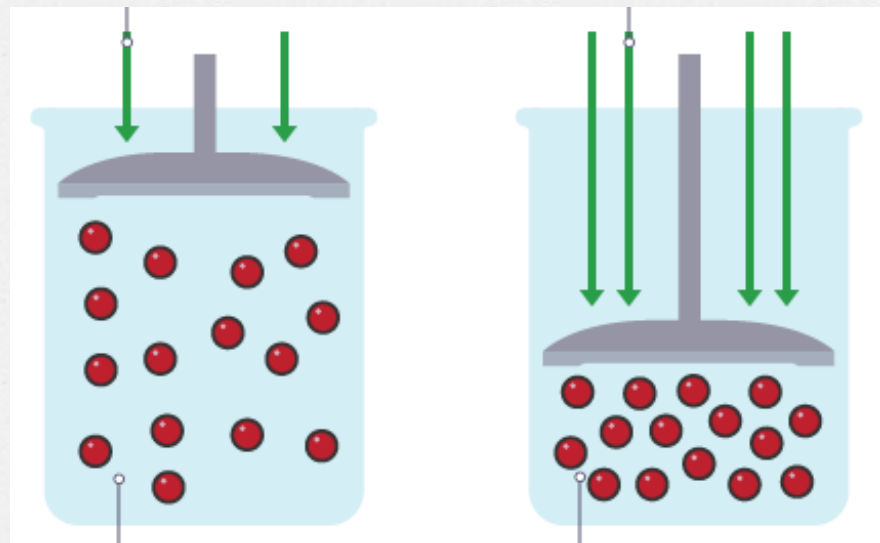
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More About Gas Particle Arrangement and Behavior

- o Particles of gas are fairly far apart.
 - o If the air particles in the room were the size of basketballs, they would be about 2.3m (7.5 ft) apart.
- o Particles of gas are in constant motion and they move pretty fast.
 - o They average about 300 m/s (670 mph).
- o Particles of gas crash into each other and other things pretty often.
 - o They hit things about 10 billion times per second!.

Compressed Air

- o There is empty space between air particles.
- o As a result, they can be forced closer together.
- o When the air particles are pushed closer together by a force, like a syringe plunger, the air becomes compressed.



Limits to Compressed Air

- o You can't push air particles close enough to stay in contact.
- o The fast moving particles bush back with a force when they hit the surface pushing them together.
- o As particles get closer together, they hit the plunger more frequently, creating more force against the surface.
- o This creates a limit to how close you can push the air particles together.

Why the Plunger Moves Back Out of the Syringe Barrel

- When you stop applying force to the syringe plunger, the air particles inside the barrel are hitting each other and the plunger frequently, pushing up on the plunger, causing it to move out of the barrel.
- The plunger continues moving out of the barrel until the force applied by the air particles pushing the plunger up is equal to the force applied by the air particles outside pushing the plunger down.

Open Cell Foam Cubes

- When a gray open cell foam cube is placed in a closed syringe and the plunger is pushed down, the cube maintains its shape and size.
- The particles outside the cube are pushed into a smaller space (the air is compressed).
- The particles inside the open cells in the cube get pushed closer together by the particles pushing on the outside of and through the cube. Because the open cells are connected, the compressed air can pass through the cube, so the cube doesn't get compressed.

Closed Cell Foam Cubes

- When a blue closed cell foam cube is placed in a closed syringe and the plunger is pushed down, the cube gets smaller.
- The particles outside the cube are pushed into a smaller space (the air is compressed).
- The particles inside the closed cells in the cube get pushed closer together by the particles pushing on the outside of the cube. As a result, the cube also gets compressed.