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PRACTICAL HANDBOOK OF SMALL-SCALE SOAPMAKING

A technical guide for self-reliance and micro-projects

A training tool for communities with limited resources

A COMPLETE GUIDE

FOR BEGINNERS, TRAINERS AND COMMUNITIES



LEARN SIMPLE TECHNIQUES

CREATE LOCAL INCOME

STRENGTHEN COMMUNITIES

RESPECT PEOPLE AND NATURE

BUILD A MORE SUSTAINABLE FUTURE

SHARING KNOWLEDGE
FOR PEOPLE, COMMUNITIES AND A SUSTAINABLE PLANET

APISARA

Practical Handbook of Small-Scale Soapmaking

A technical guide for self-reliance and micro-projects

Learn. Make. Check. Share.

16 chapters and 6 practical recipes

A guide to learning how to make soap, organizing small-scale production and passing on the key skills, using affordable means.

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How to read this handbook

This handbook can be understood through its pictures. Every important rule comes with a pictogram. The shape and color of the pictogram tell you what to do.

The five shapes to know



Green circle: do this. Always follow this step.



Red circle with a line: forbidden. Never do this.



Orange triangle: danger, take care. Check before you continue.



Blue square: information or action to take (write down, weigh, wait, call).



STOP sign: stop. Do not start, or stop immediately.

Safety pictograms



Wear safety glasses.



Wear suitable gloves.



Wear long-sleeved clothing.



Wear closed shoes.



Work in a well-ventilated place.



Keep running water close by.



Pour the caustic soda into the water.



Never pour water onto caustic soda.



No aluminum.



No children or animals near the workshop.



Never put caustic soda in a drinks bottle.



Never put vinegar on the skin.



Do not dump anything into the environment.



Splash in the eyes: rinse with water for at least 15 minutes.



Call emergency services.



Read the safety data sheet (SDS).



Caution: it gets hot.



Wait.



Tick the checklist before you start.



Weigh.

Pictograms for tasks and organization



Read the whole recipe.



Oils and fats.



Measure the temperature.


Mix.


Watch for trace (the mixture thickens).


Pour into the mold.


Label the batch.


Leave to dry (cure).


Check.


Set the batch aside.


pH alone is not enough.


Do not touch fresh soap without gloves; no use on skin without checks.


No glass for hot caustic soda.


Beware of fire.


Clean.


Calculate.


Costs and money.


Selling.


Training, group work.



A question to ask yourself.



Steps in order.



The soap.

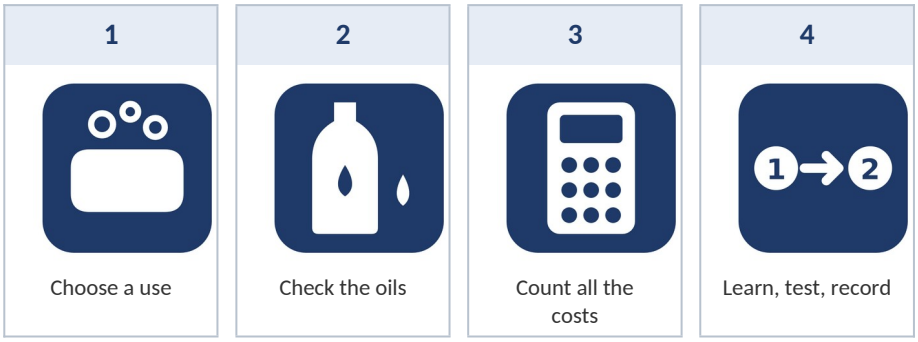
Other signs

In the picture strips, each dangerous action is shown next to its opposite: **✔ green background = do this; ✘ red background = never do this; ! or ? orange background = check.** The numbers show the order of the steps and the arrows lead to the next step.

Each chapter begins with a **"Key points in pictures"** page: look at it before reading, then again afterwards to check that you have understood.

1. Why make soap?

Key points in pictures

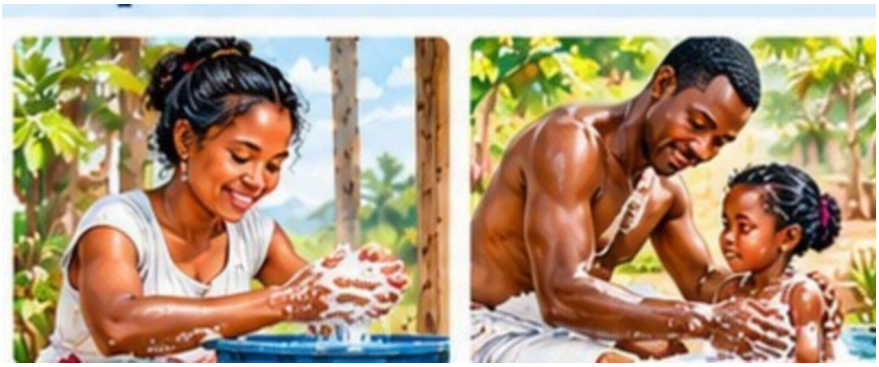


What you will learn

By the end of this chapter, you will be able to explain what soap is useful for, tell the difference between learning activities and production for sale, and identify the main expenses of a small workshop.

1.1 A useful everyday skill

Body soap or household soap: choose the use first.



Soap is used for washing hands and body, and, depending on the formula, for cleaning certain objects and fabrics. Understanding how it is made helps you know the ingredients better, make informed decisions and build a practical skill.

Body soap and household soap do not meet the same needs. Their composition, the checks they require and the rules for selling them may differ. So always state the intended use before building a recipe.

1.2 Learning to choose your raw materials

Check a local oil before using it.

Some oils and fats can be produced locally. Having them available is a possible advantage, but it guarantees neither their quality nor their suitability for a recipe. Before using an oil, check its origin, condition, price and SAP value (used to calculate the amount of caustic soda).

Used cooking oils need special assessment: breakdown, moisture, contaminants and variable composition. They are not automatically suitable for a soap meant for the body.

1.3 Assessing the benefits without promising the impossible

Handmade does not necessarily mean milder or more eco-friendly.

Making soap in small quantities can help you know the ingredients and reduce some packaging.

However, the environmental impact depends on where the materials come from, the energy used, the waste released and how long the product lasts. Handmade soap is not always more eco-friendly or milder than other soap.

1.4 Earning income: an option that needs preparation

Count all the costs, not just the oils.

A soapmaking activity can add to the income of a group, a cooperative or an individual. To judge this, you must calculate the full costs: oils, alkali (caustic soda or potash), water, energy, equipment, packaging, losses, checks and working time. You also need to know what buyers need and what local rules apply.

Start by learning, testing, recording results and making your production more consistent. A recipe that worked only once is not enough to guarantee production for sale.



Going further — Small projects and income

A cooperative makes 40 soaps, but only 36 meet the criteria for release. If these 36 soaps sell for 1 unit each and the expenses already counted add up to 24 units, the provisional difference is 12 units. This result becomes final only once all costs and obligations have been taken into account (see Chapter 13).

Activity: record the real prices of locally available raw materials, working time, losses and testing costs; discuss whether the project is feasible without assuming that every batch will be sellable.

1.5 Becoming self-reliant and passing on skills

Understand, recalculate, record, then pass it on.

Self-reliance means understanding why you choose a raw material, being able to recalculate a formula, spotting a mistake and documenting your batches.

A person who trains other adults must also be able to explain the risks and the limits of their own knowledge.

Exercise — My project in five questions

On a sheet of paper, answer the following five questions:

1. Which soap do you want to learn to make?
2. For what use?
3. Which oils are available locally?
4. What safe equipment do you have?
5. How will you check quality before thinking about selling?

Check your learning

1. Can a local oil be used without checking it?
2. Is the price of the oils enough to calculate the cost of a soap?
3. Does a successful first batch automatically allow you to sell?

Answers

Check your learning. 1. No: its identity, condition and quality must be checked. 2. No: you must count all expenses (energy, packaging, losses, checks, labor…). 3. No: selling requires an approved formula, checks and compliance with local rules.

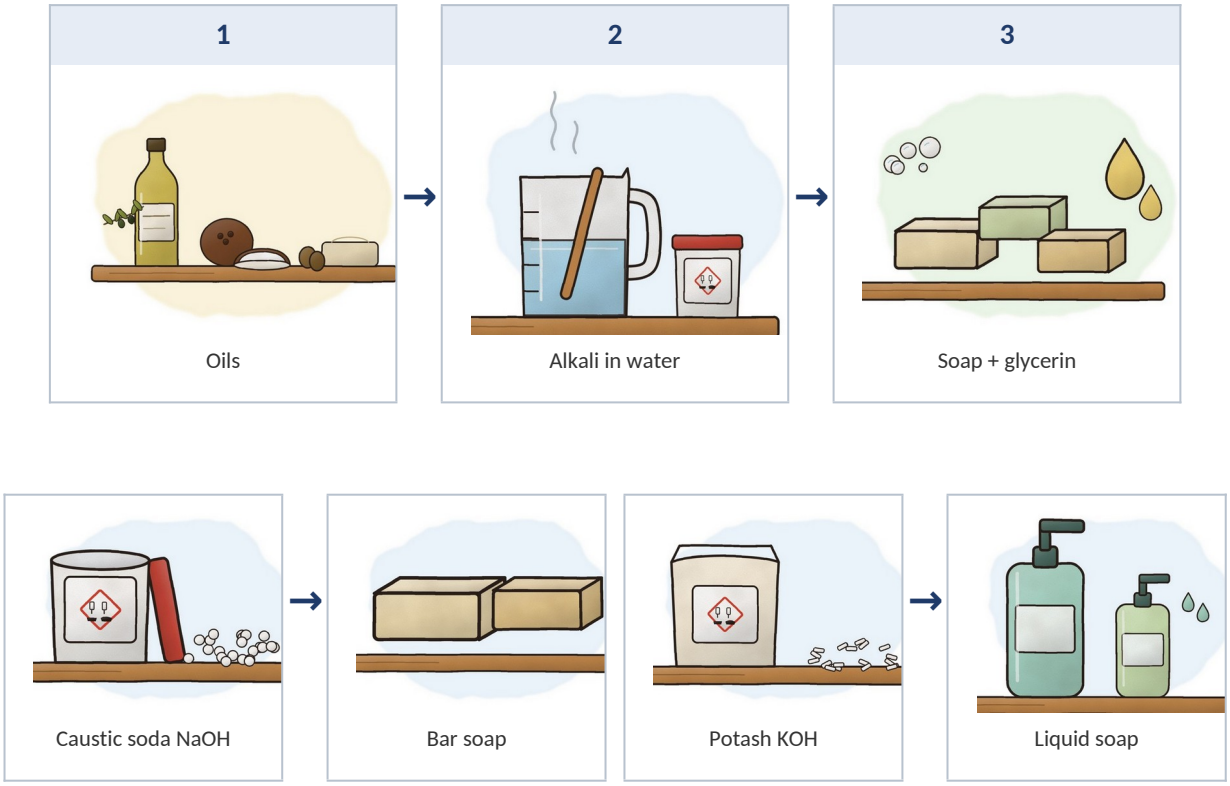
Putting it into practice

To start, choose just one use for your soap and a simple first goal. Once you understand the steps, you can improve your method and share your experience with others.

The end-of-chapter exercises help you check your understanding before moving on to practice.

2. Understanding soap

Key points in pictures



What you will learn

By the end of this chapter, you will be able to explain what soap is, describe saponification in simple words, tell NaOH and KOH apart, and understand why different oils give different properties.

2.1 What is soap?

Oil + alkali = soap + glycerin.

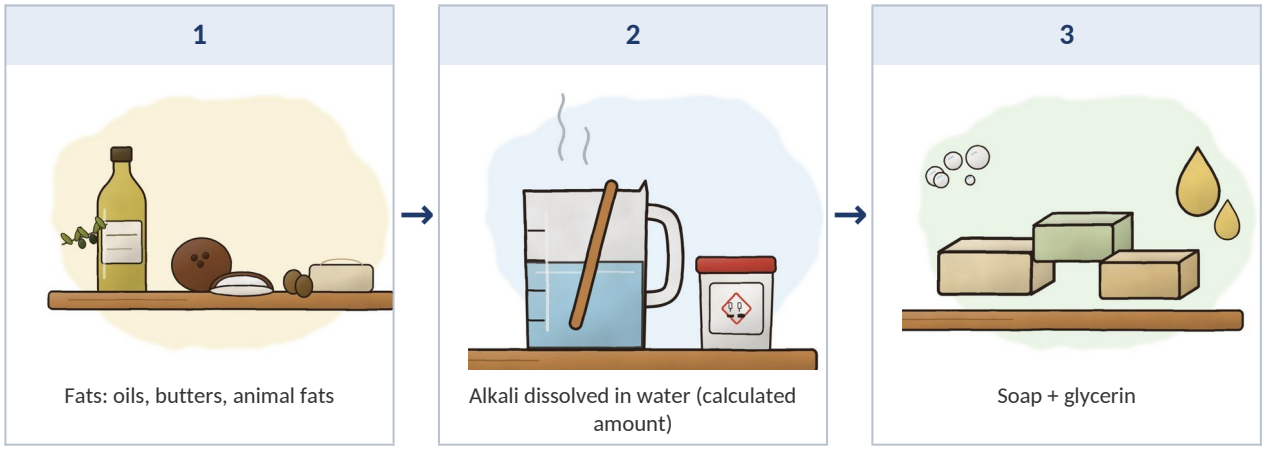
Soap is mainly made of fatty acid salts. These form when oils or fats react with an alkali. These molecules help water carry away dirt.

Saponification also produces glycerol, known as glycerin. Depending on the method used, this glycerin can stay in the product. This does not mean that all handmade soaps have the same properties for the skin.

2.2 How does saponification happen?

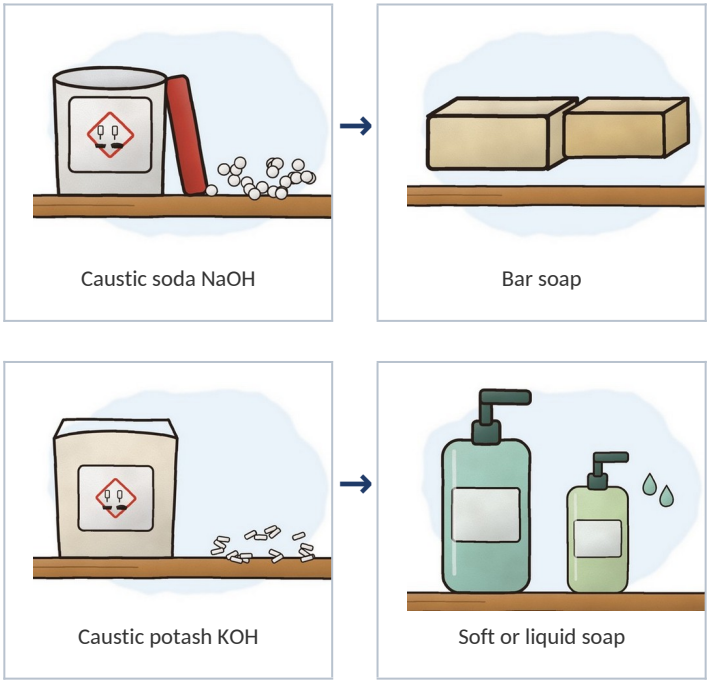
Caustic soda NaOH and potash KOH: never the same amount.

To make soap, fats are combined with an amount of alkali calculated for the chosen formula. The chemical reaction turns part of the fats into soap and also produces glycerin.



The alkali used depends on the type of soap:

- caustic soda (NaOH) is generally used to make bar soaps;
- potash (KOH) is often used to make soft or liquid soaps.



Caution: NaOH and KOH are not used in the same amounts. You cannot replace one with the other without redoing the calculations. You must also take into account the purity shown on the product.

Going further

Oils and butters contain molecules called triglycerides. With caustic soda or potash, they react to form the fatty acid salts that make up soap, along with glycerol (glycerin).

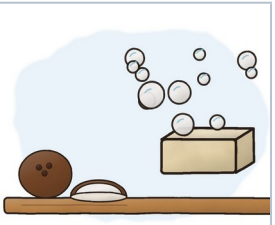
2.3 Why do oils give different soaps?

Each oil gives a different soap.

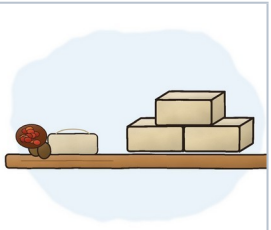
Oils are not all made up in the same way. Each oil contains its own mix of fatty acids. This mix affects hardness, solubility, lather, how the soap feels in use and how easily it oxidizes. That is why a recipe often combines several oils.

The trends in the table below are only a guide: the result always depends on the full formula and the process.

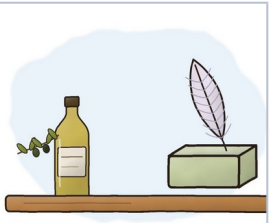
Fatty acid family	Example oil	Main effect on soap
Lauric and myristic	Coconut, copra	Lather and cleansing power; in high amounts, a harsher soap
Palmitic and stearic	Palm, shea	Hardness and long-lasting bar
Oleic	Olive	Mildness and softness
Linoleic and linolenic	Sunflower	In high amounts, prone to oxidation



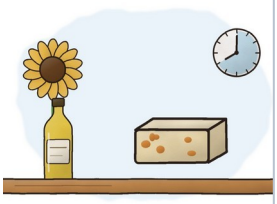
Lauric, myristic (e.g. coconut): lather, cleansing power



Palmitic, stearic (e.g. palm, shea): hardness, long-lasting



Oleic (e.g. olive): mildness, softness



Linoleic, linolenic (e.g. sunflower): may oxidize

You will explore these differences with practical examples in Chapter 5, on raw materials.

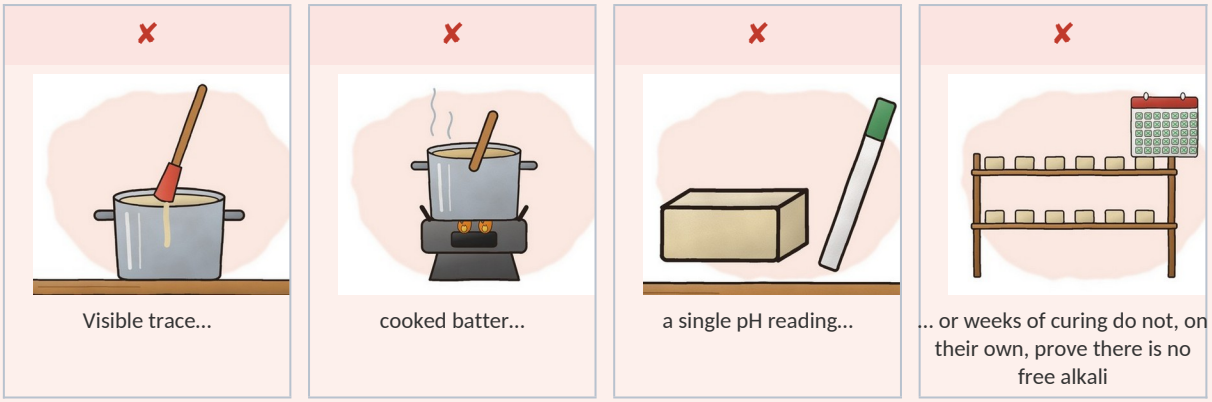
2.4 Understanding the basic terms

Trace, curing or pH do not prove that a soap is safe.

- **Saponification value (SAP)**: the theoretical amount of alkali needed to saponify a given mass of fat.
- **Lye discount** (also called “calculated superfat”): a deliberate reduction of the amount of alkali compared with the theoretical amount.

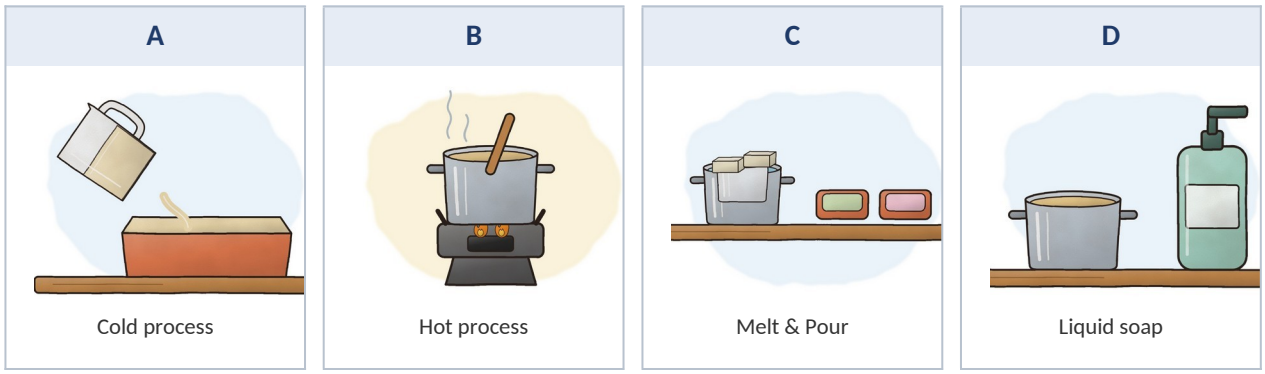
- **Trace**: visible thickening of the soap batter during mixing.
- **Cure**: the period during which a bar soap dries and matures after it is made.

Caution: visible trace, cooked soap batter, a single pH reading or several weeks of curing do not, on their own, prove that there is no free alkali. A correct formula and proper checks are still needed.



2.5 Four methods not to confuse

Four different methods: do not mix them up.



A. Cold process saponification

The oils and the alkaline solution are mixed, then the batter is poured into a mold, without deliberate heating. The soap must then go through the proper resting, curing and checking stages.

