# liquid soaps

Most liquid soaps on the market today are synthetic detergents; but why settle for the synthetics when high quality liquid soap can be made inexpensively at home and you will be rewarded with a rich, gentle soap with all natural ingredients? This section provides instructions and basic recipes to get you started.

Liquid soaps are made with potassium hydroxide diluted with water and can be produced using only one oil. Industrially, the soap is allowed to cook for up to twenty-four hours and requires specialised equipment to heat and continuously stir the soap during the entire cooking process. This is not a problem for the home soap maker as an electric slow cooker will do the trick, with the added advantage of a maximum cooking time of one-and-a-half hours. I will cover both the alcohol and paste methods for choice and convenience.

It is possible to make beautifully clear liquid soaps but if transparency is crucial to the final product it is important to give careful thought to the blending of the oils. If transparency is not an issue, then there is more flexibility to use saturated fats and waxes as they cause cloudiness.

Coconut oil is the oil of choice for liquid soap making and can account for up to 100 per cent of the oil content although the downside of using only coconut oil is that the soap produced tends to be very drying to the skin.

## other key ingredients

**potassium hydroxide**
Potassium hydroxide is the base used for making the liquid soap recipes in this book. It is not easily accessible but it can be obtained from a good soap making supply store, see *resources* page 159.

Please handle this substance with caution as it can cause severe burns on contact. Use gloves and goggles when handling flakes or liquid solution. It should be stored out of the reach of children in a locked cupboard.

**alcohol**
Alcohols are solvents used in liquid soap making to aid clarification of the soap solution. A small amount is sufficient as too much will dampen the foaming action. Both rubbing alcohol (isopropyl alcohol) and ethanol can be used but rubbing alcohol is weaker than ethanol and has a very strong odour that could affect the final fragrance of the soap if it is not allowed to evaporate out of the solution at the end of the cooking process. It is good to have spare alcohol on hand to compensate for some evaporation during the cooking stage of the process.
***Caution: this process is not recommended for use with open flame cookers.***

**borax (sodium borate)**
Borax is regarded as the 'silver bullet' ingredient in liquid soap making. It has many desirable qualities such as being an emulsifier, thickener, pH buffer, preservative, foam booster, neutraliser, and stabiliser. You can source it from a local chemist.

**citric acid**
This is used as a neutraliser to adjust excess alkali. You can source it from a local chemist or wine-making supply shops.

**boric acid**
This is used in a similar way to citric acid. You can source it from a local chemist.

**sugar**
A small quantity of a sugar solution helps to clarify the soap solution. Make the solution by adding 1lb 8oz (680g) of sugar to 1lb (454g) of boiling water and boil the mixture until the sugar dissolves completely. Add the sugar solution to the hot diluted soap at a rate of approximately 5 per cent; too much will dampen the foaming action. For example, a 6lb (2.72kg) batch of soap will need 5oz (142g) of sugar solution.

**glycerin**

This helps to clarify the soap solution but too much of it will dampen the foaming action of the soap. Add 1 to 2oz (30 to 60g) of glycerin to every pound (454g) of diluted soap.

**sulfonated castor oil**
This is the ideal super fatting oil for liquid soaps as it does not compromise the clarity of the solution. It is also known as 'turkey red oil'. Please be aware that ordinary castor oil cannot be used as a substitute for sulfonated castor oil in any of my recipes or when you are formulating your own. Use 2 to 3 teaspoons per 1lb (454g) of diluted soap for added emollience and richness.

## safety

Safety is paramount when making soap due to the use of sodium and potassium hydroxides. It is best to set aside a specific time (two-and-a-half hours) where you can work with full attention. There is no place for small children and inquisitive pets so make arrangements for them prior to making soap.

Always wear safety goggles – the kind you can get from any DIY store are suitable – gloves, and an apron. Wear clothes that you don't mind getting dirty or acquiring a few burn marks. Have a bottle of vinegar close at hand to neutralise any caustic solution on the skin and on work surfaces.

Always work in an organised manner and apply some common sense.

## liquid soap instructions

The methods detailed here are the alcohol and paste methods as they offer choice and convenience. The alcohol (whichever type is used) dissolves the soap completely resulting in a clear amber liquid that is easy to stir and handle.

