



PRIMER ON PETROLEUM HYDROCARBONS

The "crude oil" pumped out of the ground is a black liquid called **petroleum**. This liquid contains **aliphatic hydrocarbons**, or hydrocarbons composed of nothing but hydrogen and carbon. The carbon atoms link together in chains of different lengths.

It turns out that hydrocarbon molecules of different lengths have different properties and behaviors. For example, a chain with just one carbon atom in it (CH_4) is the lightest chain, known as methane. Methane is a gas so light that it floats like [helium](#). As the chains get longer, they get heavier.

The first four chains -- CH_4 (methane), C_2H_6 (ethane), C_3H_8 (propane) and C_4H_{10} (butane) -- are all gases, and they boil at -161, -88, -46 and -1 degrees F, respectively (-107, -67, -43 and -18 degrees C). The chains up through $\text{C}_{18}\text{H}_{32}$ or so are all liquids at room temperature, and the chains above C_{19} are all solids at room temperature.

The different chain lengths have progressively higher boiling points, so they can be separated out by **distillation**. This is what happens in an [oil refinery](#) -- crude oil is heated and the different chains are pulled out by their vaporization temperatures. (See [How Oil Refining Works](#) for details.)

The chains in the C_5 , C_6 and C_7 range are all very light, easily vaporized, clear liquids called **naphthas**. They are used as solvents -- [dry cleaning fluids](#) can be made from these liquids, as well as paint solvents and other quick-drying products.

The chains from C_7H_{16} through $\text{C}_{11}\text{H}_{24}$ are blended together and used for **gasoline**. All of them vaporize at temperatures below the boiling point of water. That's why if you spill gasoline on the ground it evaporates very quickly.

Next is **kerosene**, in the C_{12} to C_{15} range, followed by diesel fuel and heavier fuel oils (like heating oil for houses).

Next come the **lubricating oils**. These oils no longer vaporize in any way at normal temperatures. For example, engine oil can run all day at 250 degrees F (121 degrees C) without vaporizing at all. Oils go from very light (like 3-in-1 oil) through various thicknesses of motor oil through very thick [gear](#) oils and then semi-solid greases. Vaseline falls in there as well.

Chains above the C_{20} range form solids, starting with paraffin wax, then tar and finally asphaltic bitumen, which used to make asphalt roads.

All of these different substances come from crude oil. The only difference is the length of the carbon chains!