B. Hot process saponification

The soap batter is heated in a controlled way during making. Heating requires supervision and extra precautions.

C. Melt & Pour

A ready-made soap base is melted, then customized and molded. This is not making soap from oils and caustic soda.

D. Liquid soap

It is often made with potash (KOH). Its formula, dilution and checks, especially microbiological checks, are specific.

These four methods are not interchangeable.

Exercise — Understanding without handling

Explain to someone else why 500 g of olive oil and 500 g of coconut oil do not necessarily need the same mass of caustic soda. Then explain why curing does not replace calculating the recipe.

Check your learning

1. Can NaOH be replaced by the same mass of KOH?
2. Can glycerin form during saponification?
3. Does trace prove that a soap is safe?

Key points

Soap is the result of a chemical reaction; the choice of oils changes the result; NaOH and KOH are not interchangeable.

Answers

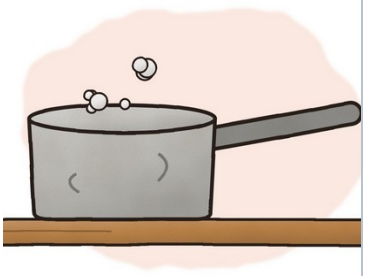
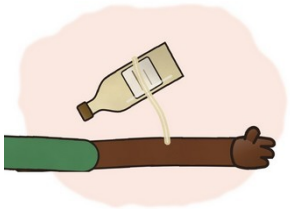
Exercise. Each oil has its own SAP value: 500 g of olive oil needs about 67 g of pure NaOH, 500 g of coconut oil about 91.5 g. Curing dries the soap; it does not correct a wrongly calculated amount of caustic soda.

Check your learning. 1. No: the calculation must be redone. 2. Yes. 3. No.

3. Working safely

Key points in pictures

1	2	3
		
Protect yourself	Ventilate, water nearby	Caustic soda into water

✘	✔	✘
		
No aluminum	Eyes: rinse 15 min	No vinegar

Soapmaking is accessible manual work, as long as you prepare your space and equipment properly. Caustic soda and caustic potash are corrosive: they can cause serious burns. This chapter presents the essential safety steps before moving on to recipes.

What you will learn

By the end of this chapter, you will be able to set up a safe workstation, choose your protective equipment, prepare an alkaline solution in the right order, store alkalis and respond correctly in case of an accident.

3.1 Why do you need to be careful?



Caustic soda burns skin and eyes.

Caustic soda (NaOH) and caustic potash (KOH) are corrosive substances. A splash can cause serious burns. Dust and spray can also irritate or damage the airways. Fresh soap batter may still contain corrosive alkali.

The danger does not go away because the quantity is small or because the person has made soap before. Every batch needs the same attention.



Work in a well-ventilated place, with running water close by.



No children, no animals, no food near the workshop.

Set up on a stable table in a well-lit, ventilated place. Keep children, animals, food and drinks away. Keep running water immediately available for rinsing in case of a splash. If these conditions are not met, postpone the session.



Safe workstation: stable table, open window, rinsing water within reach, safety data sheet and phone numbers on display, children and animals kept away.

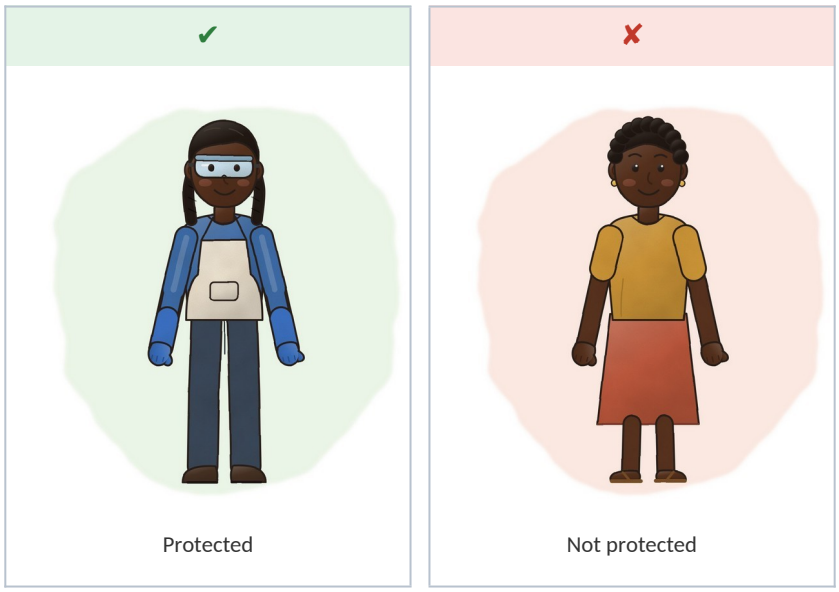
3.2 Protect yourself before opening the container



Before opening the caustic soda: goggles, gloves, long sleeves, closed shoes.

Protection	Why?
Wraparound goggles suitable for chemicals	Reduce the risk of splashes in the eyes.
Chemical-resistant gloves suitable for NaOH/KOH	Protect the hands; check the material and the recommended contact time.
Covering clothes, apron, closed shoes	Limit exposure of the skin and feet.
Proper ventilation and lung protection	Avoid breathing in fumes as much as possible; an ordinary mask does not replace ventilation or proper respiratory protection.

Tie back your hair, remove jewelry that gets in the way and inspect your protective equipment before each session. Damaged equipment must be replaced.





3.3 Setting up a safe area

Before you start: locate the safety data sheet and the emergency number.

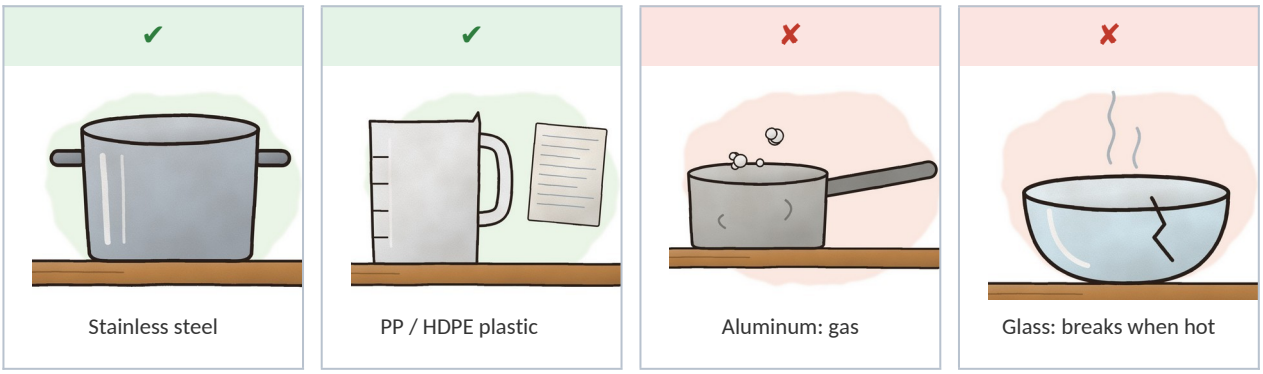
Choose a stable, clear, well-lit surface that can withstand splashes, in a properly ventilated space. Make sure there is immediate access to running water for emergency rinsing. Keep children, animals and untrained people away. Move food, drinks and kitchen utensils out of the way.

Before the session, locate the safety data sheet (SDS), the phone and the emergency numbers. A trainer must never let a beginner handle an alkaline solution alone.

Only use containers that are clean, stable and compatible with the product and the heat it gives off. Some suitable plastics and some stainless steels work, but their compatibility must be checked. Avoid glass when preparing a hot or concentrated alkaline solution: it can break.



NEVER USE ALUMINUM. Caustic soda attacks this metal and releases a gas that can catch fire.

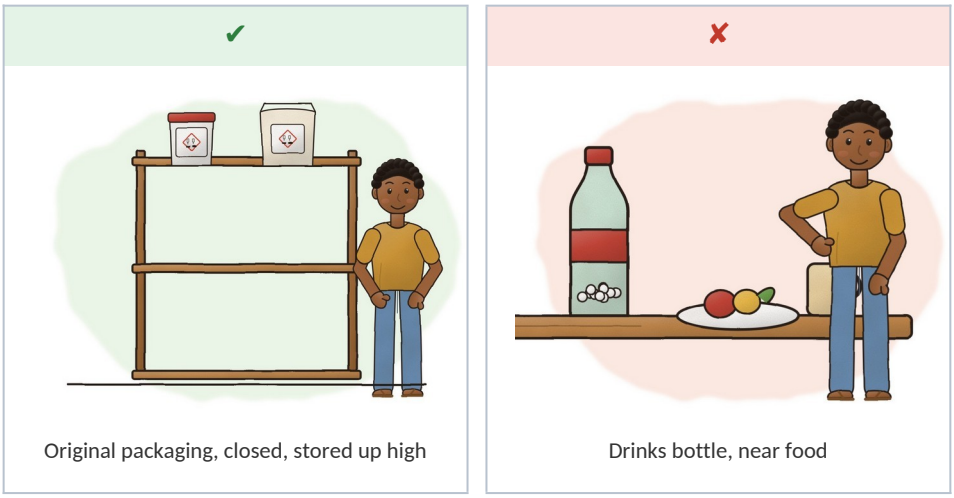


3.4 Storing alkalis



Keep caustic soda in its original packaging. Never in a drinks bottle.

Keep caustic soda and potash in their original packaging, closed, labeled, dry and out of reach of children and animals. Never transfer them into a drinks bottle. Do not store them near food and do not mix them with other products.



3.5 Preparing an alkaline solution: the rule to remember



ALWAYS add caustic soda to water.

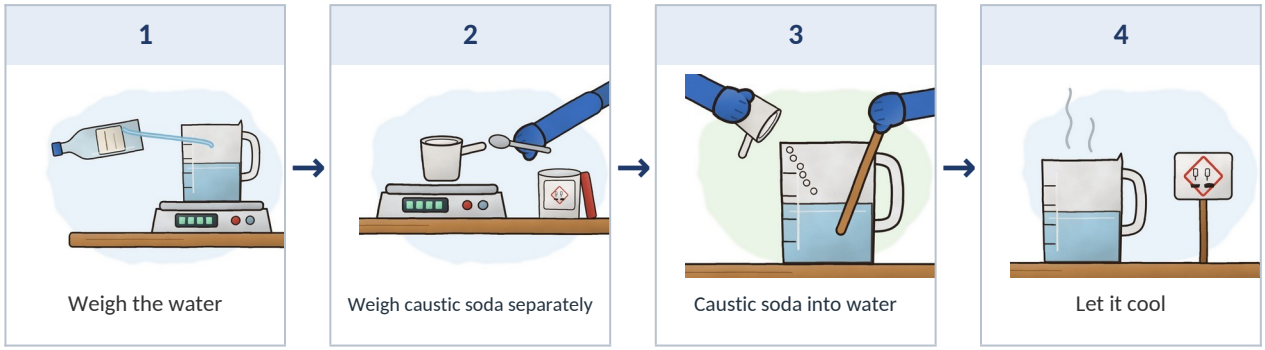


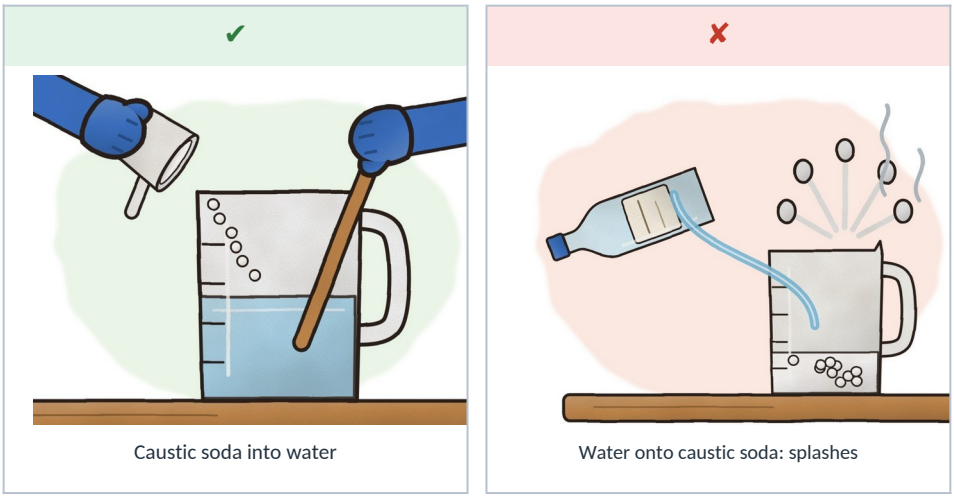
NEVER pour water onto caustic soda.



The mixture gets very hot. Let it cool.

Learn this rule before handling anything: pour the caustic soda or potash gradually into the water, never the water onto the caustic soda or potash. The mixture heats up strongly. Use a suitable, stable container (see 3.3), avoid splashes and let it cool in a place protected from accidental contact, with proper protection and ventilation.





3.6 What to do in case of an accident?



Eyes: rinse at once under running water for at least 15 minutes.



Skin: rinse at once under running water for at least 15 minutes.

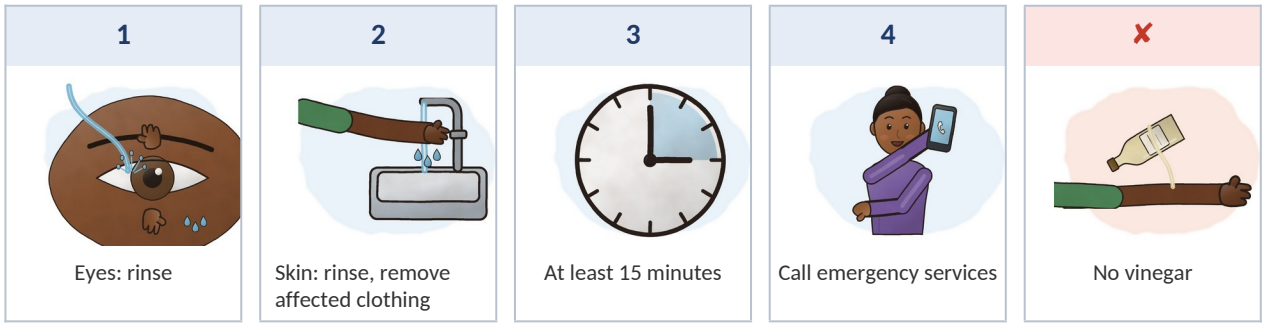


Call emergency services.



Never use vinegar.

Before you start work, find out where the nearest health center or emergency service is.



- **On the skin:** immediately start rinsing with plenty of running water, continuously, for at least 15 minutes. Carefully remove contaminated clothing without delaying the rinsing. Seek medical advice after any contact with a corrosive substance.
- **In the eyes:** immediately rinse continuously with running water, keeping the eyelids open if possible, for at least 15 minutes. Have someone call emergency services: urgent medical care is needed. Remove contact lenses only if this is easy.
- **Inhalation:** leave the area to breathe fresh air and seek medical help if symptoms appear.
- **Swallowing:** do not make the person vomit; immediately call a poison center or emergency services and follow their instructions.

Never neutralize a burn with vinegar or any other acid. In case of an accident, the instructions of the emergency services and the SDS come first.

3.7 Spills and the environment



Never dump caustic soda into the environment or a river.

Move people away, do not touch the product without protection, and follow a procedure suited to the amount, the concentration and the SDS. Do not dump concentrated caustic solution into the environment, the soil or waterways. Waste disposal also depends on local rules.



3.8 Checks before making soap



Tick each line. If even one thing is missing, do not start.

Start by setting up the workstation without opening the caustic soda. Lay out the empty containers, check your protective equipment and go through the order of steps in your head. If you do not understand an instruction or do not have the necessary protection, do not handle any caustic product. You can first practice weighing with water and non-hazardous materials, or try molding with a ready-made Melt & Pour soap base.

- ☐  I know the risks and I have access to the SDS.
- ☐  I am wearing suitable, undamaged and complete protection.
- ☐  The workshop is stable, clear and ventilated; running water is within reach.
- ☐  Children, animals and untrained people are kept away.
- ☐  The containers are compatible; no aluminum.
- ☐  The formula, ingredients and weights have been checked.
- ☐  I know the emergency procedure and the number to call.
- ☐  Cleaning equipment and waste containers are ready.



Even one box left empty? STOP: do not start. Ticking the list does not remove all risks.

Exercise — Understand and decide

A learner suggests preparing the caustic soda in an aluminum saucepan, next to a sink, without safety goggles. Look at the scene below, identify at least three problems and suggest a decision.



Look at the scene: what mistakes can you see?

Check your learning

1. In which order should caustic soda and water be mixed?
2. Why is aluminum forbidden?
3. What should you do at once if caustic soda gets in the eyes?
4. Why does a ticked list alone not guarantee safety?

Key points

Protection, caustic soda into water, never aluminum.

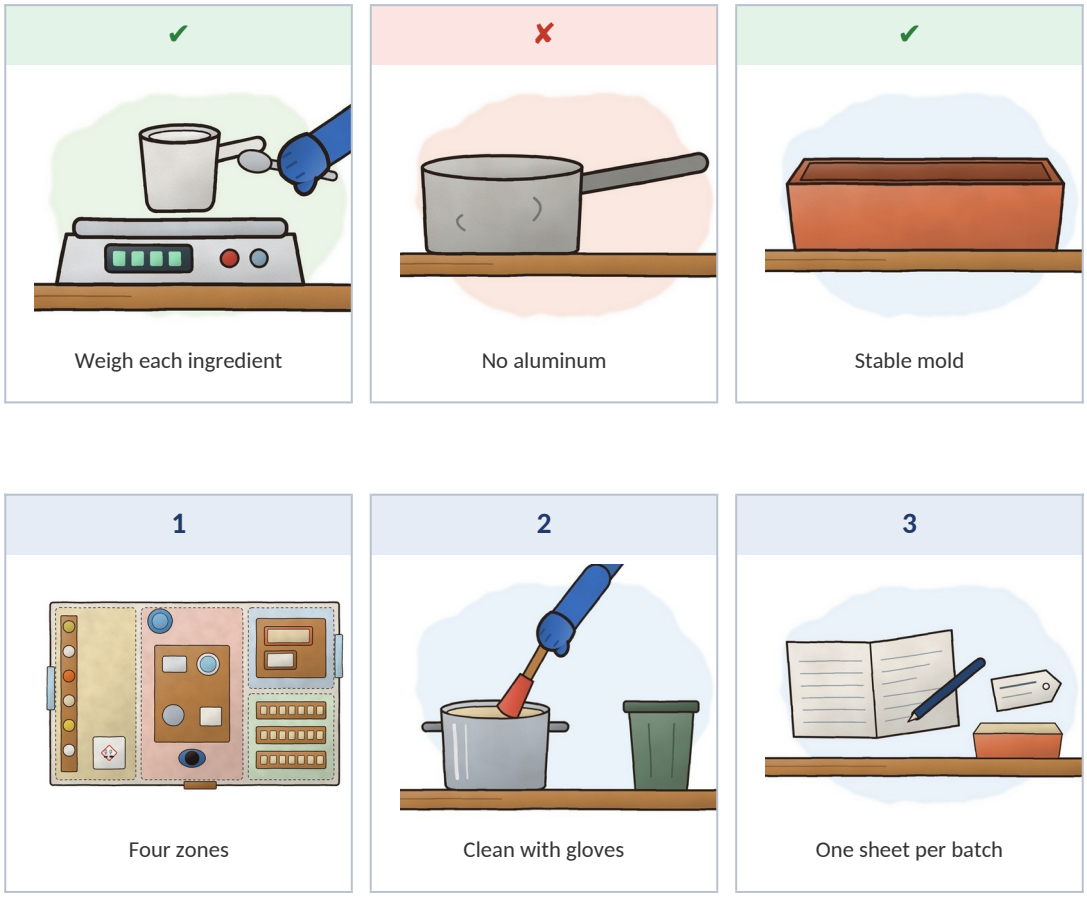
Answers

Exercise. Aluminum is forbidden; goggles are essential; the location must be assessed (stability, ventilation, access to water, no untrained people). Decision: stop the preparation and fix the conditions before handling anything.

Check your learning. 1. Alkali into water, never the other way round. 2. It reacts dangerously with alkali and releases hydrogen. 3. Rinse immediately under running water for at least 15 minutes and call emergency services. 4. The risk also depends on the people, the product, the process and the real conditions.

4. Preparing your equipment and workshop

Key points in pictures



A small workshop can be simple. You do not need expensive machines. However, each tool must be suited to its purpose and kept only for soapmaking.

What you will learn

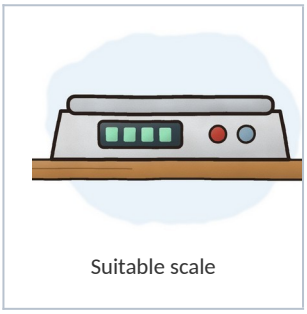
By the end of this chapter, you will be able to recognize the equipment you need, choose compatible materials, set up a simple workshop, prepare a safe mold, measure ingredients correctly and clean equipment without putting people at risk.

4.1 The essentials

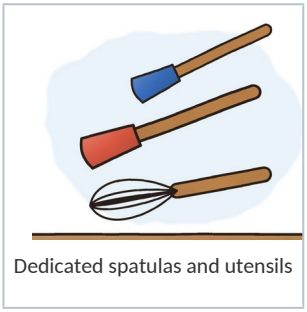


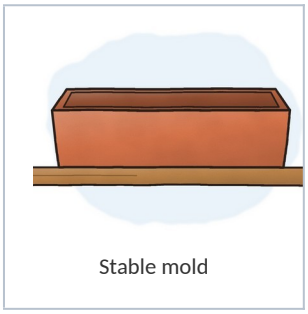
Scale, protective equipment, mold and batch record.

