

## Gasoline Facts

Gasoline, or petrol, is made of a mixture of hydrocarbons, which are molecules composed of carbon and hydrogen atoms. Typically, in standard gasoline, the hydrocarbons consist of fully saturated carbon chains (alkanes) from five to ten carbon atoms long. (*pentane thru decane*)

The exact mixture of hydrocarbons depends on the specific sample of gasoline, for example, what type of oil it was made from, which company refined it, what additives were added, etc.)

Avgas (aviation gasoline) weighs about 6.02 pounds per US Gallon at 15°C (59°F).  
Mogas (automotive gasoline) is mostly the same as Avgas.

The density and the weight of gasoline both increase when the temperature is decreased.  
Gasoline weighs 6.40 pounds per US gallon at -40°C (-40°F).

A popular myth is that gasoline's inverse relation of density and temperature, and the fact that gasoline pumps dispense exact volumes of gasoline, allows the consumer to buy more gasoline for the money (more weight) if the purchase is made at the coldest time of the day, or just before sunrise. This idea is false for consumers because the gasoline is stored in deep underground tanks where temperatures are fairly constant and vary by less than 2°F (1°C) throughout the year in temperate latitudes.

When pilots fuel their planes, there is a good reason why they measure the fuel in pounds rather than in gallons. A thousand pounds of fuel is a thousand pounds of fuel no matter what its temperature, so the pilot can very readily determine whether or not he can make it to his destination or divert to an alternate.

It may seem astonishing that a gallon of gasoline that weighs only about 6.0 pounds could produce approximately 18.5 pounds of carbon dioxide (CO<sub>2</sub>) when burned. Astonishing, perhaps, but true.

A carbon atom has an atomic weight of 12, and each oxygen atom has an atomic weight of 16, thus giving each single molecule of CO<sub>2</sub> a molecular weight of 44 - 12 from the one carbon atom and 32 from the two oxygen atoms.

Most of the weight of the CO<sub>2</sub> doesn't come from the gasoline itself. 73% (32/44) of the weight of the CO<sub>2</sub> comes from the two oxygen atoms. 27% (12/44) of the weight of the CO<sub>2</sub> comes from the one carbon atom.

When gasoline burns, the carbon and hydrogen separate. The hydrogen combines with oxygen to form water (H<sub>2</sub>O), and carbon combines with oxygen to form carbon dioxide (CO<sub>2</sub>).

To calculate the weight of the CO<sub>2</sub> produced from burning a gallon of gasoline, we merely multiply the weight of the carbon in one gallon of gasoline by (44/12) or approximately 3.7.

Since gasoline (averaged to octane, C<sub>8</sub>H<sub>18</sub>) is about 84% carbon and 16% hydrogen by weight, the carbon in a gallon of gasoline weighs 5.0 pounds because 6.0 lbs. x 0.84 = 5.0 lbs.

We then multiply the weight of the carbon (5.0 pounds) by 3.7. The product equals 18.5 pounds of CO<sub>2</sub>!

Every gallon of gasoline burned with complete combustion will produce approximately 18.5 pounds of CO<sub>2</sub>.