Saponification Chart for Soap Making

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A saponification chart or saponification table takes out the guesswork of **soap making** and wondering how much lye or caustic soda, also known as sodium hydroxide, you should be adding to each type of fat that you decide to use. Elaine White, the American Soapmaker, is responsible for the following chart.

Knowing the exact amount of caustic soda or sodium hydroxide should be added to the different oils or fats that you may use is important, because if you add too much, it could burn your skin. If you add too little, your soap will contain excess fat which will cause your soap to go rancid.

Use the following saponification saponification chart or table for making soap by multiplying the number of grams of oil or fats by the figure stated and this will give you the exact amount of sodium hydroxide to saponify it. For example, if you are going to use 150 g of sunflower oil or olive oil, multiply 150 x 0.134 which will give you 20.1 grams. You can round up or down your numbers accordingly, and therefore I would only add 20 grams of sodium hydroxide or caustic soda to the sunflower or olive oil to get the correct balance and to saponify your soap.

If you are working in ounces, follow the same process, using the figures on the saponification chart but the amount of sodium hydroxide you will need will be expressed in ounces. Therefore 16 oz of sunflower or olive oil will be multiplied by 0.134 resulting in 2.1 oz of sodium hydroxide. Add 2 oz of caustic soda to your soap.

If you are using more than one type of oil in a single **soap recipe**, do the above step for each oil used on the saponification chart and then total your results

Oil	Sodium Hydroxide (NaOH)	Potassium Hydroxide (KOH)
Apricot Kernel	0.1350	0.1890
Arachis	0.1360	0.1904
Avocado	0.1330	0.1862
Babassu, Brazil nut	0.1750	0.2450
Beef Hoof	0.1410	0.1974
Beeswax, White	0.0690	0.0966
Brazil Nut	0.1750	0.2450
Butterfat, Cow	0.1619	0.2266
Butterfat, Goat	0.1672	0.2340
Canola	0.1240	0.1736
Castor	0.1286	0.1800
Chicken Fat	0.1389	0.1944
Chinese Bean	0.1350	0.1890
Cocoa Butter	0.1370	0.1918
Coconut	0.1900	0.2660
Cod-liver	0.1326	0.1856
Coffee-seed	0.1300	0.1820
Colza	0.1240	0.1736
Corn	0.1360	0.1904
Cottonseed	0.1386	0.1940
Earthnut	0.1360	0.1904
Flaxseed	0.1357	0.1899
Florence, aka Olive	0.1340	0.1876
Gigely Tree	0.1330	0.1862
Goose Fat	0.1369	0.1916
Maize	0.1360	0.1904
Mink	0.1400	0.1960
Mustard	0.1241	0.1737
Neat's foot	0.1359	0.1902
Neem	0.1387	0.1941
Niger-seed	0.1355	0.1897
Nutmeg Butter	0.1160	0.1624
Olium Olivate	0.1340	0.1876
Olive	0.1340	0.1876
Palm Butter	0.1560	0.2184
Palm Kernel	0.1560	0.2184
Palm	0.1410	0.1974
Peanut	0.1360	0.1904
Perilla	0.1369	0.1916
Poppyseed	0.1383	0.1936
Pumpkinseed	0.1331	0.1863
Ramic	0.1240	0.1736
Rape	0.1240	0.1736
Rapeseed	0.1240	0.1736
Rice Bran	0.1280	0.1792
Ricinus	0.1286	0.1800
Safflower	0.1360	0.1904
Sesame Seed	0.1330	0.1862
Shea Butter	0.1280	0.1792
	0.1360	0.1904

ation Chart for Soap Making

			Shortening (veg.)		
Grapeseed	0.1265	0.1771	Soybean	0.1350	0.1890
Hazelnut	0.1356	0.1898	Sunflower Seed	0.1340	0.1876
Hemp Seed	0.1345	0.1883	Sweet Oil	0.1340	0.1876
Java Cotton	0.1370	0.1918	Tallow, bear	0.1390	0.1946
Jojoba	0.0690	0.0966	Tallow, beef	0.1405	0.1967
Kapok	0.1370	0.1918	Tallow, chinese vegetable	0.1345	0.1883
Karite Butter (Shea)	0.1280	0.1792	Tallow, deer	0.1379	0.1930
Katchung	0.1360	0.1904	Tallow, goat	0.1383	0.1936
Kukui Nut	0.1350	0.1890	Tallow, sheep	0.1383	0.1936
Lanolin	0.0741	0.1037	Teal/Teel/Til	0.1330	0.1862
Lard	0.1380	0.1932	Theobroma	0.1370	0.1918
Linseed	0.1357	0.1899	Tung	0.1377	0.1927
Loccu	0.1340	0.1876	Walnut	0.1353	0.1894
Macadamia	0.1390	0.1946	Wheatgerm	0.1310	0.1834

