Section: BIOFUELS
Typical Proportions of Chemicals Used to Make Biodiesel

The most cursory look at the literature relating to biodiesel reveals the following relationship for production of biodiesel from fats and oils:
100 lbs of oil + 10 lbs of methanol → 100 lbs of biodiesel + 10 lbs of glycerol - This equation is a simplified form of the following transesterficiation reaction:

Triglyceride	+	**methanol**	→	**mixture of fatty esters**	+	**glycerol**
$CH_2-O-\overset{\overset{\displaystyle O}{\|}}{C}-R_1$				$CH_3-O-\overset{\overset{\displaystyle O}{\|}}{C}-R_1$		
$CH_2-O-\overset{\overset{\displaystyle O}{\|}}{C}-R_2$	$+\ 3CH_3OH$		$\xrightarrow[\text{(Catalyst)}]{}$	$CH_3-O-\overset{\overset{\displaystyle O}{\|}}{C}-R_2$	+	CH_2-OH
						$CH-OH$
$CH_2-O-\overset{\overset{\displaystyle O}{\|}}{C}-R_3$				$CH_3-O-\overset{\overset{\displaystyle O}{\|}}{C}-R_3$		CH_2-OH

R_1, R_2, and R_3 in the above equation are long chains of carbons and hydrogen atoms, sometimes called fatty acid chains. There are five types of chains that are common in soybean oil and animal fats shown below (others are present in small amounts).

Palmitic:	R =	$-(CH_2)_{14}-CH_3$	16 carbons, 0 double bonds (16:0)
Stearic:	R =	$-(CH_2)_{16}-CH_3$	18 carbons, 0 double bonds (18:0)
Oleic:	R =	$-(CH_2)_7\ CH{=}CH(CH_2)_7CH_3$	18 carbons, 1 double bonds (18:1)
Linoleic:	R =	$-(CH_2)_7\ CH{=}CH{-}CH_2{-}CH{=}CH(CH_2)_4CH_3$	18 carbons, 2 double bonds (18:2)
Linolenic:	R =	$-(CH_2)_7\ CH{=}CH{-}CH_2{-}CH{=}CH{-}CH_2{-}CH{=}CH{-}CH_2{-}CH_3$	18 carbons, 3 double bonds (18:3)

As indicated, a short-hand designation for these chains is two numbers separated by a colon. The first number designates the number of carbon atoms in the chain and the second number designates the number of double bonds. Note that the number of carbon atoms includes the carbon that is double bonded to the oxygen atom at one end of the fatty acid (called the carboxylic carbon). This is the end that the methanol attaches to when methyl ester is produced.

Source:
J. Van Gerpen, B. Shanks, R. Pruszko, D. Clements, and G. Knothe, *Biodiesel Production Technology*, National Renewable Energy Laboratory subcontractor report NREL/SR-510-36244, chapter 1, page 1, 2004. http://www.nrel.gov/docs/fy04osti/36244.pdf