**step 1 preparations**
- protect your work area with newspaper
- dress appropriately with safety goggles and gloves

**step 2 preheat the slow cooker**

**step 3 warm the fats and oils**
- weigh out the oils and fats, then add them to the slow cooker and allow them to melt. Continue heating until the temperature reaches 71°C (160°F)

**step 4 add the potassium hydroxide (caustic) solution**
- weigh out the water and potassium hydroxide. Add the potassium hydroxide to the water and stir continuously until it dissolves completely
- slowly add this solution to the melted oils in the slow cooker and stir for a few minutes with a spatula
- stir the mixture carefully with a spatula to ensure the caustic solution is evenly distributed

*fig 40: melt the fats and oils in the slow cooker*

*fig 41: add the caustic solution to the heated fats and oils*

*fig 42: stir the mixture*

**step 5 using the alcohol method**

- add the alcohol to the oil and caustic solution mix in the slow cooker and continue blending it with the hand blender until the mixture is homogenous

**step 5 using the paste method**

- use the hand blender and continue until the mixture thickens

*fig 43: mixture at thick trace*

**step 6 cook the mixture using the alcohol method**

- once the mixture becomes homogenous, cover the slow cooker and allow it to cook on medium heat at a gentle, steady boil for two hours. The mixture should remain fluid at all times while it is cooking. If the solution develops foam add a small amount of alcohol to the mixture to compensate for that lost through evaporation.

**step 6 cook the mixture using the paste method**

- When the mixture thickens cover the slow cooker and leave it to cook on a medium heat for two hours until the paste becomes translucent.


*fig 44: the mixture slowly changes during cooking*


*fig 45: the cooked mixture*

**step 7 test for excess fatty acids**

- after two hours continuous cooking the soap mixture should be neutral. Test for the presence of excess fatty acids in the soap mixture by diluting a few grams of soap in a few grams of water and allowing the mixture to cool. If the mixture shows slight cloudiness, continue cooking it until you get a clear test result.

**step 8 dilute the cooked soap broth using the alcohol method**

- reduce the water amount stated in the recipe by the quantity of alcohol used in the solution
- bring the measured water and alcohol to the boil and dissolve the broth in it. The broth will dilute quickly as it continues to boil.

**step 8 dilute the cooked soap paste using the paste method**

- add the required amount of water to the paste in the slow cooker. Cover and leave to cook until the paste has completely dissolved.

*fig 46: add the water*

- The recipes in this book yield approximately 6lb (2.72kg) of soap. For every 1lb (454g) of soap 2lb (907g) of water is required for dilution. Therefore, 6lb (2.72kg) of soap requires 12lb (5.44kg) of water.

**step 9 neutralise the soap**

- neutralise the soap by using a 20 per cent buffer solution made of either boric or citric acid. Mix 2oz (57g) of boric or citric acid to 8oz (227g) of boiling water until it is completely dissolved. If you wish to use borax then you need to use a 33 per cent buffer solution by mixing 3oz (85g) of borax in 6oz (170g) of boiling water.
- each 1lb (454g) of soap requires approximately ¾oz (22g) of a 20 per cent boric or citric acid solution or ¾oz (22 g) of a 33 per cent borax solution. All the recipes in this book yield approximately 6lb (2.72kg) of soap, therefore, 4½oz (128g) of either boric or citric acid of borax solution is required.

**step 10 adding colour and fragrance**

- add colourants and fragrance to the hot soap broth. Use water-based colourants to ensure the clarity of the soap.

**step 11 sequester the soap**

- transfer the soap to buckets or jars; cover the jars and allow the diluted soap to settle for at least two weeks until any cloudiness has settled out of the solution. Use sequestrants such as alcohol, sugar and glycerin either singly or in combination at a ratio of 1:1:1 to cure any cloudiness

**step 12 after the soap has been sequestered it is ready for use.**

- Enjoy!!