Equipment	Use and precautions
Scale suited to the quantities	Weigh ingredients separately. The precision needed depends on the batch size; never measure caustic soda “by the spoonful”.
Compatible containers	Hold the oils, the batter and the alkaline solutions, depending on temperature and concentration.
Dedicated spatulas and utensils	Mix and transfer while limiting splashes; they are kept only for soapmaking.
Stable molds	Hold the batter without leaking; plan for safe unmolding.
Protective equipment	Goggles, suitable gloves, covering clothes and closed shoes (see Chapter 3).
Batch record and pen	Write down the weights, the raw material batches and your observations.
Thermometer / stick blender	Depending on the method and the formula; useful tools but not always essential.
Running water and storage	Emergency rinsing within reach; clearly marked storage space.

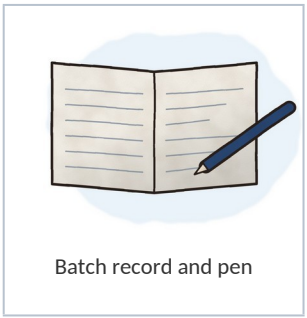

Suitable scale

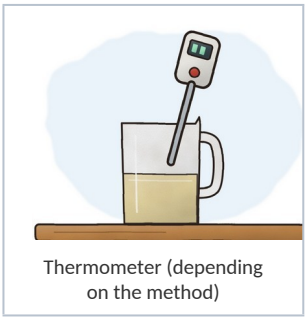

Compatible containers

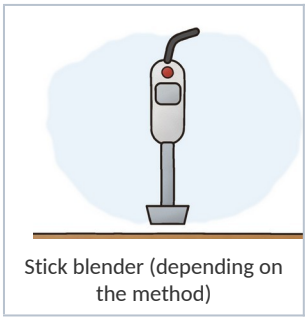

Dedicated spatulas and utensils


Stable mold


Protective equipment


Batch record and pen


Thermometer (depending on the method)


Stick blender (depending on the method)

4.2 Choosing materials



No aluminum. No glass for hot caustic soda.

Material	Decision
Suitable stainless steel	May be suitable if its grade and condition are right.
Suitable PP / HDPE	May be suitable if the manufacturer confirms chemical and heat resistance.
Compatible silicone	Useful for some molds and accessories.
Aluminum, copper, zinc	Must never be used in contact with concentrated alkalis.
Glass	Avoid for preparing or holding a hot, concentrated alkaline solution.
Wood	Useful for a mold frame, not for holding an alkaline solution directly.



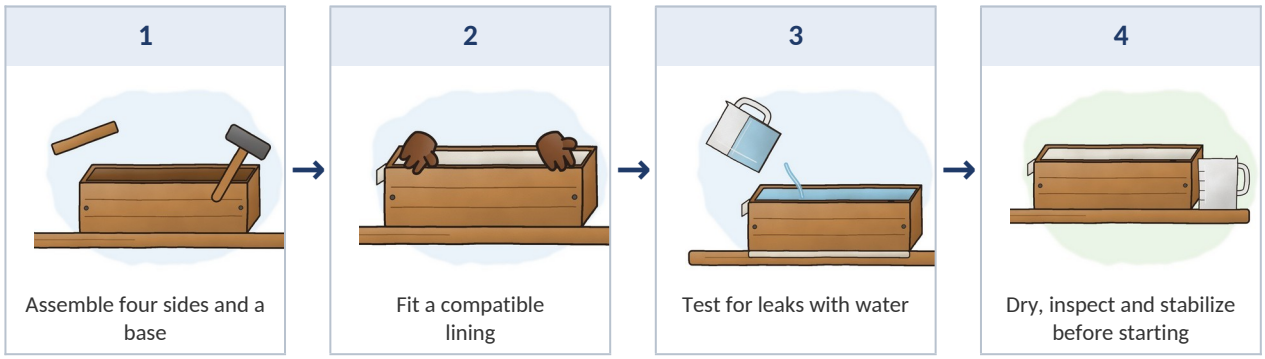
A “recycled” plastic is not automatically safe. You need to know what it is made of, its condition and its heat resistance. If in doubt, do not use it for alkalis.

4.3 Molds and cutting

Test the mold with water before using it.

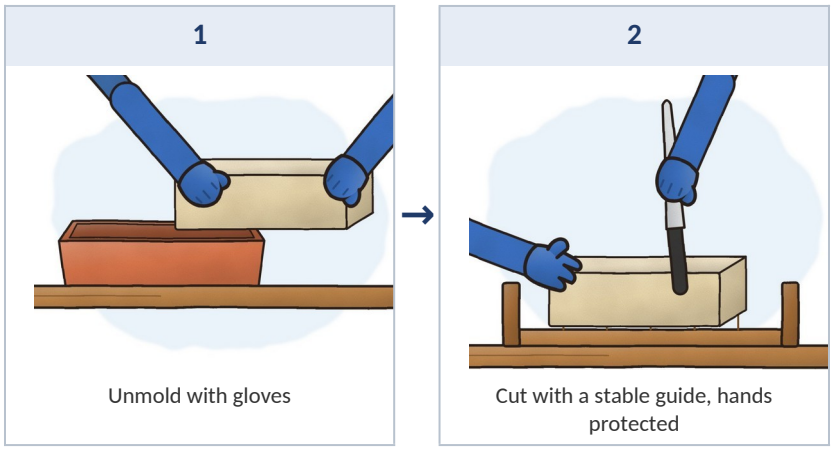
A compatible silicone mold is practical. A mold can also be made from locally available materials, for example a wooden box with four rigid sides and a stable base, fitted with a compatible lining that stops the batter from touching the wood. The lining must withstand

heat, not leak, not tear and not react with the batter. Recycled containers are acceptable only if their compatibility has been confirmed.



Check that the joints are solid, that there are no sharp edges and that the mold is stable on the table. Before using it with caustic batter, do a dry run and a leak test with a non-hazardous liquid, then dry and inspect the mold. Discard any mold that leaks or has a doubtful lining. Prepare and stabilize the mold before you start: fresh batter must not wait while you look for a container.

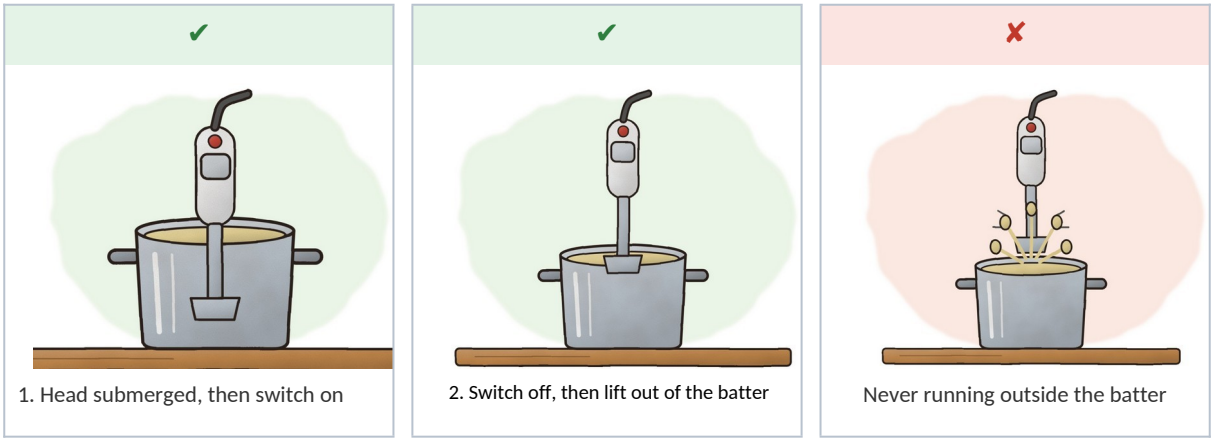
Unmold the soap when it is firm enough to handle safely. The times sometimes given, 24 to 72 hours, are only a guide and depend on the recipe. Keep suitable protection on while unmolding and cutting. Use a stable cutting guide and protect your hands from blades.



Common question — Can you mix by hand?

Yes, some preparations can be mixed by hand, but the time and effort vary with the oils and the recipe. A compatible whisk or spatula can be suitable for appropriate learning sessions. Hand mixing is not the same as using a blender for every formula: watch the batter and follow the recipe's conditions.

If you use a stick blender kept only for this purpose, submerge its head before switching it on and switch it off before taking it out of the batter, to limit splashes.



1. Head submerged, then switch on

2. Switch off, then lift out of the batter

Never running outside the batter

4.4 Measuring: mass, temperature and pH

Weigh everything, separately. Never “by the spoonful”.

A recipe is calculated and made by mass. A soap recipe is not made “by eye”: the oils, the water and the caustic soda are weighed separately. Measuring jugs can help as a guide, but they do not replace weighing.

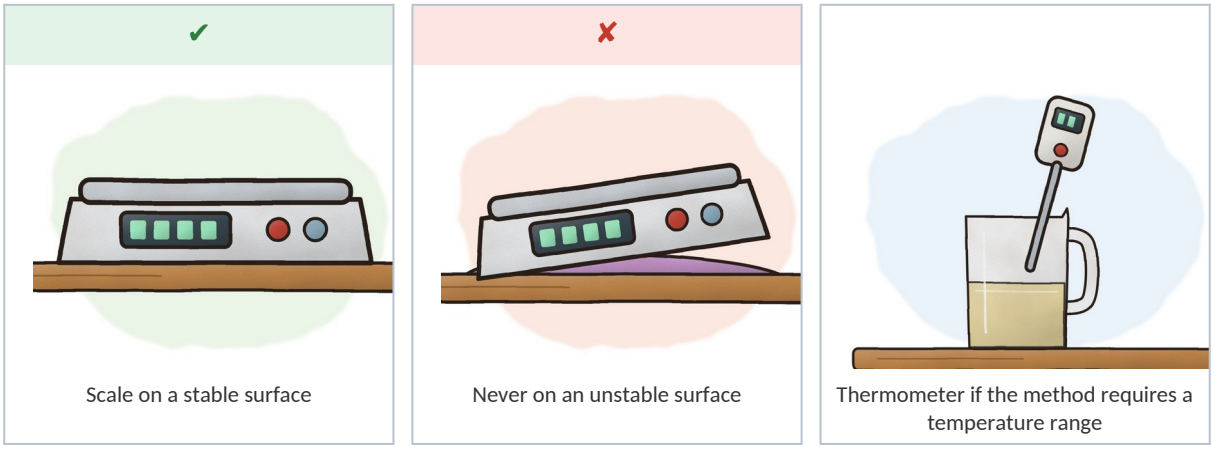
Place the scale on a stable table. Check it before weighing. It must be precise enough to weigh caustic soda: a scale that shows only whole grams is not enough to measure every recipe correctly. Never round off an amount of caustic soda without checking the precision needed and redoing the calculation.



Weigh each ingredient separately

Not “by the spoonful”

Not “by volume”



Scale on a stable surface

Never on an unstable surface

Thermometer if the method requires a temperature range

A thermometer is useful when the method requires a temperature range.

pH alone does not prove that there is no free caustic soda. Methods for checking the finished product are explained in Chapter 11.

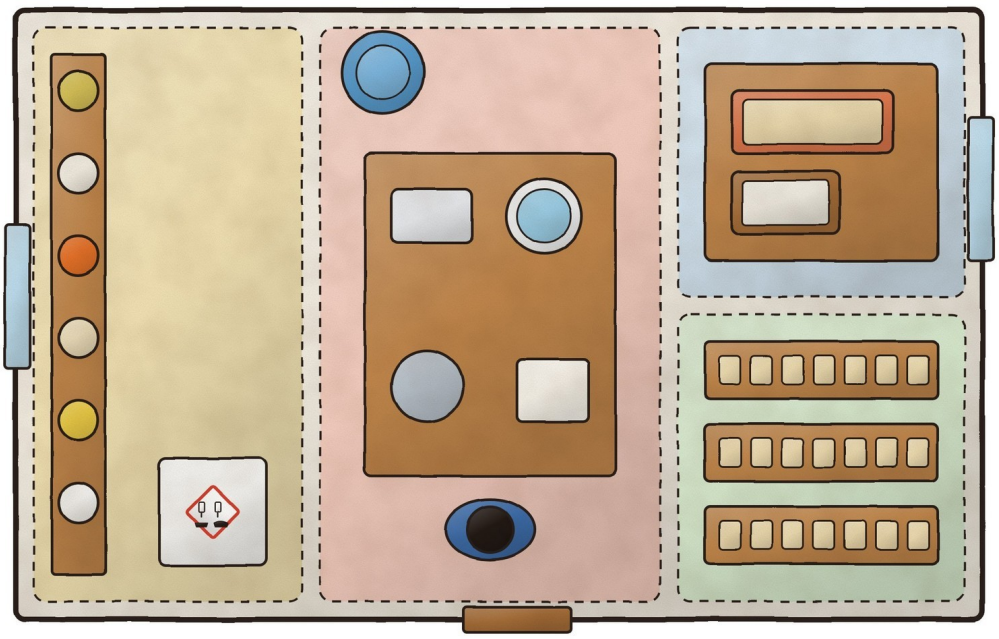
4.5 A workshop on a limited budget



Never cut costs on protection, the scale or water.

You can save money by making wooden molds, a cutting guide or storage shelves. You must never cut costs on protective equipment, the scale, container compatibility or access to emergency water.

Set aside one zone for raw materials, one for handling, one for molding and one for curing and storage. Even in a small room, these activities must be separated in time and organized to avoid contamination.



Four zones: raw materials · handling (rinsing water within reach) · molding · curing and storage.



4.6 Cleaning and tidying up

Clean with gloves: fresh batter burns.

Fresh batter can still be caustic. Wear protection, carefully collect the residues with a compatible tool, then follow a cleaning procedure suited to the SDS, the surfaces and local rules. Avoid splashes. Do not use vinegar to “neutralize” caustic soiling or a splash on the skin.

1



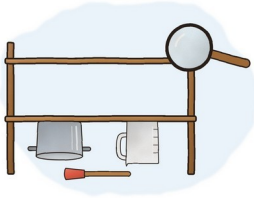
With gloves: collect the residues with a compatible tool

2



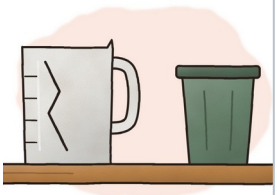
Clean according to the SDS and local rules

3



Dry, inspect, put away

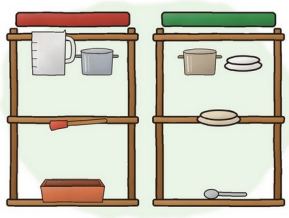
✘



Cracked container: discard it

Dry, inspect and store clean equipment away from dust and out of reach of children. Discard containers that are cracked, warped or of uncertain compatibility. Label containers and keep soapmaking tools separate from food utensils.

✔



Soapmaking tools (red mark) kept separate from kitchen utensils (green mark)

4.7 Preparing a batch record

One batch = one batch record.

For each batch, fill in a batch record. Write down at least: the date, the batch code, the recipe name and version, the identity and batch number of the raw materials, the weights actually used, the observed parameters, the operator, any incidents, the check dates and the release decision. The batch record template is in Appendix A.

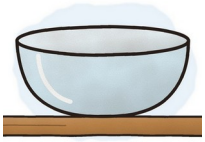


Completed batch record and mold labeled with the batch code

Exercise — Choosing without mistakes

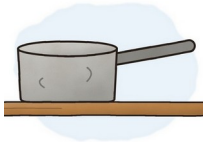
You have a glass bowl, an aluminum saucepan, a PP container with documented resistance and an unidentified plastic box. Which one could you consider for an alkaline solution, and on what condition?

A



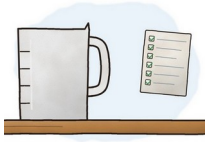
Glass bowl

B



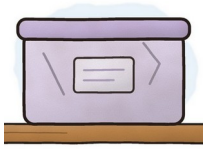
Aluminum saucepan

C



PP container with documented resistance

D



Unidentified plastic box

Check your learning

1. Why should you weigh rather than measure “by volume”?
2. Is a recycled mold always usable?
3. What should you do with a cracked container?
4. What information must be written on a batch record?

Answers

Exercise. Only the PP container (C) can be considered, if its chemical and heat compatibility with the real conditions is confirmed. Rule out the aluminum, the glass and the unidentified box.
Check your learning. 1. Masses are the basis of the calculation. 2. No: check its compatibility first. 3. Discard it. 4. At least the date, batch, recipe, raw materials, weights and observations.

For the trainer — Practical observation

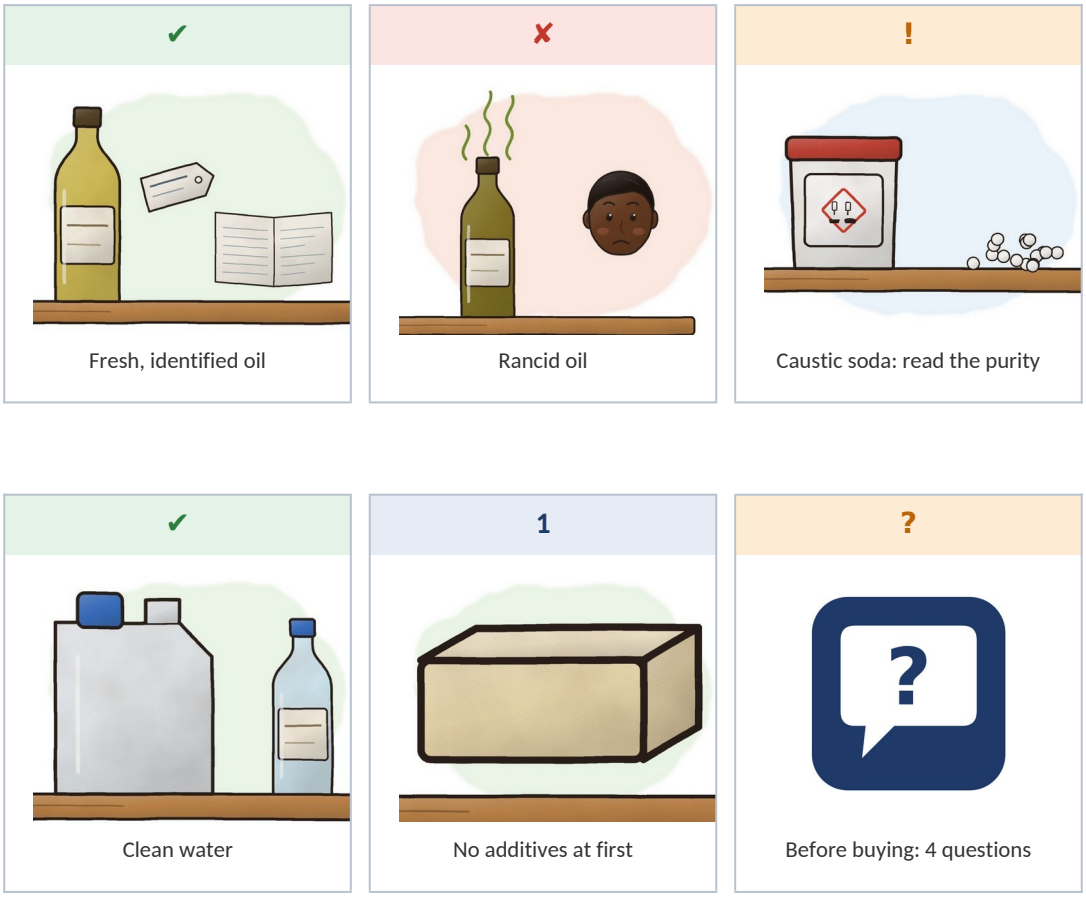
Ask each participant to spot the hazards in an imaginary workshop, choose protective equipment, sort four materials and prepare a blank batch record. This exercise can be done without caustic soda: it is the best first step for a group of beginners.

Key points

Simple equipment is often enough, but not makeshift equipment. The scale, compatible containers and how the workstation is organized are essential.

5. Choosing your raw materials

Key points in pictures



Ingredients are not all interchangeable. Before choosing a recipe, you need to know what the oils, the water, the alkali and the other materials are for.

What you will learn

By the end of this chapter, you will be able to identify the role of fats, tell caustic soda from potash, judge water quality, assess local resources and explain why a raw material must be identified before it goes into a recipe.

