**Topic 2: The Air out There**

 The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a huge layer of air that surrounds the planet Earth. Air is made up of gases. Gases are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. All gas particles are pulled toward the Earth by the force of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This explains why our air does not float into space. The weight of air in our atmosphere presses down on things. This is called atmospheric pressure, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Air is actually quite heavy. The pressure of air is about one kilogram per square centimeter. That means your open hand is actually holding up about \_\_\_ kilograms of air! The reason that we are not crushed from all the air pressure around is that there’s also air inside us and under us that’s pressing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with the same pressure, so it equals out. As you go higher above sea level, the air pressure becomes \_\_\_\_\_\_\_\_\_\_ because the less air there is pressing on you from above. There is more air pressure pressing down at sea level than there is at the top of a mountain. Because of this compression, most of the air in the atmosphere is found near the earth’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and it decreases in concentration as one goes up in altitude.

The particles of gases that make up air have lots of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy. The moving particles collide with each other with enough force to create relatively large \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between particles. Because of this free-flowing space, air, like other gases, can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Extra air can be squeezed into a container so the air pressure inside the container becomes greater. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ air is called compressed air.

**List three items that contain compressed air:**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**In the squares below, draw air particles to show the difference between compressed and free air.**

 **Compressed Air Free Air**

 The gas particles in air are in constant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. It is the unique nature of air in motion or aerodynamics that allows animals and airplanes to fly. Air possesses two qualities that are essential to flight. First, air is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that flows around surfaces. Second, air occupies a set volume of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and generally resists being compressed into a smaller space, creating air resistance.

 Long ago, in the early 1700s, a famous scientist and mathematician, Daniel \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, was investigating what happened to water when it flowed through partly blocked pipes. He experimented with different sizes of pipe and kept track of the differences in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the flowing water. He found that water flowed faster as it went past an obstacle. Whenever water flowed faster, it lost some of its normal pressure. And so, Bernoulli’s Principle states that as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a fluid increases, the pressure exerted by that fluid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Bernoulli’s Principle**

High Air Speed = \_\_\_\_\_\_\_\_\_\_ Air Pressure

Low Air Speed = \_\_\_\_\_\_\_\_\_\_ Air Pressure

Bernoulli’s Principle explains how airplanes fly. An airplane’s wings are shaped like an airfoil. The top surface of the wing is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ while the bottom surface is \_\_\_\_\_\_\_\_\_\_. The air moves faster over the top of the wing than it does the bottom. This causes a difference in air pressure on either side of the wing. The faster moving air on the top of the wing has \_\_\_\_\_\_\_\_\_\_ air pressure, while the slower moving air on the bottom of the wing has \_\_\_\_\_\_\_\_\_\_ air pressure, resulting in lift.

Another factor that affects lift is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or how much a wing is angled into the oncoming air. A wing at a higher angle of attack generates \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lift than a wing at a lower angle of attack. Both the shape and slope of an airfoil will affect the amount of lift.

**Draw a diagram of an airfoil that will generate the most lift. Think about the shape and slope of the airfoil, and make sure to include the movement of air around it, as well as areas of high and low air pressure.**