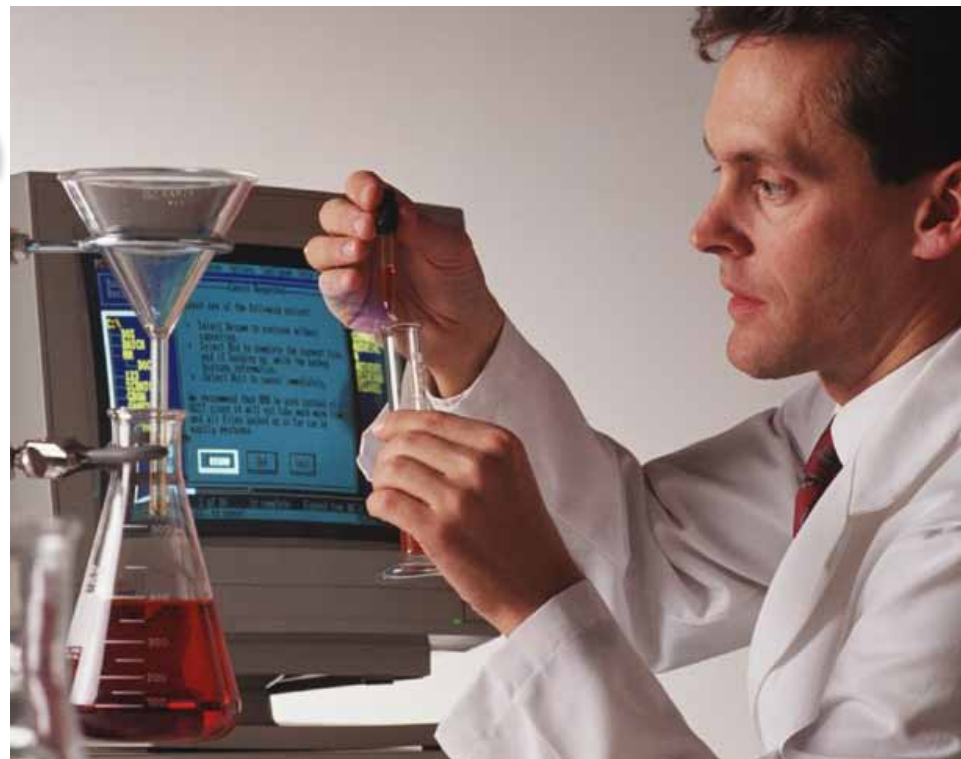


Fuels Chemist



“Fuels such as oil and natural gas are less abundant than they used to be. We need new sources of fuel in the 21st century, and I hope to discover some of these sources.”



- **Education needed:** Master's degree or doctorate in chemistry or related field
- **Salary range:** \$34,260 – \$105,340 annually
- **Related jobs:** Geologist, petroleum engineer, research chemist, science laboratory manager

➤ What I do every day

It's possible to rearrange complex molecules from plants to create fuels for cars and electricity. I work in a laboratory where I mix leaves, corn husks, and other plant materials to make fuel. I'm constantly experimenting with plant materials to find the right combination. The new fuel is suitable only if it can be made inexpensively and creates enough energy to supply our needs. After mixing a solution and testing to see if it works, I estimate the amount of energy the fuel can produce and compare it to the cost of production.

Fuels Chemist

➤ The best part of my job

Being a fuels chemist requires a lot of guesswork and estimation. I enjoy making predictions about how much energy a source will produce and how much money it will take to make the fuel.

➤ The worst part of my job

I get bored working alone in a laboratory every day. I try to schedule regular meetings and site visits so I can break up the routine.

Fuels Chemist

➤ What I need to know and be able to do

Fuels chemists need to know math, chemistry, and physics and be able to analyze the components of solid, liquid, and gas mixtures. They must be able to solve problems and pay attention to details. Fuels chemists need to use computers, microscopes, and electronic precision instruments.

➤ How I prepared to be a fuels chemist

In high school I took many math and chemistry courses. Then I enrolled in college and earned my bachelor's degree in chemistry. Because I needed an advanced degree to work in the field of fuels chemistry, I also earned my master's degree.

➤ How I could have prepared better

Plants that grow fast and need little water will make the cheapest fuel. I'm always reading books to find suitable plants, but if I had a background in botany or horticulture, I'd have less work to do.

► Skill Check 1



As a fuels chemist, you run experiments by burning a variety of fuels to find new forms of energy. To measure the amount of energy produced by heating a fuel, you use the formula $E = msT$, where:

- E = energy, measured in joules
- m = the mass or weight in kilograms of the material being heated
- s = the amount of energy needed to heat 1 kg of the material
- T = the temperature change that is produced

Calculate the energy produced for each of the following test results.

m	s	T	E
5 kilograms	300 joules	1°F	_____ joules
10 kilograms	500 joules	2°F	_____ joules
4 kilograms	200 joules	1°F	_____ joules

► Skill Check 2

Using the formula in Math Skill Check 1, calculate the following:
If a kilogram of copper needs 400 joules of energy to raise its temperature by 1°F, how many kilograms of copper are needed to produce 2,800 joules of energy?

Answer: _____

► Skill Check 1

As a fuels chemist, you know that most of the fuels in use today are called fossil fuels because they come from ancient plants that were turned into fossils thousands of years ago. Fossil fuels contain many different chemical compounds, but the most important ones are hydrocarbons. Hydrocarbons in fossil fuels release their energy when they change into other chemicals. The way to do this is by burning the hydrocarbons to release their energy.

From the list below, choose the letter for another word that describes the process of burning.

- a. Combustion
- b. Radiation
- c. Photosynthesis
- d. Fission

Answer: _____

► Skill Check 2

When chemical reactions produce heat, they are called exothermic reactions. An example is burning wood. When reactions take in heat, they are called endothermic reactions. For example, eating ice cream takes in heat from your mouth, making it feel cool.

Identify whether each of the following reactions is exothermic or endothermic.

Chewing ice _____

Starting a car _____

Turning on a kerosene lamp _____

Lighting a candle _____

Drinking soda _____