5.1 Oils, butters and fats: the role of fats

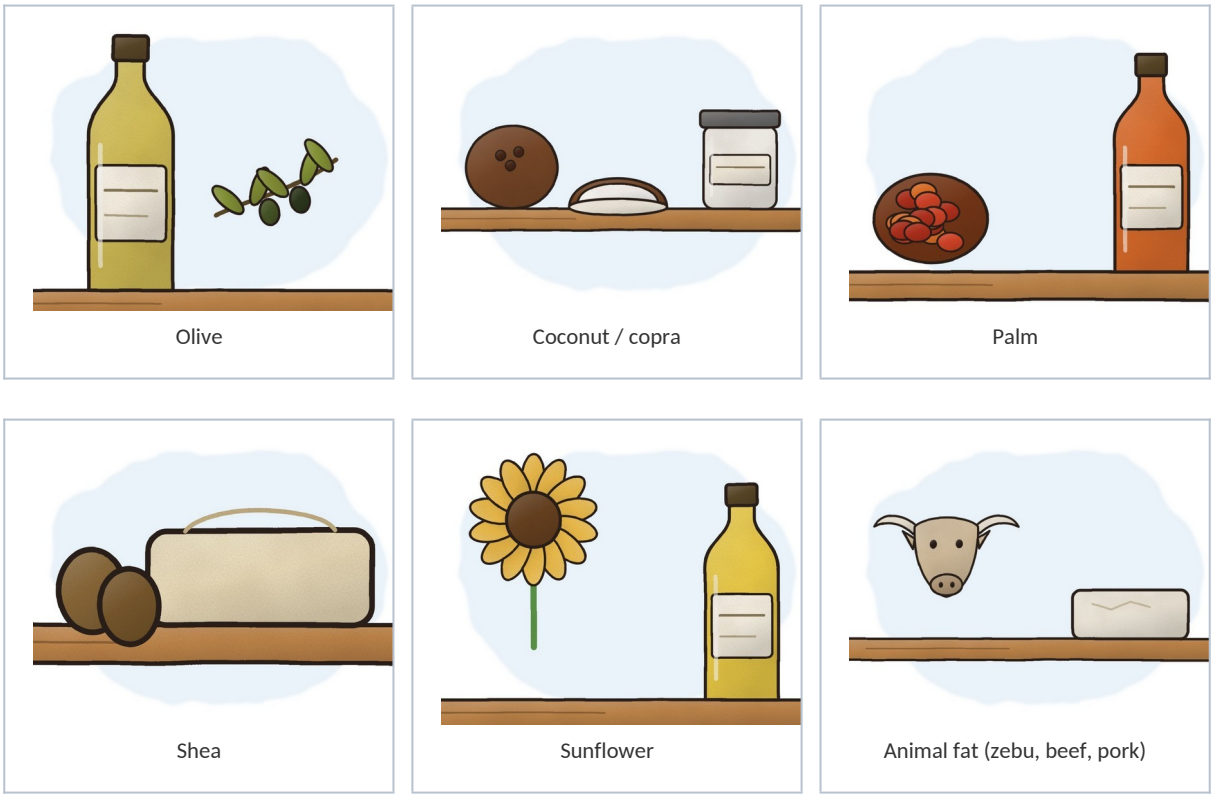
Each oil brings something different.

Oils, plant butters and animal fats provide the fatty acids that will form the soap. Their composition affects hardness, solubility, lather and resistance to oxidation.

An oil may give a rather hard soap, a soap that lathers easily or a soap that dissolves faster. None of these results depends on a single oil: it is the recipe as a whole that counts. Coconut (or copra) oil often contributes to rich lather and strong cleansing power. Olive oil gives soaps with different properties, often with a gentler lather. Shea butter and fats rich in saturated fatty acids can help make a long-lasting bar.

The properties in the table are trends, not guarantees about the finished soap; they do not replace a recipe calculation.

Fat	Typical characteristics	Point to watch
Olive	Rich in oleic acid; soaps often mild to use	May give little lather depending on the formula
Coconut / copra	Lauric and myristic acids; lather and cleansing power	In high amounts, may give an overly harsh soap
Palm	Provides palmitic and oleic acids; helps the bar hold its shape	Look into its origin and sustainability issues
Shea	Provides mainly stearic and oleic acids; helps the bar hold its shape	Quality and composition vary with origin
Standard sunflower	Often rich in linoleic acid	Prone to oxidation; tell it apart from the "high-oleic" variety
Clarified animal fat	Variable profile; can help make a firm soap	Filtering, smell, origin and hygiene



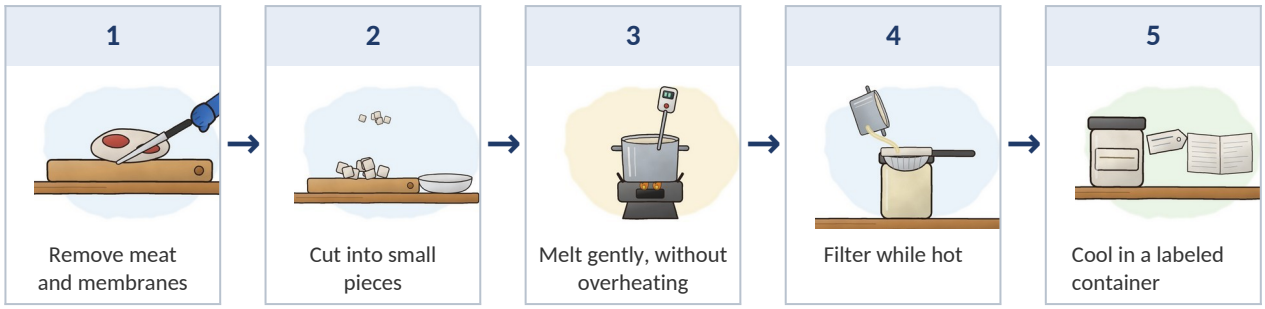
Olive | Coconut / copra | Palm

Shea | Sunflower | Animal fat (zebu, beef, pork)

Preparing a local animal fat: a method to master

Beef, zebu or pork fat can be used in soapmaking when its origin, hygiene and composition are under control. This preparation does not replace the saponification calculation: each fat requires a suitable, verified SAP value.

Before any contact with caustic soda: remove pieces of meat and membranes, cut the fat into small pieces, melt it gently in a clean stainless steel container without overheating, then filter it while hot through a heat-resistant strainer. Let it cool in a clean, labeled container.



Discard any fat that has been poorly stored, is rancid or contaminated. Write down the origin, the date, the yield after filtering and the storage conditions. Have the quality checked and recalculate any recipe before making soap.

5.2 A local resource is not automatically usable

Local does not mean suitable: identify and check.

Using an oil produced nearby can reduce some purchases or make supply easier. But “local” does not automatically mean “suitable”: identify the oil, check its condition and how it has been stored, and find out about its composition before calculating a formula. A rancid, contaminated or poorly identified oil must not be used for a body soap.

Used cooking oils (frying oils) need special assessment: they have no reliable universal SAP value and are not an ordinary raw material for a soap meant for the body.



In a low-budget project, compare the price per kilogram, regular availability, losses during filtering, transport costs and quality. A cheap raw material can end up expensive if it leads to a lot of rejects.

5.3 Recognizing quality

On delivery: look, smell, label.

Check the exact name of the raw material, its supplier, the date received, its appearance, smell, cleanliness, packaging and, if available, its technical data sheet. Appearance alone is not enough to rule out chemical breakdown or contamination.

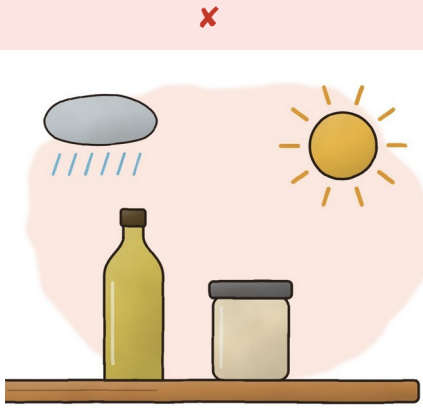


On delivery: name, appearance, smell, cleanliness, packaging; label the batch

Store materials in clean, suitable containers, protected from heat, light and moisture. Write a batch identifier on each container.



Clean, closed, labeled containers, protected

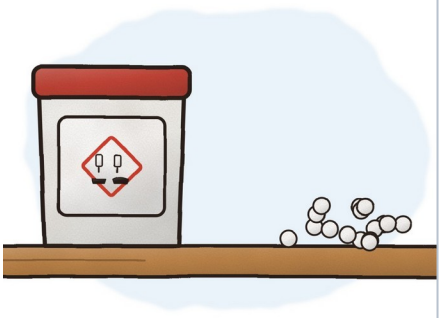


Not exposed to heat, sun or moisture, and never unlabeled

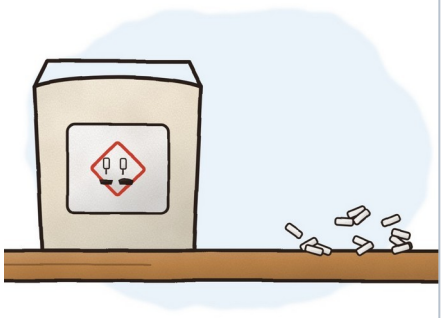
5.4 Caustic soda NaOH and potash KOH

Caustic soda and potash burn. Their purity changes the calculation.

Caustic soda has the chemical name NaOH: it is mainly used for bar soaps. Caustic potash, KOH, is commonly used for soft and liquid soaps. Both are corrosive.



NaOH: mainly bar soaps



KOH: soft and liquid soaps

The commercial purity of the product counts in the calculation: a product sold as 98% pure does not contain the same amount of active substance as a pure product. Recalculate the formula every time you change alkali or commercial grade.

Caustic soda sold for technical use is not automatically suitable for a soap meant for the body: check its composition and possible impurities. Never use a drain cleaner containing unidentified ingredients.



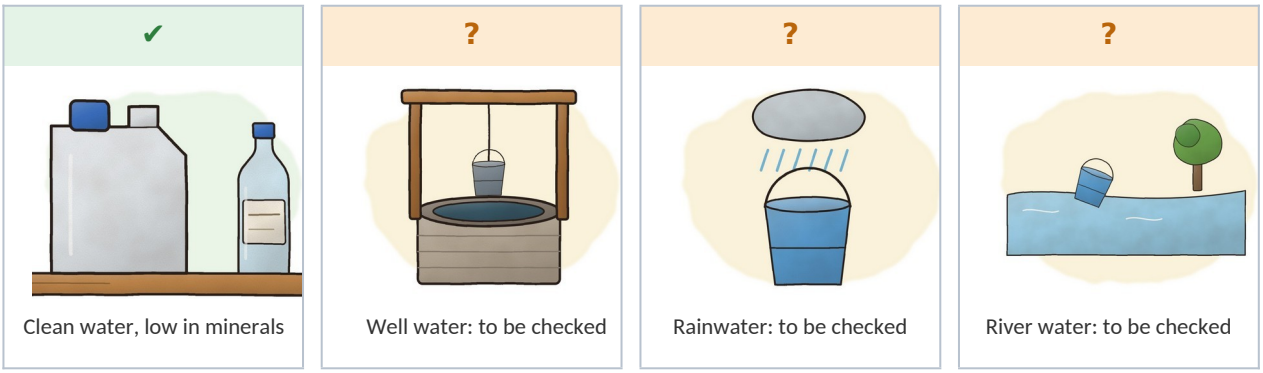
Never use a drain cleaner with unidentified ingredients

5.5 Water




Clean water, low in minerals. Check well water or rainwater.

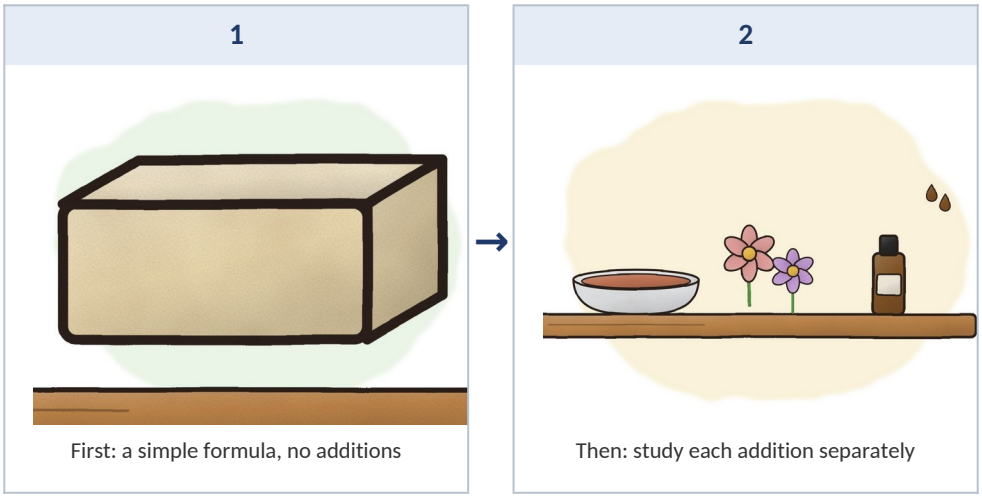
Water is used to dissolve the caustic soda or potash and makes mixing easier. Clean water of known quality and low in minerals is best; demineralized water of suitable quality has a more consistent composition. Water containing salts, metals or contaminants can change the appearance and stability of the soap. Well water, rainwater, river water and tap water vary: do not assume they are suitable without checking.



5.6 Additives: useful but not essential

No fragrance or color at first. Then, one addition at a time.

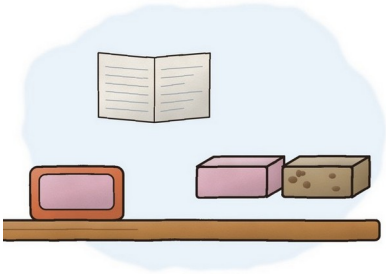
Fragrances, colorants, clays, plants and other additions are not needed to learn how to make a first soap. They can change the batter, its appearance, texture or behavior, or how well the product is tolerated. Some irritate, cause allergies or react with the alkali: their safety and compliance must be assessed for the intended use. Start with a simple formula without additives, then study the additions one by one.



Choosing a natural colorant methodically

A plant powder or clay can change color in contact with caustic soda. So the color you see before making the soap does not guarantee the result after curing.

For a first trial, choose an identified, clean material suited to the intended use. Make a small trial batch with a formula that has already been checked, write down the amount added, then watch the color, spots, smell and stability over time.



Small trial batch: write down the amount added; the color may change during curing

Do not use an unknown plant or a contaminated homemade powder. A pleasant color proves neither that the colorant is harmless nor that the soap is safe.

Fragrances, essential oils and powders: choosing without unnecessary risk

An essential oil is not automatically gentle just because it is natural. Some substances are irritating, cause allergies or are not recommended for certain uses. Only choose identified materials of suitable quality, and check the restrictions that apply to the finished product and the country of sale.

Do not use a universal percentage for fragrances: the limit depends on the substance, its composition, the type of product and the applicable rules. Keep the supplier's documentation and record every addition on the batch record.

For exfoliants, choose fine, clean particles without sharp edges; avoid the face and sensitive uses without proper assessment. Milks, sugars and plant extracts can speed up heating or change how the batter behaves: keep these variations for people who are already trained.

5.7 Choosing before buying

Before buying: name, quality, availability, price.

Before choosing a raw material, ask yourself four questions: what is its exact name? What is its quality? Is it regularly available? Does its cost suit the project? Write your answers in your notebook.

Exercise — Choose and justify

A cooperative has three oils: a fresh, identified oil, a used cooking oil of unknown origin and an oil that smells rancid. Which one can be included in a formula study for a body soap?

Check your learning

1. Why do two oils need different caustic soda calculations?
2. Why do you need to know the purity of the caustic soda?
3. What information should you write down when an oil is delivered?

Key points

First choose identified, suitable materials, then calculate the recipe. Never replace one oil with another without recalculating.

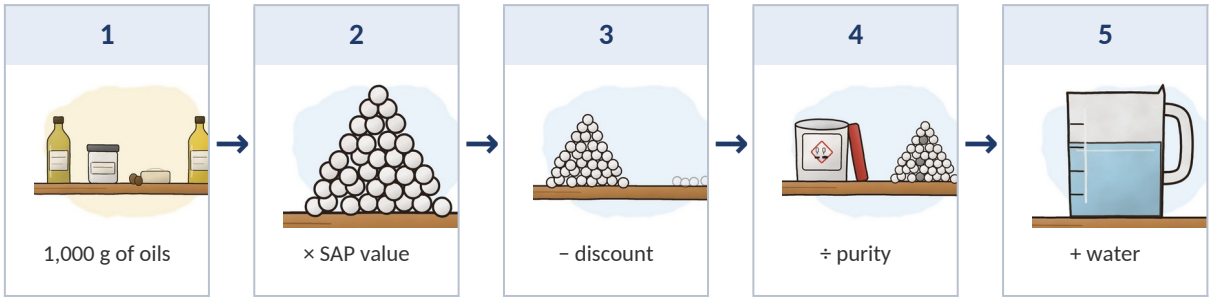
Answers

Exercise. Only the fresh oil, properly identified and of suitable quality, can be studied. This is not enough to approve the formula or the final product. The other two must be ruled out for this use unless properly assessed.

Check your learning. 1. Their fatty acid profiles and SAP values are different. 2. The mass of commercial product is not equal to the mass of pure NaOH. 3. Its identity, supplier, date, batch number and condition on delivery.

6. Understanding and calculating a recipe

Key points in pictures



Before making a soap, you need to know how to read a recipe. A recipe tells you which oils to use, how much of each, and how much caustic soda or potash and water to use. These numbers are not chosen at random: they are calculated.

What you will learn

By the end of this chapter, you will be able to convert percentages into grams, check that the oils add up to 100%, use consistent SAP values, calculate a lye discount, take commercial purity into account and calculate the water using a clearly stated convention.

This chapter follows a single example from start to finish: **1,000 g of oils** (olive, coconut, shea, sunflower). Each step is presented in the same way: the rule, the example, then the result.

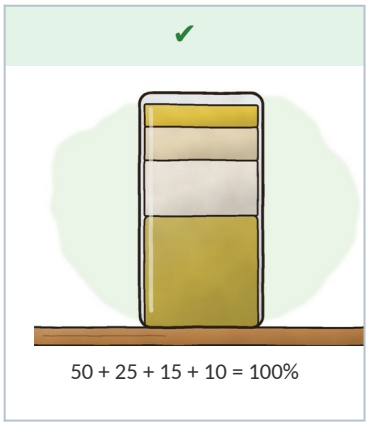
6.1 Percentages: the first check

The oils must add up to 100%.

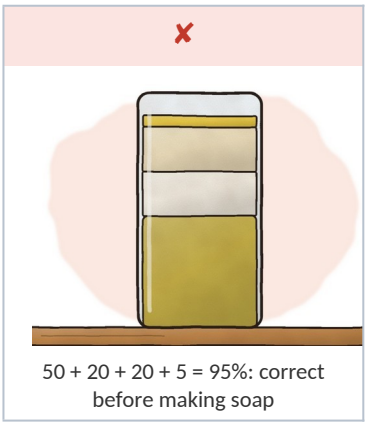
Rule. A recipe often gives the oils as percentages. The total must always be exactly 100%. Mass of one oil = total mass of oils × percentage ÷ 100.

Example. For 1,000 g of oils: olive 50% → 500 g; coconut 25% → 1,000 × 25 ÷ 100 = 250 g; shea 15% → 150 g; sunflower 10% → 100 g.

Result. 500 + 250 + 150 + 100 = 1,000 g: the formula is complete.



50 + 25 + 15 + 10 = 100%



50 + 20 + 20 + 5 = 95%: correct before making soap

If a recipe gives 50% + 20% + 20% + 5%, the total is only 95%: 5% is missing. If the total is 95% or 105%, correct the formula before going any further. Never fill a gap at random.

6.2 What is the saponification value for?

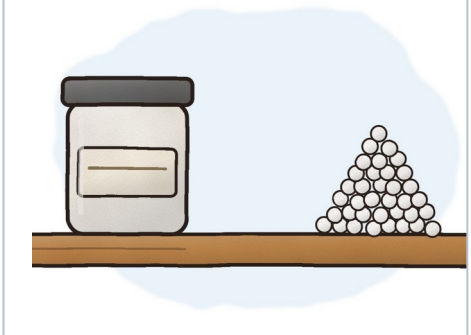
Mass of each oil × its SAP value = caustic soda needed.

Rule. Not all oils react with the same amount of caustic soda. The saponification value (NaOH SAP value) gives the theoretical mass of pure NaOH needed for 1 g of a fat. Calculate each oil separately, then add them up: mass of oil (g) × NaOH SAP (g/g) = theoretical pure NaOH (g).

Example. A SAP value of 0.134 means that 1 g of this oil theoretically needs 0.134 g of pure NaOH. For 500 g of olive oil: 500 × 0.134 = 67 g.



500 g of olive × 0.134 = 67 g of theoretical pure NaOH



500 g of coconut × 0.183 = 91.5 g of theoretical pure NaOH

These values are a guide. They vary between oils, batches and data sources: check the values you use before making real soap.

6.3 Worked example for 1,000 g of fats

Fat	Mass	Typical NaOH SAP	Theoretical pure NaOH
Olive	500 g	0.134	67.00 g
Coconut / copra	250 g	0.183	45.75 g
Shea	150 g	0.128	19.20 g

Fat	Mass	Typical NaOH SAP	Theoretical pure NaOH
Sunflower	100 g	0.135	13.50 g
Total	**1,000 g**	—	**145.45 g**

Result. We get 145.45 g of theoretical pure NaOH for all the oils together. This is not yet the mass of commercial caustic soda to weigh.

These figures are a teaching example: before making any soap, confirm the SAP values of each raw material and the other parameters of the formula.

6.4 Applying a lye discount ("calculated superfat")

Take away a little caustic soda: this is the lye discount.

Rule. In many recipes, the amount of caustic soda is deliberately reduced compared with the theoretical amount. This is the lye discount, often called "calculated superfat". Pure NaOH to use = theoretical pure NaOH × (1 − discount).

Example. With an 8% discount, 92% of the theoretical caustic soda remains: 145.45 × (1 − 0.08) = 145.45 × 0.92.

Result. 133.814 g of pure NaOH.

An 8% discount does not prove that the finished soap contains exactly 8% free oils: it is a calculation choice, not a measurement of the finished soap. Nor does it guarantee that the soap is safe.

6.5 Taking into account the purity of commercial caustic soda

Read the purity on the packaging, then divide.

Rule. A package may say "NaOH 99%": 100 g of this product contains 99 g of pure NaOH. Mass of commercial caustic soda = mass of pure NaOH ÷ purity.



99% caustic soda: 100 g of product contains 99 g of pure NaOH

Example. 133.814 ÷ 0.99 = 135.1657 g.

Result. 135.17 g of 99% commercial caustic soda, after rounding.