*fig 47: the finished product!*

## how to test the pH of the soap paste or broth

### using phenolphthalein

Phenolphthalein has many and various uses. It is available in both powder and liquid forms and can be dissolved in alcohol or water. It is invaluable in identifying and treating pH problems in the soap making process. I had difficulty sourcing it here in the UK as sellers seemed to think I might be using it for terrorist purposes – no, really; I was interrogated to the 3rd degree and didn't manage to buy any. I eventually located it on the internet from the US. Please see *resources* page 159 for more information.

### prepare the test solution

- using a dropper, add approximately four drops of phenolphthalein to 454g (1lb) of alcohol (either isopropyl alcohol or ethanol)
- make up a potassium hydroxide solution (approximately 0.2oz (5g) potassium hydroxide and 3½oz [100g water]) and add a small amount to the alcohol/phenolphthalein mixture until the colour changes to a faint pink
- use approximately 57g (2oz) of this solution to test the soap before dilution of the whole batch

### prepare a small soap sample

- completely dissolve 1oz (28g) of soap paste or broth in 2oz (57g) of hot water
- add the dissolved soap mixture to 2oz (57g) of the phenolphthalein test solution

### assess the acidity, alkalinity or neutrality

- acidity – if the test solution turns clear when the soap solution is added, the soap has excess fatty acids. However, this may not be a problem. You can ascertain whether this is a problem by diluting another small sample of the soap paste or broth in hot water and allow it to cool. If this sample remains clear after cooling then the excess fatty acids are ok and will add emollience to the soap. However, if the test solution turns cloudy then this is a problem – it can be corrected using the instruction given in the troubleshooting section for excess fatty acids (page 123).
- alkalinity – if the test solution turns a darker shade of pink when the soap solution is added, the soap has excess alkali. It is important to note that some pink colour is expected from the test if using any of the recipes in this book as all the soap recipes are formulated with a slight excess of alkali. However, the problem of over alkalinity can be corrected using the instructions given in the troubleshooting section for excess alkali (see page 123).

- neutrality – using a dropper, add approximately 10 drops of a 20 per cent boric or citric acid buffer solution to the test sample; the solution should change to pale pink to clear indicating a neutral solution. See *step 9 neutralise the soap* on page 108 for instructions on how to the make buffer solution.

**using the tongue test**

As mentioned earlier, phenolphthalein is hard to source in the UK but, in its absence, there is still the good old-fashioned tongue test. It is important to note that this test is neither scientific nor precise but it is useful, simple, quick and easy with the slight possibility of getting a sore tongue.

**to assess the acidity, alkalinity or neutrality**

Cool a small amount of the soap paste or broth and lightly touch it with the tip of your tongue.

- acidity – a bland taste without a stinging sensation indicates excess fatty acids and insufficient alkali
- alkalinity – an instant sharp sting indicates excess alkali
- neutrality – a mild stinging sensation is felt after a few seconds

# liquid soap recipes

## mild and creamy hand and body soap

*This soap is high foaming and creamy, suitable for sensitive skin. The palm oil contributes body and it is just wonderful.*

**oil blend**
340g castor oil
992g coconut oil
85g palm oil

**caustic solution**
369g potassium hydroxide
1106g water

**alcohol/isoproyl**
595g alcohol/isopropyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or 128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## pure coconut soap

*This soap is high foaming and suitable for oily skin. It is perfect for use in salt water.*

**oil blend**
1418g coconut oil

**caustic solution**
415g potassium hydroxide
1245g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## sudsy castile baby soap

*This soap is mild, high foaming and creamy, suitable for tender baby skin.*

**oil blend**
227g castor oil
227g coconut oil
964g olive oil

**caustic solution**
312g potassium hydroxide
937g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None or as desired

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## hair and body shampoo

*This soap is high foaming, creamy, moisturising and silky, suitable for all skin types.*

**oil blend**
454g castor
851g coconut oil
43g jojoba oil
71g olive oil

**caustic solution**
358g potassium hydroxide
1074g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## vitamin E body wash

*This soap is high foaming, creamy and moisturising and suitable for all skin types.*

**oil blend**
425g castor
851g coconut oil
28g cocoa butter
85g olive oil
28g wheat germ oil

**caustic solution**
362g potassium hydroxide
1087g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## easy soap

*This soap is high foaming and economical to make and suitable for all skin types.*

