

Clean Air

What is clean air? When look at the composition of the clean air, it is found that there are 10 gases which make up clean air: In order of highest to lowest concentration they are **Nitrogen, Oxygen, Argon, Carbon dioxide, Neon, Helium, Methane (CH₄), Krypton, Hydrogen, and Xenon.**

Five of them travel alone, so we call them atoms. For example, a helium balloon contains atoms of helium (He), but an oxygen tank contains molecules of oxygen (O₂). When there's two or more atoms are bonded together, they are called molecules.

Nitrogen:

Eight (8) out of 10 atoms (or molecules) of air are made of nitrogen. Nitrogen gas can't be seen but when it is cooled to -320 °F (-195°C) it turns to a liquid, which you can see. Being this cold makes it handy for many things. It is being used to quickly freeze cream and sugar to make ice cream.

Liquid nitrogen is also used to cool certain metals to the point where they become superconductors. Superconductors conduct electricity (electrons) without any resistance. Oxygen reacts with many things including paint. Therefore, expensive

works of art and other rare relics are stored in pure nitrogen. Nitrogen gas is fairly inert and doesn't react (combine) with most other substances, so it is used to protect items and keep oxygen away.

Under high temperatures, like in jet engine or car engine, nitrogen will combine with oxygen to form a class of toxic compounds called nitrogen oxides. The simplest having one nitrogen and one oxygen (NO). Others have two nitrogens and one oxygen (N₂O), one nitrogen and two oxygens (NO₂), and the fourth has two of each (N₂O₂). Their names (in order) are nitrogen oxide, dinitrogen oxide, nitrogen dioxide, and dinitrogen dioxide. Nitrogen dioxide has a brownish appearance, and it could often be seen in the polluted cities.

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Oxygen:

Two (2) out of 10 atoms/ molecules of air are oxygen. Oxygen is produced by plants

and is consumed by animals. Animals need oxygen to "burn" the food they eat in order to get the calories (energy) they need. The way animals use oxygen to burn food is different than a fire, but it produces the same products of carbon dioxide and water. Of all of the gases that make up air, oxygen is the most reactive.

Oxygen is everywhere. As a gas it makes up 21% of the air. Some oxygen gas is dissolved in water, and some oxygen gas is in the pores in the ground. Ninety per cent (90%) of the weight of the water in the rivers is oxygen atoms. Remember water is H₂O. The one oxygen in H₂O weighs 8 times as much as the two hydrogen atoms combined. The trees and grass are made out of carbon, oxygen, hydrogen, and nitrogen, with oxygen accounting for about half of a plant's weight. The rocks, the soil, and the mountains contain metals and silicon that is bound to oxygen, which makes up about 1/2 of their weight. Think about it; one half of a mountain's weight is from oxygen.

Argon:

Argon is 1 out of 100 atoms/ molecules of air. Argon is an inert gas that is used to pressurize light bulbs. Being inert it doesn't react with the tungsten metal, which makes

the filament. The argon gas also helps keep the tungsten metal atoms on the surface of the filament from jumping off the filament. Argon gas is also used in welding to push away the air so that the oxygen in the air won't react (oxidize) the metal being welded.

Carbon dioxide:

Carbon dioxide only makes 3 out of 10,000 atoms/molecules of air; however, it supplies the carbon that plants use to make leaves, trunks, roots, etc. It's hard to believe that the weight of giant redwood trees came from the small amount of carbon dioxide gas in the air.

Neon:

Two (2) out of 100,000 atoms/molecules of air are Neon. It is a clear inert gas; however, high voltage can strip electrons off neon atoms. As the electrons fall back into place, they give off ultraviolet light (black light), which you can't see. However, the glass tubes are coated with different phosphor powders, which glow when ultraviolet light hits them.

Helium:

Five (5) out of 1,000,000 atoms or molecules of air are helium. Helium is the second lightest gas (hydrogen is lightest). It is used to fill toy balloons and weather balloons. It is so inert that there is no danger of igniting nor will it combine with other elements. For this reason it is used in

welding by having helium gas surround an electric arc that is melting a metal. The flow of helium gas keeps the oxygen away from the metal so that the oxygen won't oxidize (rust) the metals being welded.

Methane:

Two (2) out of 1,000,000 atoms/molecules of air are methane molecules. Bacteria is a big source of methane gas and this type of bacteria is found in termites, cattle (cow flatulence), rice paddies, swamps (called swamp or marsh gas), and in the sea bed. In the sea bed, methane can be found trapped in ice (see person holding ice that's on fire). Methane also comes from petroleum fields and is the natural gas you cook with. An embarrassing source of methane is from the eating of beans.

Krypton:

One (1) out of 1,000,000 atoms/molecules of air is krypton gas. You may remember krypton as the name of the planet that Superman came from. The pieces of the planet that fell as meteorites were called kryptonite. The element krypton is used in lamps in a similar way that argon is used (see above). The word krypton comes from "Krypto" meaning hidden. The gas krypton was in a way hidden because it took quite a while for scientists to discover it.

Hydrogen:

One (1) out of 2,000,000 atoms/molecules of air is hydrogen.

Hydrogen is the lightest element, which is why it was the preferred gas to fill blimps and dirigibles. Unfortunately, hydrogen is very flammable, which led to the catastrophic tragedy of Germany's Hindenberg airship.

Xenon:

Eighty seven (87) atoms out of 1,000,000,000 (one billion) atoms/molecules of air are xenon. Like argon and krypton, xenon is used as the gas in lamps. This one is for a car's headlamp. These are probably the ones that look more blue.

One Last Look at Composition of Air:

Imagine the volume of air in a typical classroom that is 30 feet by 30 feet with a 10 foot high ceiling. Also assume, we separated all the gases. Oxygen would cover the room to about 2 feet deep. Nitrogen would fill almost to the ceiling (another 8 feet minus a couple of inches). Argon gas would fill a one inch layer over the whole room. The remaining gases fill the last one inch. Carbon dioxide has about the same volume of one student. Neon is 1.5 gallons. Helium would fill a one liter bottle. Methane gas would fill someone's 1/2 liter bottle. Krypton would fill a 12 oz soda can. Hydrogen would fill about half of a 12 oz soda can. And xenon gas would have the volume of a pencil's eraser.

Source:

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