Do not confuse 133.81 g of pure NaOH with 135.17 g of 99% caustic soda. The real precision of the scale and the quality of the product must match the recipe: hundredths of a gram on the display are not

an invitation to improvise with an imprecise scale. If the purity is unknown or the product contains other substances, do not improvise.

6.6 Calculating the water: always state the convention

Always state how you calculate the water.

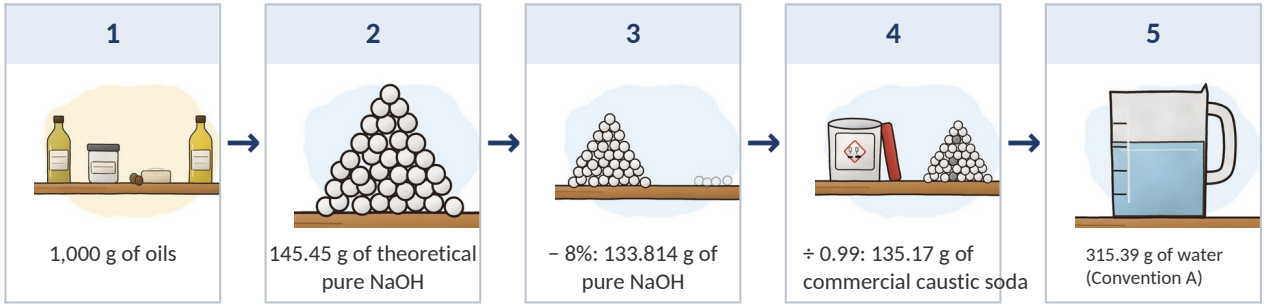
Rule. The concentration shows what share of the alkaline solution is caustic soda. At 30%: 30 g of caustic soda for 70 g of water. Water = mass of caustic soda × (1 − concentration) ÷ concentration.

There are two conventions, depending on which mass of caustic soda is used in this calculation:

- **Convention A — based on the commercial mass weighed:** 135.1657 × (1 − 0.30) ÷ 0.30 = **315.39 g of water.**
- **Convention B — based on the mass of pure NaOH:** 133.814 × (1 − 0.30) ÷ 0.30 = 312.23 g of water.

These results differ because the starting mass differs. **In this handbook and on the batch records, we use Convention A,** based on the commercial mass weighed. Use the same convention in the calculator and on the batch record.

Result of the full example: 1,000 g of oils; 145.45 g of theoretical pure NaOH; 133.814 g of pure NaOH after an 8% discount; 135.17 g of 99% commercial caustic soda; 315.39 g of water using Convention A.



These figures are for understanding the operations. On their own, they are not an approved recipe for making or selling soap.

6.7 Check before preparing anything

Have your calculations checked by someone else.

Re-read the percentages, the masses, the SAP values of the oils actually used, the purity and type of alkali, the concentration convention and the precision of the scale. Have the calculations checked by a second person or by an independent method, and write the data on the batch record. A modified formula must be recalculated and properly checked.

A formula that is arithmetically correct can still be unsuitable for the skin, unstable or non-compliant.



Have the calculations checked by a second person

6.8 The APISARA calculator

A calculator saves you redoing every multiplication by hand. It does not replace understanding. Before confirming a formula, check at least: the oils and their proportions, the SAP values used, the type of alkali, its purity, the chosen discount and the water calculation convention.

You will find the calculator and free resources at apisara.org. Calculation exercises are given below and in each of the six recipes; the answers are kept separate from the questions.

Exercise — Checking a formula

For 500 g of oils, the plan is 250 g of olive, 125 g of coconut, 75 g of shea and 50 g of sunflower.

1. Are the proportions the same as in the example?
2. What would the theoretical mass of pure NaOH be, with the same SAP values?

Check your learning

1. What should you do if the oils add up to 95%?
2. Why must you not confuse pure mass and commercial mass?
3. Why can two calculators show different amounts of water?
4. Do pH or curing prove that a wrongly calculated recipe is safe?

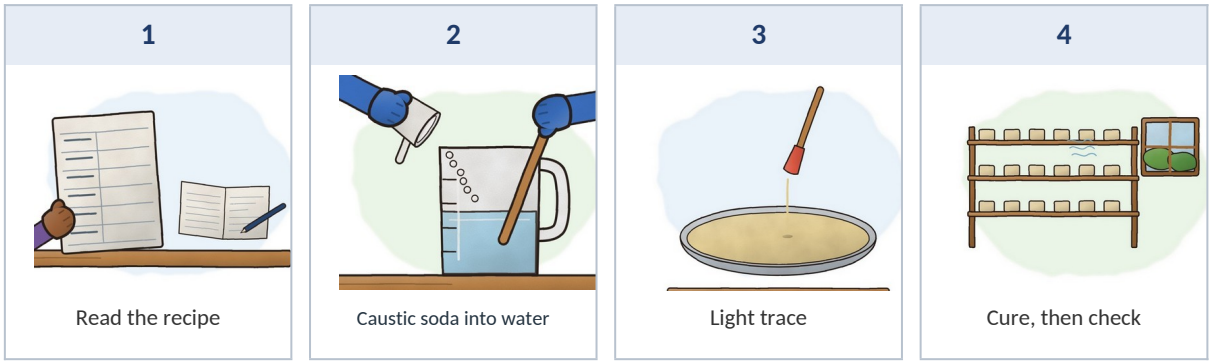
Answers

Exercise. 1. Yes: 50%, 25%, 15% and 10%. 2. The theoretical mass of pure NaOH is halved: 145.45 ÷ 2 = 72.725 g. This exercise is not a production recipe.

Check your learning. 1. Correct the formula before weighing anything. 2. Commercial purity is below 100%. 3. They do not use the same concentration convention. 4. No: proper checks are needed.

7. Making your first body soap

Key points in pictures



You now know why a recipe must be calculated. Let's see how a cold process batch is made. This chapter explains the steps in order. The sheet "Recipe 01 — Cold process body soap" then gives the quantities and instructions specific to this formula.

What you will learn

By the end of this chapter, you will be able to explain the steps of cold process soapmaking, prepare a batch record, recognize the main points to watch and tell the difference between an unmolded soap and a soap that has been checked and is ready to use.

7.1 Why start with a simple formula?

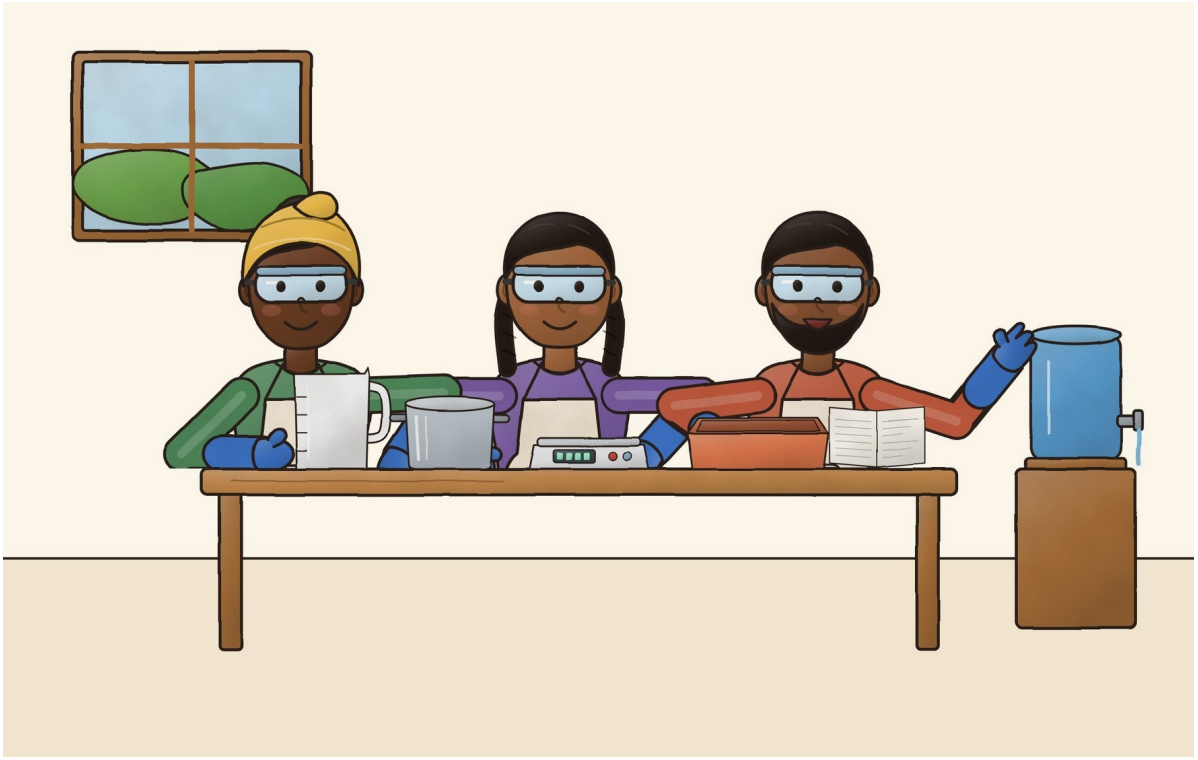
Start with a simple recipe, without fragrance or color.

For a first batch, choose a short recipe with a few clearly identified fats. Leave out fragrances, colorants and plants: you can study them later. Each extra ingredient makes the results harder to interpret; a simple formula makes it easier to see what is happening.

However, a simple formula is not automatically safe or suitable for the skin. Before any real session, the trainer must have a fully approved body soap formula: identity and quality of the fats, SAP values, NaOH purity, masses, concentration, equipment, procedure, checks and applicable obligations. The exercise in Chapter 6 is not a substitute for this approval.

7.2 Preparing the session without handling caustic soda

First do a dry run, without caustic soda.



Dry run: empty containers, protection worn; everyone points to where the rinsing water is.

Before opening the raw materials, re-read the whole recipe sheet. Prepare the protective equipment, containers, scale, mixing equipment and mold. Keep the batch record within reach to note down what you do.

Start with a dry run: set out the scale, empty containers, molds, batch record and protective equipment, then follow the order of steps with empty containers. You will see straight away if a tool is missing or if a step is unclear.

In a group, have participants identify each zone of the workshop. Ask each participant to show where the rinsing water is and to repeat the rule “alkali into water” in their own words.

7.3 The eight steps of the process — overview

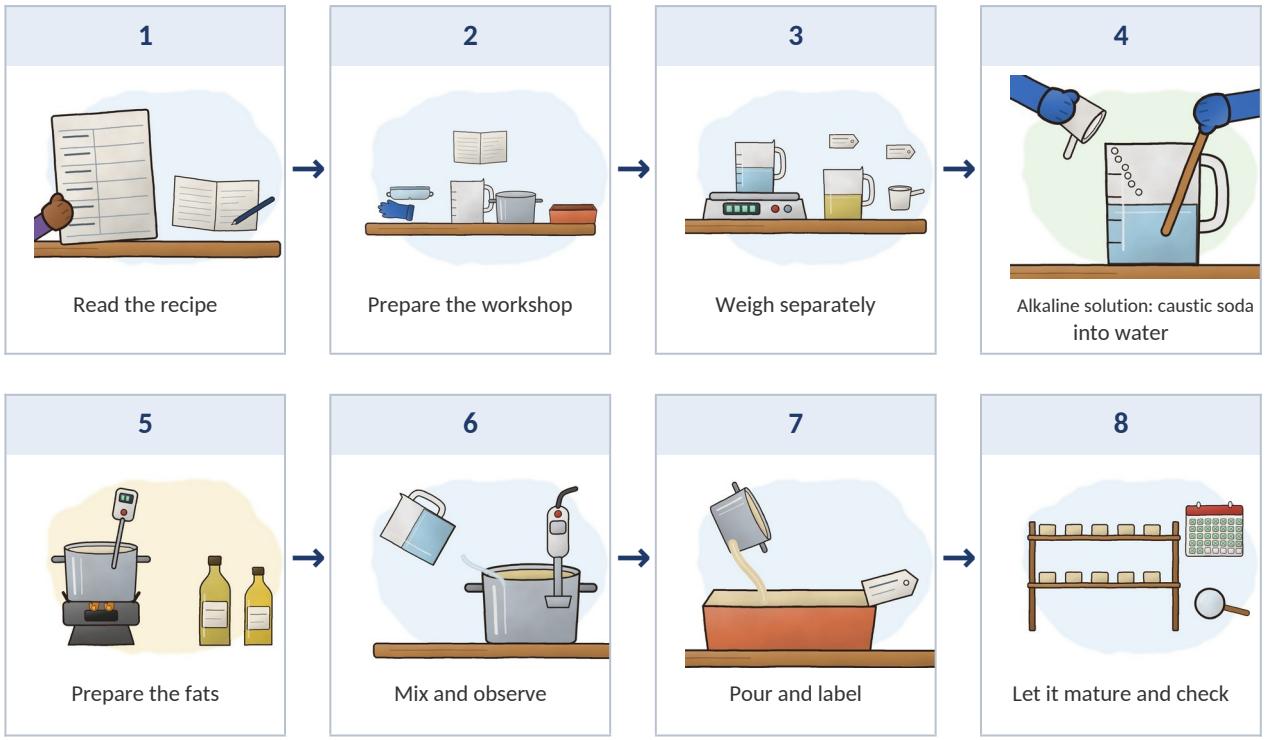
Eight steps, always in the same order.

Step	What the learner needs to understand	Check before continuing
1. Read the recipe	Identify each ingredient and its mass	Approved formula, identified materials
2. Prepare the workshop	Organize the zones, protective equipment and batch record	Compatible equipment and rinsing water
3. Weigh separately	Keep weighings separate and avoid mix-ups	Double-check the masses
4. Prepare the alkaline solution	Add the alkali to the water following a supervised procedure	Protection, ventilation, compatible container
5. Prepare the fats	Apply the approved method for the oils and butters	Compliant materials and parameters recorded
6. Mix and observe	Obtain an emulsion according to the process	No splashes; watch for trace
7. Pour and label	Transfer the fresh batter carefully	Stable mold and batch label

Step	What the learner needs to understand	Check before continuing
8. Let it mature and check	Follow unmolding, curing and checks	Batch on hold until the decision

Caution: this table describes a learning sequence. It gives no universal temperature, mixing time or dosage to improvise with. Fresh batter can remain corrosive.

1. **Read the recipe** — check the ingredients, their masses and the instructions specific to the formula.
2. **Prepare the workshop** — set out the tools, protective equipment, mold and batch record.
3. **Weigh separately** — weigh the ingredients in labeled containers, without mixing up the quantities.
4. **Prepare the alkaline solution** — gradually add the caustic soda to the water, never the other way round, using compatible equipment and protection.
5. **Prepare the oils** — weigh the fats and bring them to the state the recipe requires, melting the butters if needed.
6. **Mix and observe** — combine the preparations as the sheet says, then watch the emulsion and the thickening of the batter.
7. **Pour and label** — transfer the batter into a stable mold and write down the batch code.
8. **Let it mature** — check firmness before unmolding, then follow the planned curing and checks.

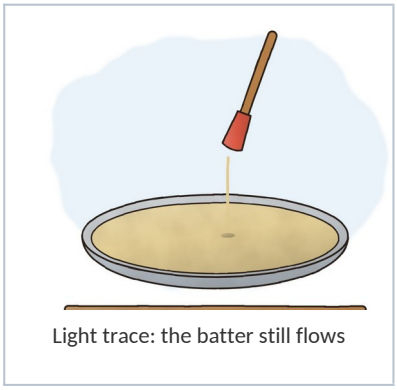


7.4 Understanding trace

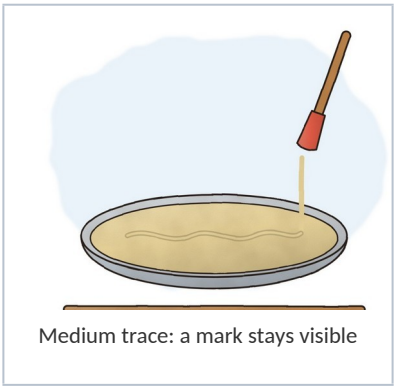
Trace: the batter thickens. It is not the end.

At the start of mixing, the batter is very runny. Then it thickens: this thickening is called trace. There are three stages:

- **light trace**: the batter still flows easily;
- **medium trace**: a mark stays visible on its surface;
- **thick trace**: the batter becomes hard to pour, which can make molding difficult.



Light trace: the batter still flows



Medium trace: a mark stays visible



Thick trace: hard to pour

Trace varies with the oils, temperature, mixing method and some additives. It does not prove that saponification is complete or that the soap is safe.

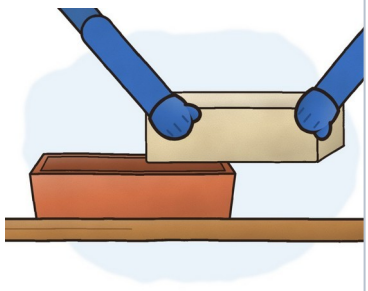
7.5 Unmolding, cutting and curing

Curing: 4 to 6 weeks to dry. It is not proof of safety.

After molding, the batter must become firm enough to be unmolded without losing its shape and handled safely. The time needed varies with the formula, temperature and mold: there is no universal time. Wear suitable protection as long as the batch has not been assessed.

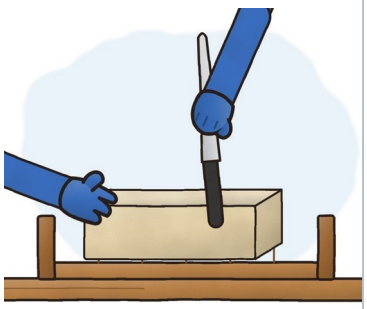
After cutting, place the soaps in a clean, airy place to cure. During curing, the soap dries and hardens. A period of 4 to 6 weeks is often given. But waiting does not prove that no free caustic soda remains, or that the soap is fit for use.

1



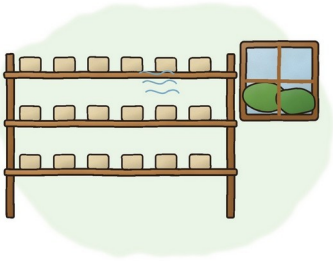
Unmold when the batter is firm, with gloves

2



Cut

3



Curing: clean, airy place

7.6 Check before any use on the body

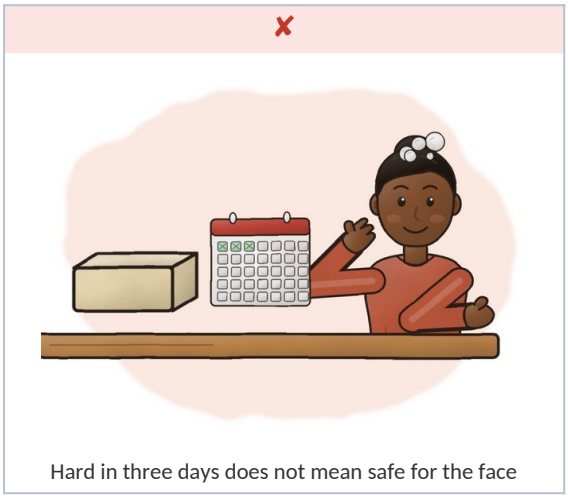
No use on the skin before checks.

The batch record must contain the masses actually weighed, the origin of the materials, observations, deviations, the date of manufacture and the results of suitable checks. A soap that feels pleasant, is nice and hard or has a single measured pH value is not automatically compliant.

To sell a cosmetic soap, apply the requirements of the country concerned, in particular the safety assessment and regulatory documentation required in the European Union.

Exercise — Spot the mistake

Someone says: “The soap hardened in three days, so I can use it on my face.” Is that enough?



Hard in three days does not mean safe for the face

7.7 Observing and recording

Write down what you see, even mistakes.

On the batch record, note what you actually observed: how runny the batter was, how fast it thickened, its appearance, unmolding, cutting and changes during curing. If a result differs from the recipe sheet, write it down without trying to hide it.

7.8 After this chapter

You will find the practical sheet “Recipe 01 — Cold process body soap” in the practice workbook of six recipes, after the glossary.

Check your learning

1. What does trace mean?
2. Why do a dry run?
3. What must a batch record contain?
4. Does curing replace checks?

Answers

Exercise. No. Hardness and time passed do not show that the initial dosage was correct or that the product is safe. You need an approved formula, traceability and suitable checks.

Check your learning. 1. The thickening of the emulsion. 2. To learn the organization without any chemical risk. 3. The materials, masses, dates, observations and checks. 4. No.

Personal notes — observations during the session

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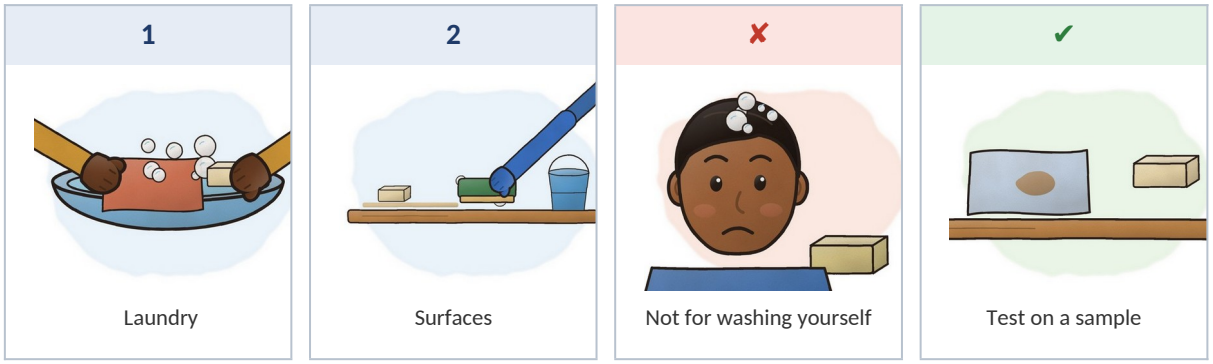
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8. Making a household soap

Key points in pictures



A household soap is used to clean objects, laundry or surfaces. It is not automatically suitable for the skin. Before choosing the oils, ask yourself a very simple question: what do you want to wash?