**oil blend**
71g castor oil
992g coconut oil
354g sunflower oil

**caustic solution**
378g potassium hydroxide
1134g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## moisturising amber soap

*This is a beautiful high-foaming moisturising soap suitable for all skin types.*

**oil blend**
213g castor
28g cocoa butter
851g coconut oil
113g olive oil
213g rosin (rosin is distilled from the resin of pine trees and sold as amber crystals)

**caustic solution**
363g potassium hydroxide
1089g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## conditioning hair and body shampoo

*This is a beautiful high-foaming conditioning shampoo suitable for all hair types.*

**oil blend**
213g castor
709g coconut oil
354g olive oil
71g jojoba oil
71g rosin (rosin is distilled from the resin of pine trees and sold as amber crystals)

**caustic solution**
349g potassium hydroxide
1047g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or 128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
None

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## avocado and jojoba bodywash

*This is a beautiful, high-foaming, moisturising bodywash.*

**oil blend**
71g avocado
213g castor
851g coconut oil
213g olive oil
71g jojoba

**caustic solution**
357g potassium hydroxide
1072g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or 128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
10g geranium essential oil
5g lemon verbena essential oil
10g ylang ylang essential oil

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## cocoa butter hand and body soap

*This is a lovely, soothing, refreshing, high-foaming hand and body soap for all the family.*

**oil blend**
425g castor oil
765g coconut oil
213g olive oil
142g rosin (rosin is distilled from the resin of pine trees and sold as amber crystals)

**caustic solution**
382g potassium hydroxide
1147g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
5g eucalyptus essential oil
10g lemongrass essential oil
5g peppermint essential oil

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## golden wheatgerm bodywash

*This is a beautiful amber conditioning bodywash to de-stress you.*

**oil blend**
213g castor oil
709g coconut oil
142g olive oil
213g rosin (rosin is distilled from the resin of pine trees and sold as amber crystals)
142g wheatgerm oil

**caustic solution**
350g potassium hydroxide
1051g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
5g allspice essential oil
5g lavender essential oil
5g spruce essential oil

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## gentle pet shampoo

*This is a beautiful high-foaming conditioning shampoo to keep your pets clean and fresh.*

**oil blend**
213g castor oil
851g coconut oil
284g olive oil
71g rosin (rosin is distilled from the resin of pine trees and sold as amber crystals)

**caustic solution**
364g potassium hydroxide
1092g water

**alcohol/isoproyl**
595g alcohol/isoproyl

Add the alcohol to the oil and potassium hydroxide mixture.

**neutralisation solution**
Add 128g of a 20 per cent boric or citric acid solution or
128g of a 33 per cent borax solution.

**additives**
None

**colour**
None

**fragrance**
5g citronella essential oil
5g lemongrass essential oil
5g spearmint essential oil
5g tea tree essential oil

**temperature**
71°C (160°F)

Please follow the instructions given on pages 103 to 109.

## troubleshooting

The majority of the problems experienced with liquid soap making result from inaccurate measurement of ingredients or under cooking the soap solution. It is comforting to know that most of these problems can be corrected.

**curdling**
The soap solution has a curdled appearance like soured milk or tiny pieces of scrambled egg. This tends to result from combining the oils and caustic solution at widely different temperatures. If this is the case, add a few ounces of alcohol to the mixture and stir with a hand blender. The alcohol will help to smooth out the emulsion. This could also be caused by excess alkali, see below for full instructions on correction.

**an oily layer floats on top of the alcohol-alkali solution**
The solution needs to be mixed thoroughly with the hand blender before it is cooked.

**separation of emulsion when cooking in the crock pot**
Before cooking the emulsion it is important to keep stirring it with the hand blender until it thickens.

**the soap stock becomes thick and sticky during cooking**
This results from excess evaporation of alcohol. Add a little bit more alcohol to the soap stock – no more than 2oz (57g).