Now that you have the saponification chart under your belt visit our **Mak** **Soap** page for more information on how to make soap at home. You will a find **Soap Recipes** for the three main types of soaps; hand-milled soaps wh you do not have to use raw lye, cold process and hot process soaps.

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Other Resources that you May be Interested In

Certified Lye™

High-Quality Sodium Hydroxide (NaOH) and Potassium Hydroxide (KOH) for Making Soap

Using SAP Values and Lye to Make Soap

Lye Calculator & Recipe Formulator

This Lye Calculator & Recipe Formulator calculates the amount of lye needed to make a specific batch of soap. This lye calculator allows the user to add oils and their exact saponification values. It also provides options for instructions, lye discount, superfat, and water portions.

Making Soap

The following information, Chart of Saponification Values for Making Soap, and Cold Process Soap Recipe have been provided by *Pallas Athene Soap*.

Saponification

Saponification is the chemical process of making soap that involves an exothermic reaction between lye (sodium hydroxide) and a fat (usually oils). What is commonly known as *cold process soap making* yields a glycerin-rich soap, which used to be referred to as *lye soap*. People often think of lye soap as a soap that is unpleasant to use because too much lye was used in the soap formula and lye (sodium hydroxide) remained in the bar of soap to irritate and burn the skin. Soap cannot be made without using lye. When made correctly, no lye will remain in the bar of soap.

Historic "Lye Soap"

Throughout history, soap was made by rendering available animal fats and adding natural lye (leached from ashes) to make soap. Without the scientific data readily available today, the soap makers of yesteryear approximated the amount of lye to add to the fats. If not enough lye was added, with too many fats remaining, the mixture would separate, not be

useable, and the effort and time of preparation would be wasted. If too much lye was added, some extra lye would remain in the soap but the soap could be used. Therefore, the preference was to add extra lye to ensure the soap would be useable. However, the extra lye remaining in the bar of soap made it unpleasant to use because it would often irritate or burn the skin.

Saponification Value

Today, with easy access to the exact composition of a fat and the molecular weight of a fat, it is easy to determine the exact amount of lye needed to completely saponify a measured amount of a specific fat, so there will not be any extra lye in the soap and the soap will not irritate the skin. The number of milligrams of lye (sodium hydroxide) required to completely saponify one gram of a specific fat is referred to as the *saponification value*. Note: Laboratories usually refer to the saponification value of *potassium hydroxide*, not *sodium hydroxide*. *Potassium hydroxide* is commonly used to make liquid soap and *sodium hydroxide* is necessary for making solid bars of soap. The numbers in the chart of saponification values, below, are listed both for lye (sodium hydroxide) and for potassium hydroxide and have been converted from milligrams to be generically applicable to any consistent unit of weight.

Saponification Chart

The chart, below, lists an average of the known saponification values for specific oils. It was compiled in 2006 by contacting dozens of oil distributors and processors to obtain their most recent and most exact saponification values. Then, the different saponification values for each fat were uniformly converted to NaOH values and were averaged. The precise saponification value for a specific fat must be acquired from the distributor because the exact molecular weight of each fat will vary by crop and processing method. For example, two different olive oils will have slightly different saponification values because the two oils may have been processed from different crops, harvested at different times of the year, and processed by different extraction methods. The values in the chart are the most accurate average saponification values on the Internet and may be trusted to accurately saponify the listed fats. To learn the exact, un-averaged saponification value for a specific fat, contact the distributor.