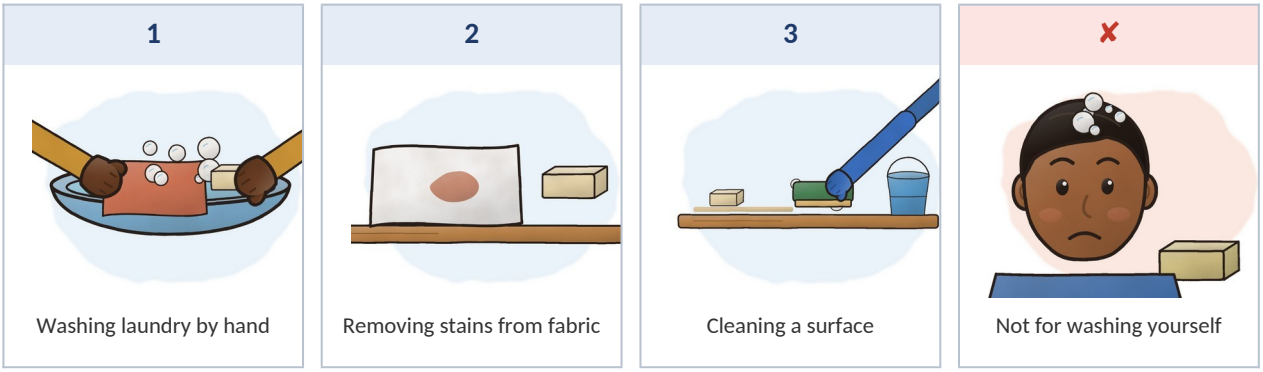
What you will learn

By the end of this chapter, you will be able to tell the needs of a household soap from those of a body soap, define a specific use, prepare a technical sheet and organize an assessment before any distribution.

8.1 Define the use before choosing the ingredients

What do you want to wash? Just one use to start with.

"Household soap" can mean a product for washing laundry by hand, removing stains from fabric or cleaning a surface. These three uses are different, and one product is not necessarily suitable for all three. The formula, the instructions for use, the warnings and the checks must match the stated use. To start, choose just one use and write it at the top of your project sheet.



A household soap is not meant for personal washing just because it contains the same types of ingredients. It may be harsher or contain substances unsuitable for repeated use on the skin.

8.2 Comparing the two projects

Question	Body soap	Household soap
Purpose	Cleaning the skin under the intended conditions of use	Cleaning a defined fabric or surface
Formulation	Skin tolerance and cosmetic assessment	Performance and suitability for the use
Checks	Cosmetic safety, stability, compliance	Safety, performance, compatibility, compliance
Labeling	Applicable cosmetic requirements	Requirements specific to household products
Can one replace the other?	No, not without reassessment	No, not without reassessment

8.3 Local fats and quality



Used oil: never without checks and a new calculation.

Can local oils be used? Yes, if their identity and quality are known. A local fat may be suitable for studying a household formula if it is properly identified and characterized.

Used cooking oils raise particular problems: contamination, oxidation, variable composition and uncertain SAP values. They are not equivalent to fresh oil and must not be treated as an interchangeable raw material. So never replace one oil with another without reviewing the formula.

8.4 The steps of a household soap project



Seven steps for a household soap project.

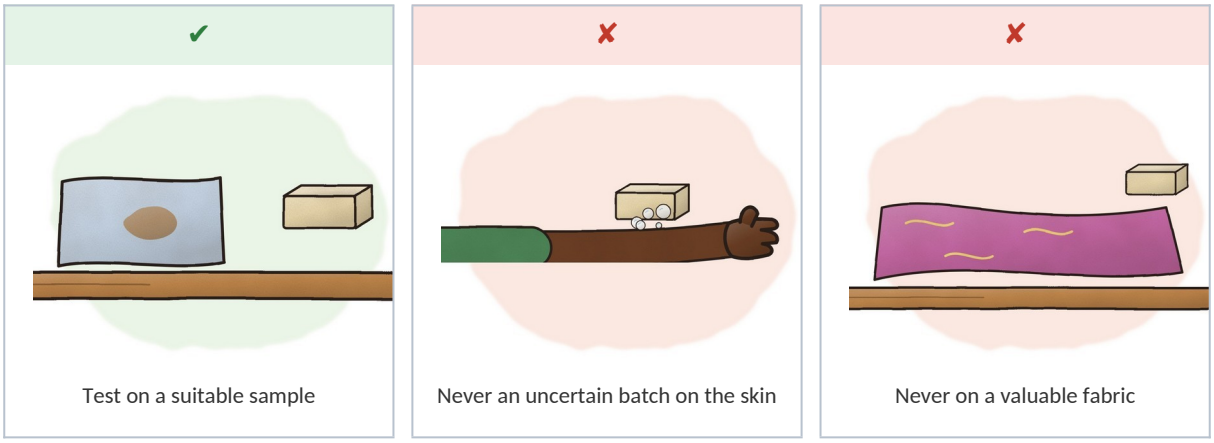
1. Choose one specific use: what the soap must clean.
2. Identify the raw materials and their characteristics.
3. Have a formula for this use calculated and checked.
4. Prepare the protective equipment, the tools and the batch record.
5. Only make a supervised batch, following an approved recipe sheet.
6. Observe the result and carry out suitable checks.
7. Record the results and decide whether the batch is usable.

The safety steps are the same as for a body soap: suitable protection, never aluminum, always alkali into water, never the other way round.

8.5 Checking performance without putting people at risk

Never use an uncertain batch on the skin.

Tests can cover cleaning a suitable surface, ease of rinsing, cleaning effect, how long the bar lasts and its compatibility with materials. A good cleaning result does not replace safety checks. Do not test an uncertain batch on the skin or on a valuable fabric.



8.6 Cost and small-scale production

Total cost ÷ sellable soaps.

To estimate the price of a household soap, count the fats, the caustic soda or potash, water, energy, consumables, packaging, losses and working time. Divide the total cost by the number of soaps that are actually usable and sellable, not by the number of soaps molded. Plan to keep track of complaints and batches.

8.7 Regulations and labeling

Write clearly: “do not use on the skin”.

The obligations for a household product differ from those for a cosmetic product. Depending on its composition, use and market, other rules may apply, in particular those on detergents, classification, labeling and chemical safety. Check the local framework before any sale.



Use clearly stated: household soap, do not use on the skin

Exercise — Choosing a specification

A cooperative wants to make “one soap for everything: laundry, dishes, body”. What advice would you give?

Check your learning

1. Is a household soap automatically usable on the skin?
2. Can fresh oil be replaced by the same mass of used cooking oil?
3. Which figure is relevant for setting the unit cost?

Key points

Choose the use first. See Recipe 02.

Moving from explanation to practice

Recipe sheets 01 (body soap) and 02 (household soap), found in the practice workbook after the glossary, present the ingredients, equipment and steps for making the soap. Read the whole sheet before you start, then use the batch record and the safety instructions in Chapters 3 and 4. The other recipes let you gradually discover other materials and processes.

Before selling anything, check the regulatory requirements and checks that apply in the country where the soap is made and sold.

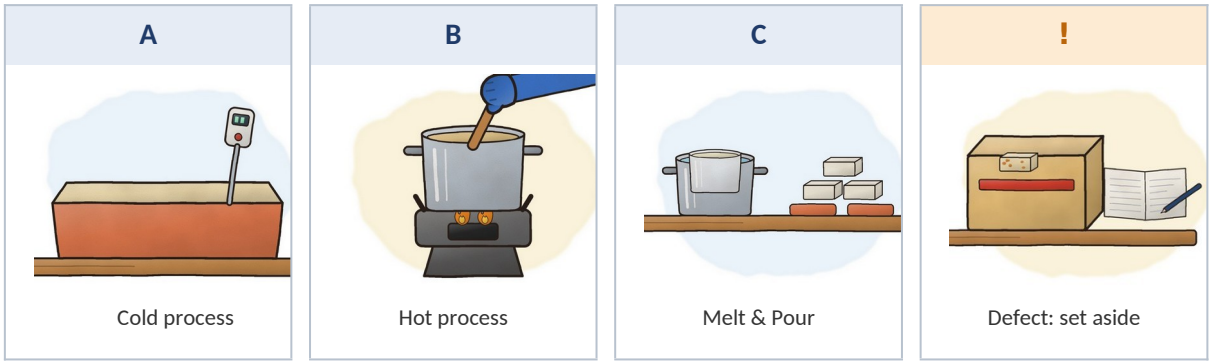
Answers

Exercise. First define one priority use and its requirements. A single formula cannot be assumed to suit every use. Study the safety, performance and obligations of each category separately.

Check your learning. 1. No. 2. No, not without characterization and recalculation. 3. The total cost divided by the number of soaps that are actually sellable.

9. Mastering the techniques

Key points in pictures



There are several ways to make or shape soap. Understanding their differences helps you choose the right method and interpret what you observe.

What you will learn

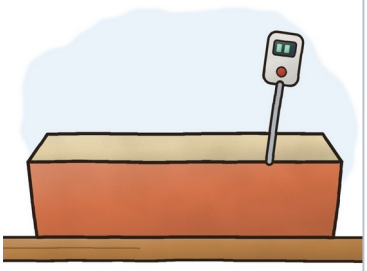
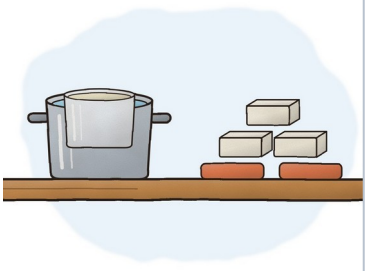
By the end of this chapter, you will be able to tell the main production methods apart, watch the stages of the emulsion, recognize an abnormality, decide when to set a batch aside and explain why curing alone does not establish its safety.

9.1 Three processes not to confuse

Three methods: cold process, hot process, Melt & Pour.

- **Cold process (CP)**: fats and an alkaline solution are mixed without deliberate heating; the reaction may still give off heat.
- **Hot process (HP)**: the batter is heated in a controlled, supervised way during making.
- **Melt & Pour**: a ready-made soap base is melted, then poured into a mold; no raw caustic soda is handled.

Liquid soap made with potash is presented separately, in Recipe 06.

A	B	C
		
CP: no deliberate heating	HP: controlled, supervised heating	Melt & Pour: ready-made soap base, melted then molded

9.2 Comparison table

Read this table with three questions in mind: does the method use raw alkali? Does the process add deliberate heating? Which checks are needed before using or selling the soap?

Criterion	CP	HP	Melt & Pour
Alkali	Used to saponify	Used to saponify	Already transformed in the soap base
Heating	No deliberate heating	Controlled cooking	Melting the soap base
Points to watch	Emulsion, temperature, curing	Heat, splashes, evaporation, uniformity	Quality and instructions of the soap base
Product checks	Required	Required; cooking is not a compliance test	Required depending on use
What the method teaches	Caustic soda calculation and basic steps	Running a supervised cook	Molding and presentation, without caustic soda calculation

9.3 Recognizing trace without mistakes



Visible trace does not mean finished soap.

Trace is the thickening of the emulsion (see 7.4): light trace is still runny, medium trace leaves a temporary mark, thick trace flows with difficulty.

Beware of false trace: some batters seem to thicken because the fats are cooling or setting. A batter that thickens very quickly may also signal cooling or acceleration caused by the formula.

Do not confuse visible trace, complete saponification and the absence of free alkali: these three situations are not the same.

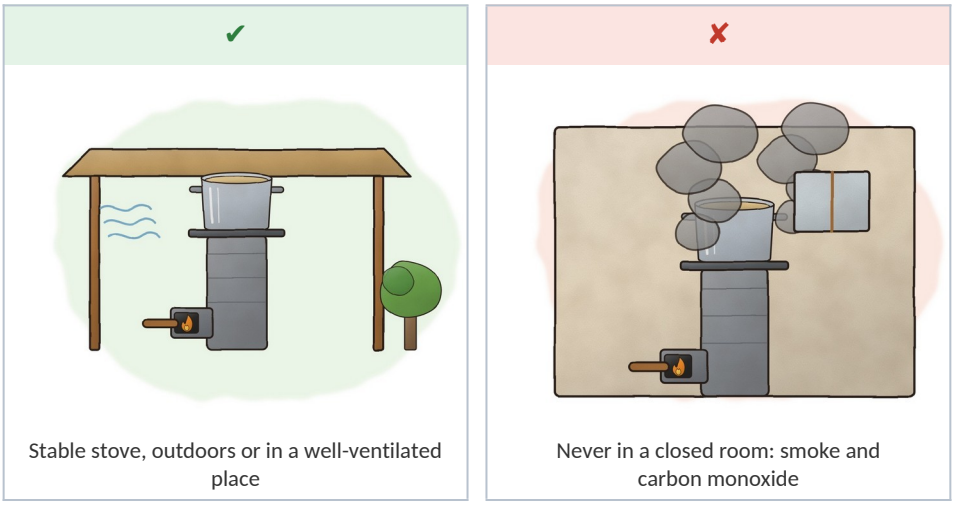
9.4 Heating and energy



Stove: always outdoors or in a well-ventilated place.

In some workshops, an improved stove such as a Rocket Stove can reduce fuel use. However, you need a stable stove, good ventilation and heat you can control. Avoid makeshift setups around caustic batter.

Never light a fire in a closed room: smoke and carbon monoxide can kill.



Stable stove, outdoors or in a well-ventilated place

Never in a closed room: smoke and carbon monoxide

9.5 Unmolding, cutting and curing



A defect? Set the batch aside.

The rules for unmolding, cutting and curing are explained in 7.5. In practice, add two habits:

- when unmolding and cutting, note any crack, liquid pocket, separation or other defect, and set aside any suspect batch;
- during curing, place the soaps on a clean, airy rack, out of reach of the public and away from excess moisture. The times often given, such as 4 to 6 weeks for some CP soaps, are only a guide: they do not prove that a batch is safe or compliant.

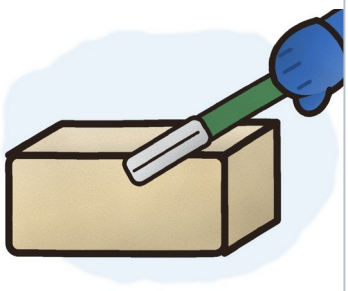
9.6 Simple finishing and presentation



Finishing makes soap look better; it does not fix a defect.

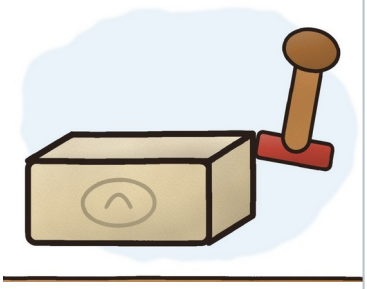
After proper unmolding, you can even out the edges with a plane, round off the corners (beveling), stamp a design or make a simple relief. These finishes make the soap easier to hold and improve its presentation. They require clean, suitable tools, careful handling and batch traceability. They never make a poorly dosed or suspect soap compliant.

1

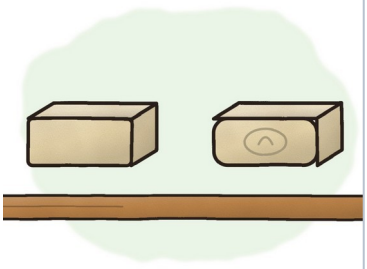


Round off the corners

2



Stamp a design



Simply cut / rounded corners

Finishing takes time: record this time if you are preparing a small business activity. For a small project, compare two soaps from the same batch, one simply cut and the other with rounded corners. Ask the learners to describe the difference in how they feel in the hand, the extra working time and its cost. Photograph the results if you have the equipment, without replacing written notes.

Key points

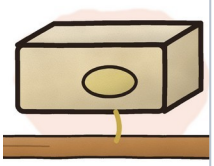
Observing the batter, the soap and the production conditions teaches a lot. But a normal appearance does not replace proper checks.

9.7 What to do when something looks wrong?

Something wrong: set aside, record, do not distribute.

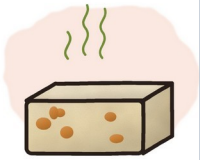
Observation	Careful response
Liquid pocket or separation	Set the batch aside, document it, do not distribute it
Unusual smell or rancidity	Set aside and examine the raw materials, storage and batch
Crumbly or very soft soap	Check the weighings, formula, process and curing conditions
Single pH result	Do not conclude that there is no free alkali

!



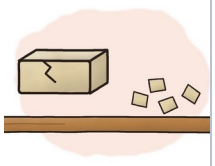
Liquid pocket, separation

!



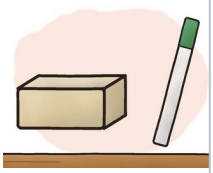
Unusual smell, spots

!



Crumbly or very soft soap

!



Single pH reading: not proof

✔



Set aside, document, do not distribute

Exercise 1 — Two identical soaps?

Two soaps look the same; one was cooked, the other dried for five weeks. Can we say that both are safe?

Exercise 2 — Choosing a method: three situations

A. A group of beginners wants to try molding and presentation without handling raw caustic soda.

B. An experienced workshop has controlled heating and wants to study hot process saponification.

C. A person wants to learn how to calculate caustic soda for an oil recipe.

For each situation, choose a method and explain its limits.

Check your learning

1. What is the difference between CP, HP and Melt & Pour?
2. What is trace?
3. Name three defects that justify setting a batch aside.
4. Why does a longer cure not fix a caustic soda calculation error?

Answers

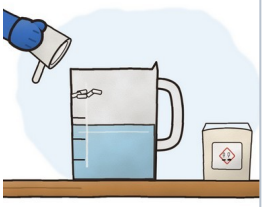
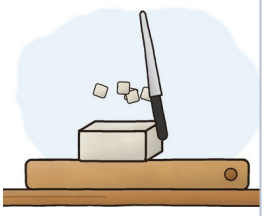
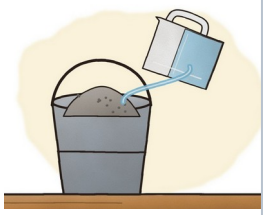
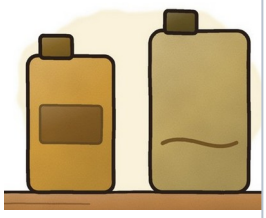
Exercise 1. No. Neither the appearance, the cooking nor the curing time replaces suitable checks and a review of the batch file.

Exercise 2. A. A suitable Melt & Pour soap base may be appropriate, following the manufacturer's instructions. B. HP can be studied with supervision, protection and suitable checks; cooking does not guarantee the absence of free alkali. C. Start with paper calculations using documented SAP values; a CP batch comes only after the formula, the equipment and the safety conditions have been approved.

Check your learning. 1. CP: no deliberate heating; HP: controlled cooking; Melt & Pour: ready-made soap base, melted then molded. 2. The thickening of the emulsion during mixing. 3. For example: liquid pocket or separation, unusual or rancid smell, crumbly or very soft soap. 4. Curing dries the soap; it does not change the amount of caustic soda added.

10. Discovering other soaps

Key points in pictures

1	2	?	!
			
Liquid: potash KOH	Melt & Pour	Ash: unknown strength	Used oils: check first

Once you understand bar soap, you can discover other techniques. They are interesting, but they do not all use the same ingredients or the same calculations.

What you will learn

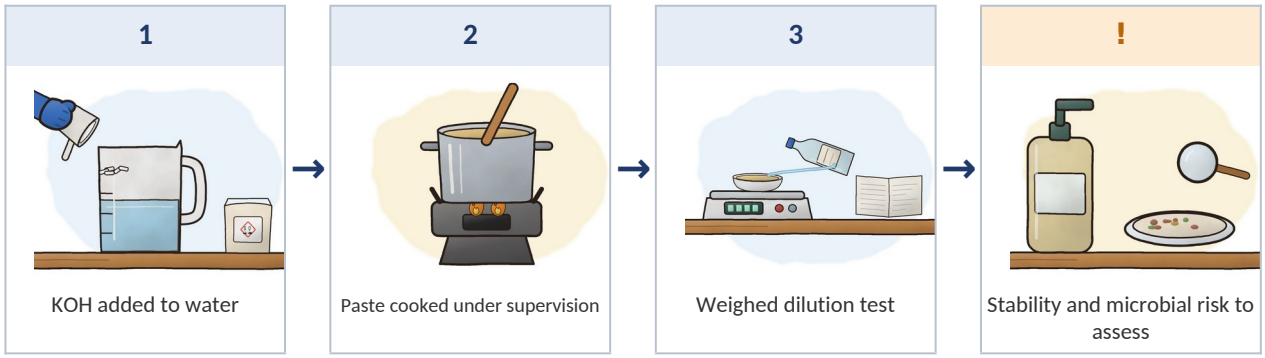
By the end of this chapter, you will be able to recognize the limits of a bar soap recipe, tell apart liquid soap, melt-and-pour soap base, additives and ash lye, and know when a method requires training or extra checks.

10.1 Liquid soaps

Liquid soap: potash KOH, a new calculation, extra checks.

Many liquid soaps use caustic potash (KOH) instead of caustic soda (NaOH); it often gives more soluble soaps. Never replace the mass of NaOH in a recipe with the same mass of KOH: the calculation must be redone with the right SAP values and the purity of the commercial potash.