**the soap stock is cloudy**
This could be caused by any one of a number of factors. It is always best to dissolve a sample 1oz (28g) of the soap broth in 2oz (57g) of hot water and allow it to cool before diluting the entire batch of soap broth to check if it will be cloudy. The cloudiness could be caused by excess fatty acids and this can be remedied by allowing the stock to cook a little longer before continuing with the process. Please see the *cloudiness and its causes* section, page 124.

**excess alkali – how to recognise and correct**
When dissolving 1oz (28g) of the soap broth in 2oz (57g) of water then adding it to a solution of phenolphthalein (see page 110) gives a very deep pink colour, this indicates over-alkalinity. Please note that all the samples you test using my recipes should turn a light pink because the recipes in this book are deliberately over-alkalised to ensure clarity.

If you make up a 20 per cent boric or citric acid solution and add 8 to 12 drops of it to the small amount of diluted solution, the pink colour should be dissipated. If the deep pink colour persists, then continue cooking the broth for a further 30 to 40 minutes then take another sample and test as before. If the deep pink remains then add 2oz (57g) of castor oil to the soap broth and up to 2oz (57g) of alcohol and continue cooking and testing until a faint pink colour is achieved.

**excess fatty acids – how to recognise and correct**
Excess fatty acid manifests itself as cloudiness and film on top of the

soap. The soap broth may need more time to cook so allow a further 30-40 minutes cooking time. After this cooking period dissolve 1oz of broth in 2oz (57g) of water and allow it to cool. Add the diluted soap solution to 1oz (28g) of phenolphthalein test solution. If the faint pink of the test solution disappears then excess fatty acid is present. To rectify this, make up a 1:3 potassium hydroxide water solution by dissolving 2oz (57g) of potassium hydroxide in 6oz (170g) of water. Add 2oz (57g) of this solution to the soap broth and cook for a further 30 minutes. Continue cooking and testing until the test sample indicates a faint pink colour. In the absence of phenolphthalein you need to rely on the appearance of the soap and the changes in the colour to check for excess fatty acids.

**pH problems – how to recognise and correct them**

A test solution of phenolphthalein is the best way of indentifying and correcting pH problems as well as a tongue test.

The phenolphthalein solution gives a clear reading in the presence of excess acid and turns deep pink to red in excess alkali. Please see page 110 for more detail.

To test with your tongue, cool a sample of the soap and touch it with the tip of your tongue. Excess alkali will give a sharp sting immediately and neutral soap will give a mild sting after a few seconds. Please see page 111 for more detail.

**cloudiness and its causes**

Cloudiness is one of the major problems in liquid soap making. There are a number of different causes of it.

***incorrect measurement of ingredients***

The most common problems are excess or too little oils or hydroxide from inaccurate measurement. Always double check the weights of the ingredients.

***hard water***

The minerals in hard water will react with the hydroxides to form insoluble mineral salts. It is best to use distilled or soft water if possible.

***oils or waxes***

Oils that contain high proportions of stearic and palmitic acids cause cloudiness as well as waxes such as jojoba, beeswax and lanolin because they also contain substances that do not fully saponify.

***undercooking the soap broth***

The soap broth should be allowed to cook for 2 hours to fully neutralise the fatty acids.

Ensure that the broth boils thoroughly throughout the cook. Check the crock pot setting is constant throughout the cook.

***excess neutralisers***

It is impossible to create a pH 7 solution similar to commercial soaps as they are really detergents and not true soaps. True soaps have a pH of 9.5 and are very safe to use. The soap solution cannot be buffered below 9.5.

Excess boric or citric acids will throw soap out of solution and break it down further into free fatty acids and hydroxides, causing cloudiness.

The same can be said if excess borax is used; try limiting borax to 2 to 3 per cent dry weight of diluted soap.

Excess neutralisers can be corrected by adding a small amount of sugar solution, glycerin or alcohol and letting the soap sequester for two weeks. Please see *liquid soap instructions, step 11*, page 109.

***essential and fragrance oils***

These should be added to the hot soap for proper dispersal throughout, however some cloudiness will occur. This can be corrected by sequestering the soap for a few days or adding a small amount of sugar solution, glycerin or alcohol singly or in combination at a ratio of 1:1:1. Please see *liquid soap instructions, step 11* page 109.