Measure Consistently by Weight, Not by Volume

Never measure ingredients by volume, such as by cups or tablespoons. Always measure ingredients by weight, such as by pounds, ounces, or grams. Be sure to use the same unit of measure for all ingredients. Consistently measure both the lye and the fats in ounces, or measure both the lye and the fats in grams. For example, the first fat listed is almond oil, which has a listed lye saponification value of 0.1367. So, it will require 0.1367 of an *ounce* of lye to saponify one *ounce* of almond oil. Also, 0.1367 of a *gram* of lye is needed to saponify one *gram* of almond oil. Likewise, 0.1367 of a *pound* of lye will saponify one *pound* of almond oil.

Calculating and Measuring Water

Water is needed to dissolve the lye (sodium hydroxide) and for the hydrolysis of the fats. Using too much water may produce soft bars of soap, may demand extra drying time, or may encourage rancidity. Because the water is used to dissolve the lye, the amount of lye will determine the amount of water. To calculate the correct amount of water, first determine the total amount of lye (sodium hydroxide). Divide the amount of lye by 0.3 and then subtract the amount of lye from the result.

1. **(Amount of Fat) × (Saponification Value of the Fat) = (Amount of Lye)**
2. **(Amount of Lye) ÷ 0.3 = (Total Weight of Lye Water Solution)**
3. **(Total Weight of Lye Water Solution) − (Amount of Lye) = (Amount of Water)**

For example, to make just over 2 pounds of olive oil soap, measure 32 ounces of olive oil and 4.33 ounces of lye because 32 ounces of olive oil × 0.1353, which is the saponification value for olive oil, = 4.33 ounces of lye. Next, to calculate the correct amount of water: 4.33 ounces of lye ÷ 0.3 = 14.43, which will be the total weight of the solution (lye and water). Subtract the weight of the lye from the solution (14.43 − 4.33) to get the weight of just the water, which equals 10.10 ounces of water.

Remember, after weighing the lye (sodium hydroxide) and water, always add the lye to the water; never add water to the lye.

Chart of Saponification Values for Making Soap

Saponification Values for Making Soap with Lye (Sodium Hydroxide) or with Caustic Potash (Potassium Hydroxide)

Fat or Oil	Lye (Sodium Hydroxide), NaOH	Caustic Potash (Potassium Hydroxide), KOH
Almond Oil ♥	0.1367	0.1925
Aloe Vera Butter ♥	0.1788	0.2518
Aloe Vera Oil ♥	0.1421	0.2001
Apricot Kernel Oil ♥	0.1378	0.1941
Avocado Butter ♥	0.1339	0.1886
Avocado Oil ♥	0.1337	0.1883
Babassu Nut Oil ♥	0.1749	0.2463
Beeswax **Animal!**	0.0689	0.0970
Borage Oil ♥	0.1339	0.1886
Candelilla Wax ♥	0.0322	0.0454

♥ Indicates a fat not from an animal source.
Animal! Indicates a fat from an animal source.

These saponification values indicate the amount of lye (sodium hydroxide) or the amount of caustic potash (potassium hydroxide) needed to completely saponify the listed fat using consistent units of weight.

Fat or Oil	Lye (Sodium Hydroxide), NaOH	Caustic Potash (Potassium Hydroxide), KOH
Canola Oil ♥	0.1328	0.1870
Canola Oil, High Oleic Acid ♥	0.1330	0.1873
Castor Bean Oil ♥	0.1286	0.1811
Cherry Kernel Oil ♥	0.1389	0.1956
Chicken Fat **Animal!**	0.1356	0.1910
Cocoa Butter ♥	0.1378	0.1941
Coconut Oil, Refined 76° ♥	0.1910	0.2690
Coconut Oil, Hydrogenated 92° ♥	0.1910	0.2690
Coconut Oil, Fractionated/Saturated ♥	0.2321	0.3269
Copha® Vegetable Shortening ♥	0.1910	0.2690
Corn Oil ♥	0.1368	0.1927
Cottonseed Oil ♥	0.1387	0.1954
Crisco® Vegetable Shortening ♥	0.1369	0.1928
Emu Oil **Animal!**	0.1377	0.1939
Evening Primrose Oil ♥	0.1362	0.1918
Flaxseed Oil ♥	0.1358	0.1913
Goat Fat **Animal!**	0.1382	0.1946
Goose Fat **Animal!**	0.1349	0.1900
Grapeseed Oil ♥	0.1321	0.1861
Hazelnut Oil ♥	0.1369	0.1928
Hempseed Oil ♥	0.1359	0.1914
Jojoba Seed Oil ♥	0.0695	0.0979
Jojoba Seed Liquid Wax ♥	0.0695	0.0979
Karite Butter ♥	0.1296	0.1825
Kremelta® Vegetable Shortening ♥	0.1910	0.2690
Kukui Nut Oil ♥	0.1351	0.1903

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These saponification values indicate the amount of lye (sodium hydroxide) or the amount of caustic potash (potassium hydroxide) needed to completely saponify the listed fat using consistent units of weight.