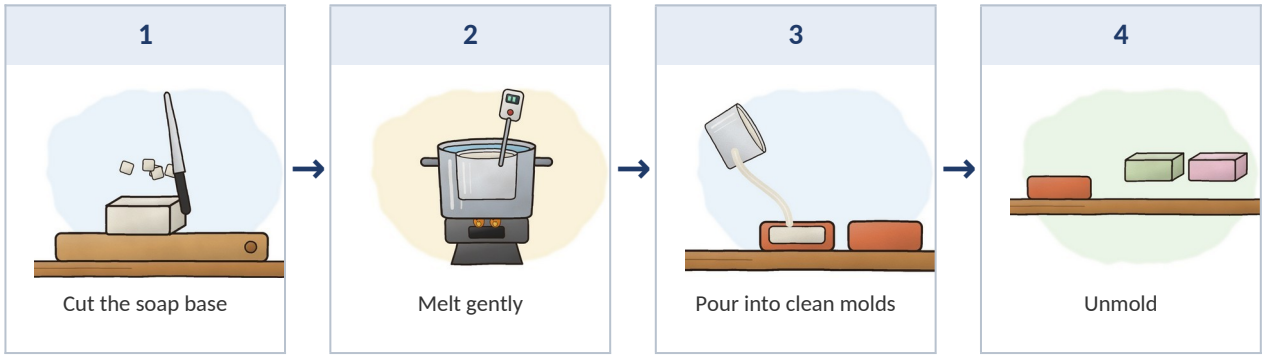
Making a paste and then diluting it in water is a specific process. Dilution raises questions of stability, packaging and microbiological quality. A diluted soap is not necessarily well preserved just because it is alkaline: the checks and, depending on the formula and use, the preservation strategy must be adapted.



10.2 Melt & Pour: another way in

Melt & Pour: learning to mold without handling caustic soda.

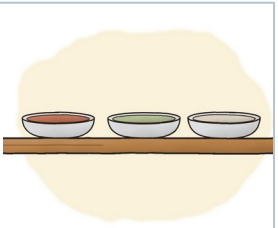
With a ready-to-use soap base, you can learn to prepare a mold, gently melt the soap base without overheating it, and pour it into clean molds. Only add compatible additives, within the limits given by the manufacturer. Do not assume that fresh plants, milk, food or extra water can be added without consequences for shelf life.



10.3 Additives: useful, but never automatic

Natural does not mean harmless.

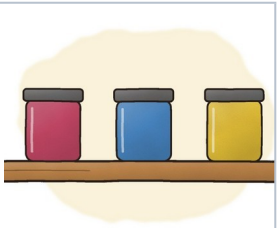
Type	Possible role	Precaution
Clays, powders	Appearance, texture	Dispersion, purity, dosage
Fragrances and essential oils	Scent	Restrictions, allergens, irritation
Colorants	Color	Compatibility and stability
Milk, honey, purées, decoctions	Desired formulation effects	Overheating, spoilage, stability and microbial risk



Clays, powders



Fragrances, essential oils



Colorants



Milk, honey, purées, decoctions

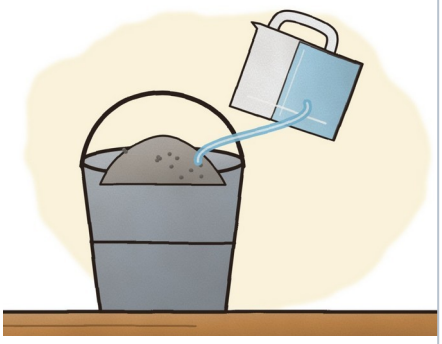
A natural ingredient is not automatically suitable for the skin or for every recipe. Any change to a recipe may require a new safety and stability assessment.

10.4 Ash lye: a traditional technique to understand

Ash lye: unknown strength. No recipe for beginners.

Traditionally, an alkaline liquid is obtained by putting certain ashes in contact with water, then separating the liquid from the solids. But its composition, strength and real ability to saponify vary greatly depending on the ashes and the preparation.

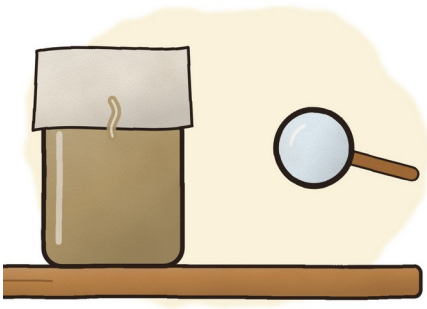
1



Ashes put in contact with water

→

?



Liquid separated: variable strength, not measured

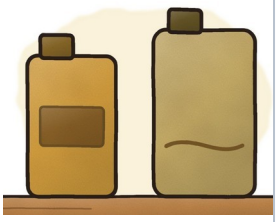
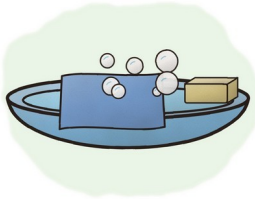
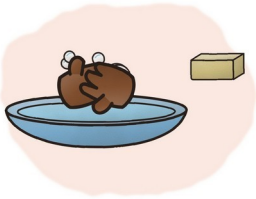
This liquid is not a direct replacement for commercial caustic soda or potash. Without measuring its alkalinity or using a suitable method, a soap recipe cannot be calculated reliably. In this handbook, ash lye is presented as part of technical culture, with no recipe for beginners. An uncharacterized ash liquid must not be used to formulate a body soap that is sold or distributed (see also Appendix I).

10.5 Used cooking oils

Used oils: only for some household soaps, after checks.

They can have economic and environmental value for some household soaps, but their condition, oxidation and contaminants vary. Using them requires organized collection, characterization and a suitable calculation. Do not treat them as a substitute for fresh oil;

they are not recommended for body soap without proper assessment (see also Appendix K).

1	2	✔	✘
			
Organized collection	Filter and characterize	Possible study for some household soaps	Not for body soap without assessment

10.6 Choosing a method according to your goal

Choose the method according to what you want to learn.

- To understand how soap is made, first study a checked and well-explained bar soap formula.
- To try molding without handling raw caustic soda, you may start with a suitable Melt & Pour soap base.
- For liquid soaps and special processes, follow training and a protocol specific to each technique.

Going further

To learn more about special soaps, consult reliable technical references and compare the processes before any trial. The requirements that apply depend on the country, the type of soap and its use: check local rules before any sale.

Exercise — Replacing caustic soda with potash?

A cooperative wants to make liquid soap by simply replacing caustic soda (NaOH) with potash (KOH). Is this possible?

Check your learning

1. What makes a liquid soap different from a bar soap?
2. Why can ash lye not replace caustic soda or potash of known quality?
3. Name two risks linked to additives.
4. Which method would you suggest to a group of beginners who must not handle caustic soda?

Key points

A new method is not just a different recipe. It may require other calculations, extra equipment and a different organization.

Answers

Exercise. No. The formula must be recalculated with the KOH SAP values, the purity of the potash checked, and then the process, dilution, stability and product quality assessed.

Check your learning. 1. It is usually made with potash (KOH), then diluted: its stability and shelf life need a specific assessment. 2. Its composition and strength vary and are not measured. 3. For example: irritation or allergy, overheating of the batter, spoilage or microbial risk. 4. A suitable Melt & Pour soap base.

11. Checking and storing

Key points in pictures



A soap can look successful and still have a problem. That is why you must keep a record of every batch. The aim is not to turn a small workshop into a laboratory, but to know what you made, with which materials and under what conditions.

What you will learn

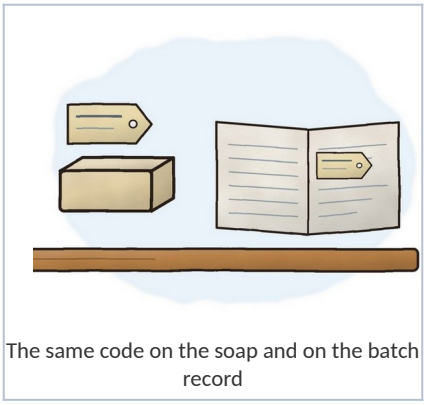
By the end of this chapter, you will be able to tell an observation from proof of compliance, document checks, identify a batch that must be set aside, and understand curing, storage and the limits of simple measurements.

11.1 Why check every batch?

One number per batch, on the soap and on the record.

Two batches of the same formula can differ: variation in the oils, a weighing error, temperature, mixing, humidity or storage. A batch must be identifiable, open to examination and, if necessary, discarded. Quality is not just a question of appearance: it includes safety, consistency, intended use and applicable obligations.

Give each batch a simple number, for example AP-2026-001. A batch is one production run that can be traced through its batch record. Write down the date, the recipe, the raw materials, the quantities actually weighed and your observations.

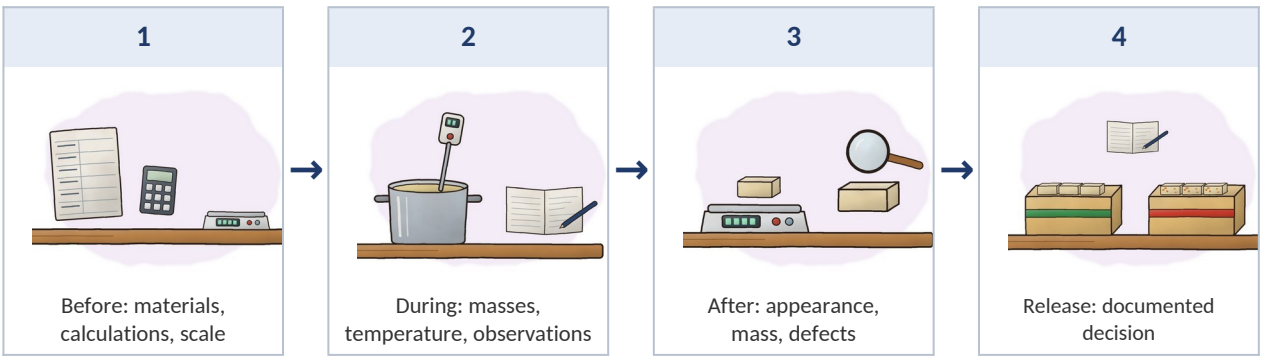


The same code on the soap and on the batch record

11.2 Four levels of checks

Check before, during and after, then decide in writing.

Step	What is checked	Limit to understand
1. Before making	Identity of materials, SAP value used, purity of the alkali, calculations, scale, condition of equipment	A correct sheet does not guarantee correct weighing.
2. During	Masses actually added, temperature if relevant, incidents, appearance of the emulsion, batch number	Trace does not show that saponification is complete.
3. After making	Appearance, uniformity, mass, drying, storage, visible defects, changes over time	A hard, dry or attractive soap is not necessarily safe.
4. Release	Suitable checks completed, complete file, written and dated decision	Without a documented decision, the batch remains on hold.



A well-completed record makes it possible to trace an error. It does not replace the checks needed to decide how the batch can be used.

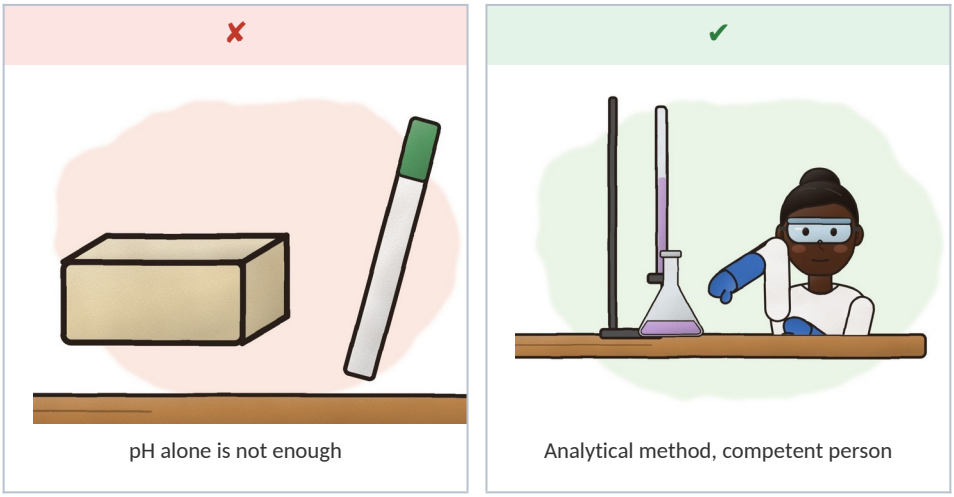
11.3 pH, free alkali and laboratory tests

pH alone does not tell you whether the soap is safe.

Traditional soaps are generally alkaline. pH shows whether a preparation is acidic or alkaline under the measuring conditions; the result depends in particular on the method and the dilution, and

test strips can be imprecise. **A pH strip does not tell you how much caustic soda remains in the soap. It is not enough to decide that a soap can be used on the skin.**

If free alkali needs to be checked, use an analytical method suited to the product, carried out by a competent person. Compliance criteria vary with the type of product, its use and local regulations: do not invent a universal limit. Curing time, cooking and the "tongue test" do not replace these checks.



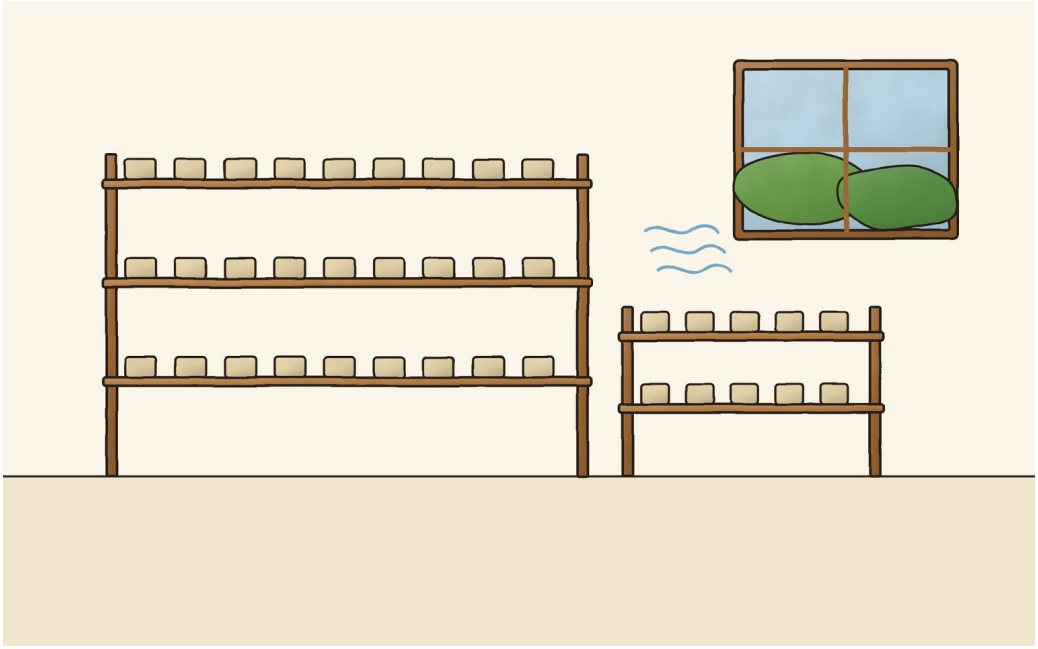
pH alone is not enough

Analytical method, competent person

11.4 Curing and storage

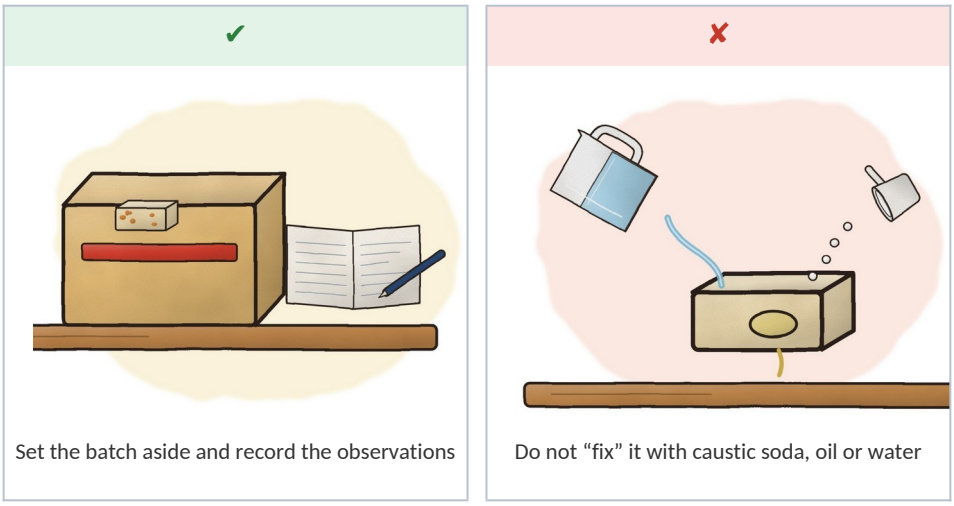
Cure in a clean, protected place. A defect: batch set aside.

For many cold process bar soaps, a period of several weeks (as a guide) allows the texture to change and water to evaporate; it is not a safety test. Store the soaps in a clean, airy space, protected from contamination, excess moisture, animals and direct sunlight where this suits the formula. Write down the dates and observations.



Curing: clean, airy space, away from direct sunlight, excess moisture and animals.

Watch especially for abnormal smells, spots, rancidity, sweating, cracks and warping. If the soap shows separation, a liquid pocket, an unusual smell, spots, sweating or a known weighing error, identify the batch, set it aside and write down what you observed. Then look for the cause and decide what to do with it. Never try to “fix” a potentially caustic soap by adding caustic soda, oil or water.



Set the batch aside and record the observations

Do not “fix” it with caustic soda, oil or water

Do not announce a universal shelf life: stability depends on the formula, the raw materials, the packaging, humidity, storage conditions and the checks carried out. Any date or shelf life given to users must be justified for the product concerned.

11.5 Liquid soaps: extra care

Liquid soap: extra checks.

Liquid soaps and diluted products raise particular issues of stability, packaging and microbiological contamination. High alkalinity does not automatically remove the need for a proper assessment of microbiological risk, stability and, where relevant, preservation.

Exercise — Deciding without guessing

A batch hardened after five weeks, but the weighing record shows more caustic soda than the calculated amount. Can it be distributed?

Check your learning

1. Why is a measured pH not enough to check free alkali?
2. What data should you keep to trace the origin of a defect?
3. What should you do with a batch whose compliance is uncertain?

Key points

Observe, record and be able to trace a batch.

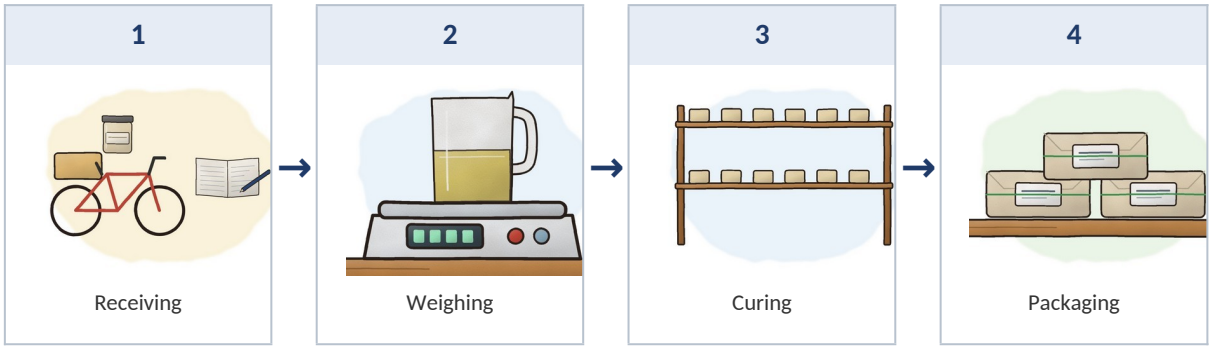
Answers

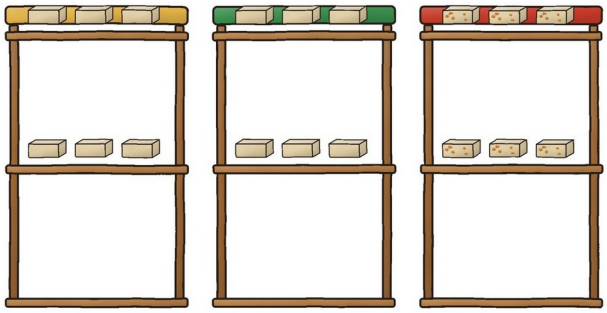
Exercise. No. Set the batch aside, keep its traceability and ask for a competent assessment. Neither hardness nor curing time makes up for a formula error.

Check your learning. 1. pH tells you about acidity or alkalinity under the measuring conditions, not about the amount of free alkali. 2. The batch identifier, the materials and their batch numbers, the weighings, the process, the observations and the checks. 3. Set it aside, document it and do not distribute it before a well-founded decision.

12. Organizing small-scale production

Key points in pictures





On hold (yellow) · released (green) · rejected (red)

Small-scale production does not start with buying machines. It starts with a well-organized space, repeatable steps and a realistic estimate of what you can make.

What you will learn

By the end of this chapter, you will be able to move from a one-off trial to repeatable production, organize space and stock, prepare batch records and distinguish cost, capacity and compliance before selling.

12.1 Producing regularly does not mean producing fast

A few well-recorded batches rather than many untracked ones.

Successful small-scale production starts with a well-controlled formula, a written procedure, checked equipment and realistic capacity. A small number of documented batches is better than many batches that cannot be traced.