Fat or Oil	Lye (Sodium Hydroxide), NaOH	Caustic Potash (Potassium Hydroxide), KOH
Lanolin **Animal!**	0.0748	0.1054
Lard **Animal!**	0.1399	0.1970
Linseed Oil ♥	0.1358	0.1913
Macadamia Nut Oil ♥	0.1391	0.1959
Milk Fat **Animal!**	0.1599	0.2252
Mink Oil **Animal!**	0.1403	0.1976
Monoï de Tahiti Oil ♥	0.1796	0.2530
Neem Tree Oil ♥	0.1372	0.1932
Olive Oil ♥	0.1353	0.1906
Ostrich Oil **Animal!**	0.1385	0.1951
Palm Kernel Oil ♥	0.1777	0.2503
Palm Oil ♥	0.1420	0.2000
Peach Kernel Oil ♥	0.1361	0.1917
Peanut Oil ♥	0.1367	0.1925
Pumpkin Seed Oil ♥	0.1389	0.1956
Rapeseed Oil ♥	0.1328	0.1870
Rice Bran Oil ♥	0.1284	0.1808
Safflower Oil, High Linoleic Acid ♥	0.1374	0.1935
Safflower Oil, High Oleic Acid ♥	0.1369	0.1928
Sesame Seed Oil ♥	0.1336	0.1882
Shea Butter ♥	0.1296	0.1825
Soybean Oil ♥	0.1359	0.1914
Soybean Oil, 27.5% Hydrogenated ♥	0.1361	0.1917
Stearic Acid, Animal-Source **Animal!**	0.1413	0.1990
Stearic Acid, Vegetable-Source ♥	0.1411	0.1987
Sunflower Seed Oil ♥	0.1358	0.1913
	0.1351	0.1903

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These saponification values indicate the amount of lye (sodium hydroxide) or the amount of caustic potash (potassium hydroxide) needed to completely saponify the listed fat using consistent units of weight.

Fat or Oil	Lye (Sodium Hydroxide), NaOH	Caustic Potash (Potassium Hydroxide), KOH
Sunflower Seed Oil, High Oleic Acid ♥		
Tallow, Beef **Animal!**	0.1419	0.1999
Tallow, Deer **Animal!**	0.1382	0.1946
Tallow, Sheep **Animal!**	0.1384	0.1949
Tamanu Seed Oil ♥	0.1437	0.2024
Tiaré Flower Oil ♥	0.1796	0.2530
Walnut Oil ♥	0.1349	0.1900
Wheat Germ Oil ♥	0.1319	0.1858

♥ Indicates a fat not from an animal source.
Animal! Indicates a fat from an animal source.

These saponification values indicate the amount of lye (sodium hydroxide) or the amount of caustic potash (potassium hydroxide) needed to completely saponify the listed fat using consistent units of weight.

Cold Process Soap Recipe

The *Pallas Athene Soap* company formulated a quick and easy cold process soap recipe that requires exactly 20 ounces of lye (the size of 1 canister from Certified Lye™) and yields a superior bar of natural soap.

- 41 ounces coconut oil (76°)
- 47 ounces olive oil
- 47 ounces palm oil
- 20 ounces lye (exactly 1 canister from Certified Lye™)
- 47 ounces water

This soap recipe makes a fabulous natural soap that is approximately 30% coconut oil, 35% olive oil, and 35% palm oil. The lye is discounted to 96%, so 4% of the oils will freely remain unsaponified in the soap. Because Certified Lye™ guarantees the accuracy of the net weight of lye in each canister, there is no need to measure or excessively handle the lye when using this recipe; it simply requires one canister of lye. The combined weight of the ingredients is 202 ounces, which requires a soap pot with an 8-quart capacity to allow extra room for stirring. This soap recipe makes approximately 40 regular size bars of soap. When making this soap recipe, all proper safety precautions and soap making procedures should be followed.

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