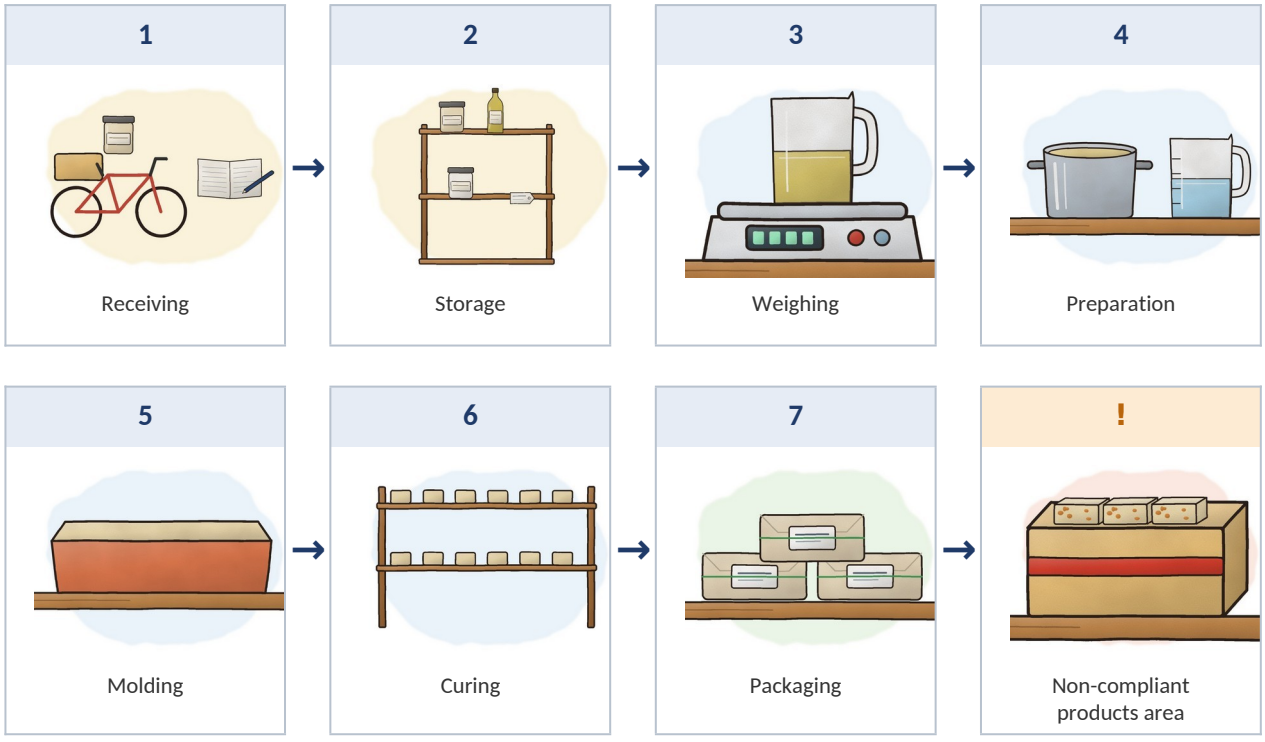
Quantities should only increase once the methods, quality control and workshop safety have been approved.

12.2 Organizing the flow of materials

A clear path: receiving, storage, weighing, making, curing, packaging.

Picture the journey of an oil through the workshop: it arrives, is identified, stored, weighed and mixed, then the soap is molded, monitored, possibly packaged and stored. Arrange the tools so that these steps follow one another without confusion.

As far as possible, separate the receiving of raw materials, storage, weighing, preparation, molding, curing, packaging and the area for non-compliant products. Even in a single room, clearly separate raw materials, clean tools, batches in progress and batches set aside. Avoid crossovers, contamination and access to caustic substances.



12.3 Batch record: an example to follow

Never write a made-up figure on a batch record.

Never fill in a box with an assumed figure. If a piece of data is missing, say so clearly.

Field	Example of data to record
Identification	Batch AP-2026-001; date; person in charge

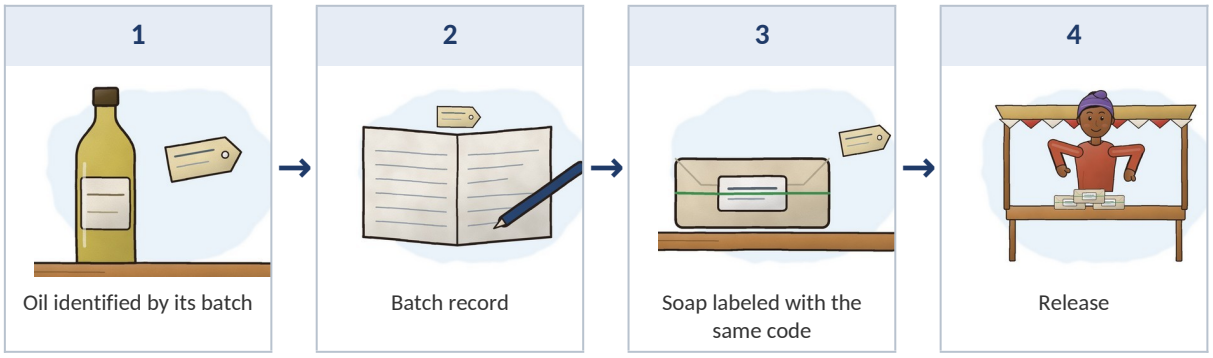
Field	Example of data to record
Materials	Name, supplier, batch number, date, planned quantity
Production	Masses actually weighed, method, equipment, incidents
Follow-up	Molding and unmolding dates, observations and checks
Decision	Batch on hold / released / rejected; date and person in charge

Fictional example of a completed record: batch AP-2026-001; date of manufacture: 11 October; person in charge: workshop A; formula: reference F-01; materials: batch numbers and masses actually weighed to be filled in; observation: medium trace; initial status: AWAITING CHECKS.

When unmolding, add the date and observations. Before any release, write down the checks actually carried out, their results, the decision and the name of the person responsible.

Exercise — Tracing a faulty oil

On a blank record, note three pieces of information that would help trace a faulty oil.

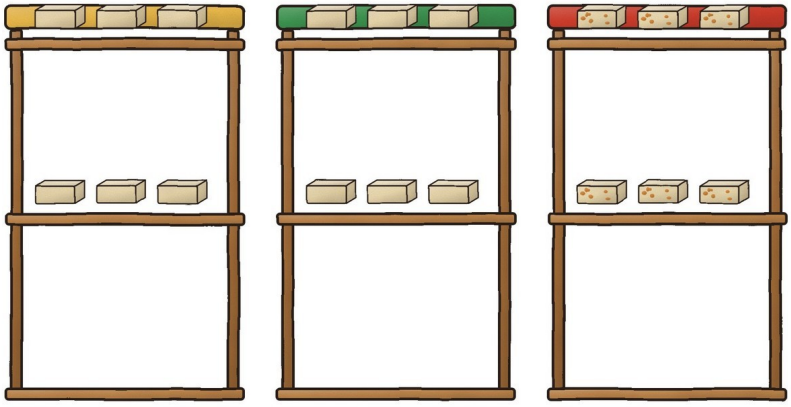


12.4 Stock and traceability

Three statuses: on hold (yellow), released (green), rejected (red).

When an oil arrives, write down its name, origin and date of receipt, and label it. Record the quantities received, used and remaining. Keep doubtful materials separate from those that can be used and regularly check for smells and signs of spoilage. Use a rotation system suited to the dates, stability and real condition of the materials. Oxidized oils or oils of uncertain composition must be assessed before use.

Clearly mark finished products with three statuses, always the same: **on hold** awaiting checks (yellow), **released** (green) and **rejected** (red).



Three storage areas: awaiting checks (yellow) · released (green) · rejected (red).

12.5 Packaging and labeling

Only package soap that has been checked and is dry.

Only package a soap once its checks and the appropriate follow-up period are complete. Choose packaging that is clean, dry and suited to the product and how it will be stored. Do not seal a soap that is still too moist in packaging that traps water.



Clean, dry, suitable, labeled packaging

No soap that is still moist in packaging that traps water

For micro-production, compare the cost and availability of several types of packaging, but never remove essential information to lower the price.

The label helps customers recognize the soap and allows its batch to be traced. Prepare a label mock-up with the product name, its use, the identity of the manufacturer or person responsible, the batch number, net quantity, ingredients and relevant precautions. This list is a teaching reminder: the information actually required, its order and its layout depend on the country and the product category (cosmetic or household).

Before printing, check the local requirements that apply. INCI names, allergens, shelf life and claims are not handled the same way everywhere. Check on a real sample that the label is readable and suited to where the product is going. Never invent an

expiry date and never promise an unproven effect, for example “suitable for all skin types”, “completely safe” or “disinfectant”.

Exercise — Designing a label

Draw a label for a 100 g soap, then check that its batch number matches the batch record. Have the regulatory information reviewed before any sale.

12.6 Hygiene, cleaning and waste

Who cleans, when and with what.

Set up a simple plan: who cleans, when, with what and how it is checked. Fresh batter residues can remain caustic. Do not use vinegar as a makeshift neutralizer, neither on the skin nor to treat an exposure. Manage waste and cleaning water according to their composition and local rules.



Cleaning plan: who, when, with what, how to check

12.7 Preparing costs and sales

The price does not depend only on the oils.

For each batch, record the mass of oils, the amount of soap actually sellable, the cost of materials, energy, water, packaging, losses, transport and labor. The selling price must not be calculated from the cost of the oils alone (see Chapter 13). Selling a body soap may be subject to specific cosmetic requirements; selling a household soap, to other rules. Check the obligations of the target country and market before putting anything on sale.

12.8 A small workshop, a team of five or six people

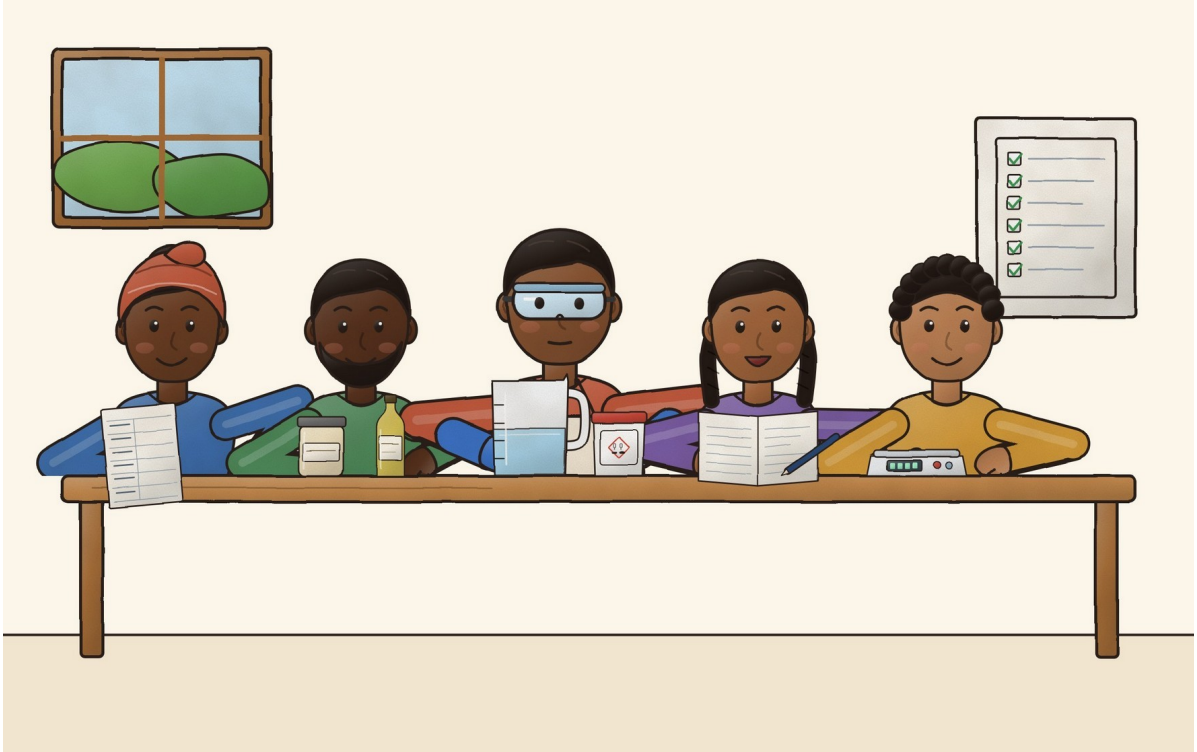
One role per person. Only the trained person in charge handles caustic soda.

With five or six people, share out the tasks: preparing documents, checking materials, weighing under supervision, observing the process, keeping the batch record, tidying up and checking. Any

handling of alkali remains the responsibility of a trained and equipped person, following a suitable procedure. Each participant must be able to explain the steps they carry out.

Exercise — Calculating sellable production

A batch gives 40 molded soaps. Three are rejected at the check. How many soaps can be counted when calculating the cost per sellable soap? If the total cost of the batch is €74, what is the average cost per sellable soap?



Everyone has a role and can explain it; only the trained and equipped person handles the alkali.

12.9 Do not produce more than you need

Start with small batches.

Start with batches of a manageable size. Measure the time needed, the losses and the storage needs. Larger production is only useful if you know how to monitor it, store it and find buyers.

Check your learning

1. What is a batch number for?
2. Why keep products on hold separate from released products?
3. Which expenses must be included in the full cost?

Key points

A well-organized workshop avoids losses and makes learning easier. The batch record template is in Appendix A.

Answers

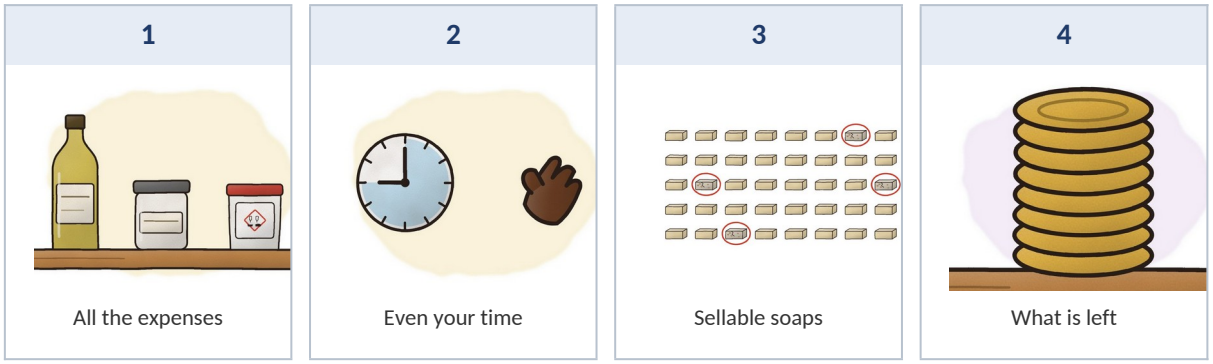
Exercise — faulty oil. The identity and supplier of the oil, its batch number, and the quantity used in each batch.

Exercise — sellable production. 37 soaps, provided that all 37 units meet the release criteria. Average cost: 74 ÷ 37 = €2.00 per sellable soap; this is not yet a selling price.

Check your learning. 1. To trace the materials, operations and checks. 2. To avoid distributing a product that has not been assessed. 3. Materials, energy, water, packaging, losses, labor, transport and other relevant costs.

13. Calculating costs and selling

Key points in pictures



Making soap can help create an activity and generate income. But to know whether this activity really pays, you must count all the expenses, not just the oils.

What you will learn

By the end of this chapter, you will be able to list the expenses of a batch, calculate the cost per sellable soap, tell the difference between revenue and profit, and prepare a sales decision without neglecting quality or local obligations.

13.1 Why calculate before selling?

Selling does not mean earning. Calculate first.

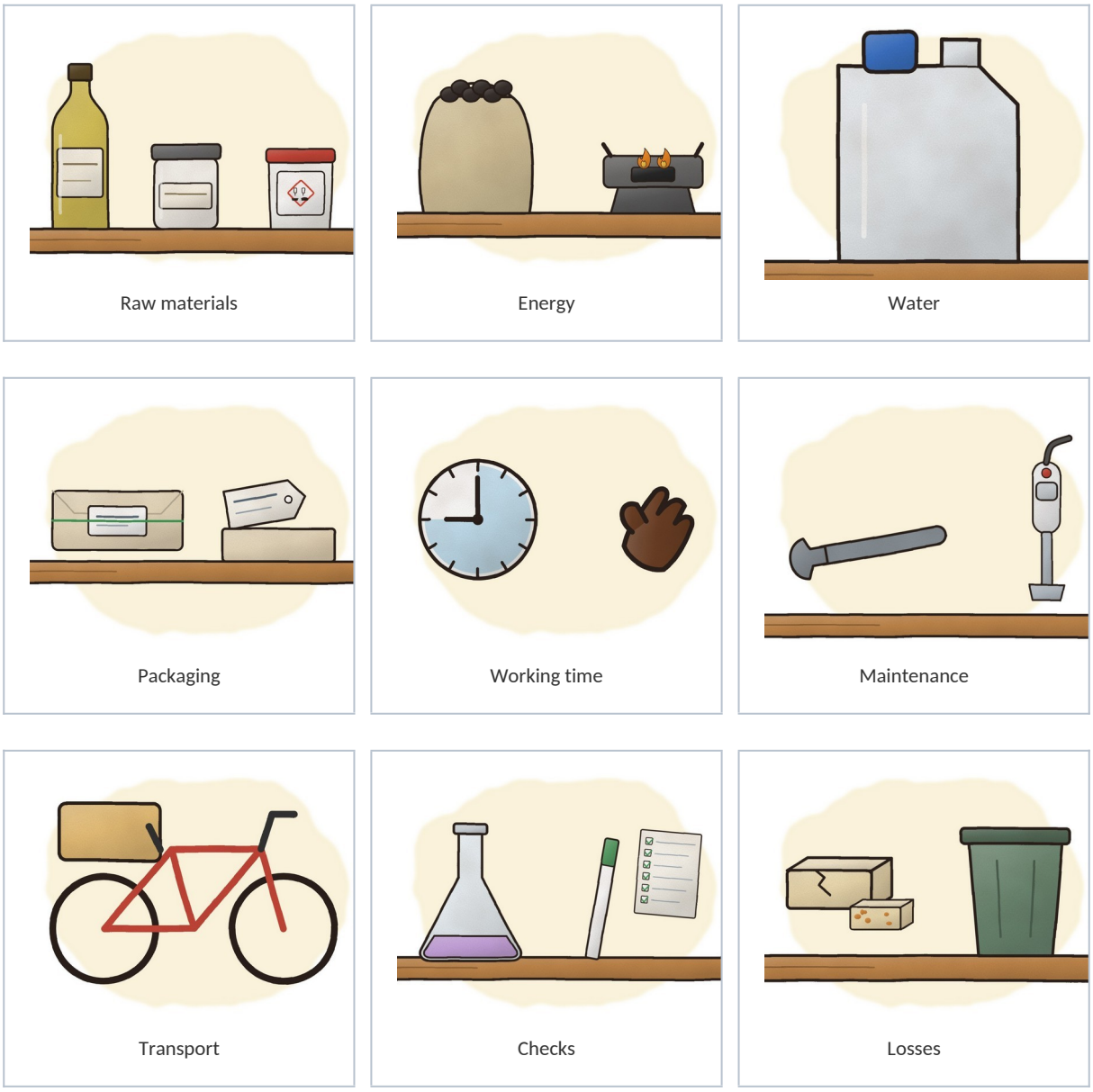
A small soap workshop can help generate income, but selling does not necessarily mean making money. An activity can bring in cash while losing resources if the price does not cover raw materials, labor, losses and other costs.

Start by estimating the expenses of a small documented batch and the possible sales. After each batch, replace the estimates with the real expenses. Note what has changed and correct your forecast for the next batch. Also review the calculation when the price of oils, energy or packaging changes.

13.2 Identifying expenses

Write down every expense, even your time.

Record separately the raw materials (oils, alkalis, water, additives), energy, packaging, working hours, maintenance, transport, checks, losses and the share of fixed costs allocated to the batch. For each expense, give the quantity, unit price and total amount.



Do not forget the cost of protective equipment, training and checks. An expense that is essential for safety must never be cut to show a lower price. Working time has value, even if the person making the soap does not yet pay themselves a salary.

13.3 Counting the soaps that are actually sellable

Divide by the sellable soaps, not by the molded soaps.

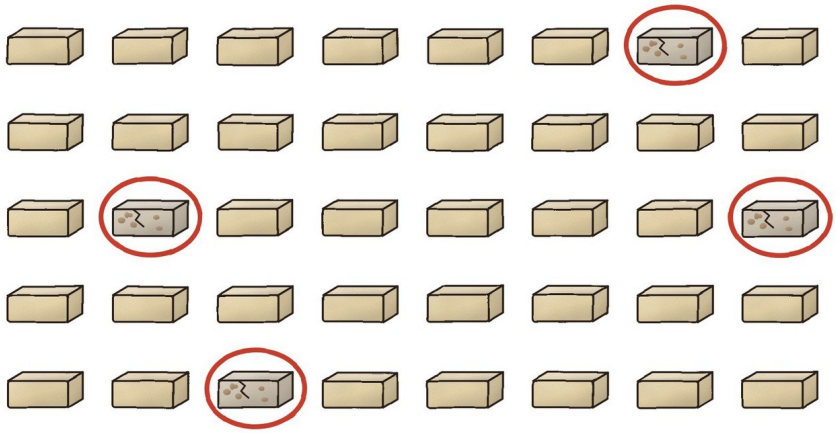
The quantity that comes out of the mold is not necessarily the quantity you can sell. Soaps may be rejected after checks, damaged or kept as samples. The unit cost is calculated on the units that are compliant and actually sellable, not on theoretical production.

Formula: full cost of the batch ÷ number of sellable soaps = full cost per soap.

13.4 Example

Here is an example calculation, in fictional currency units. You can replace these units with your own country's currency.

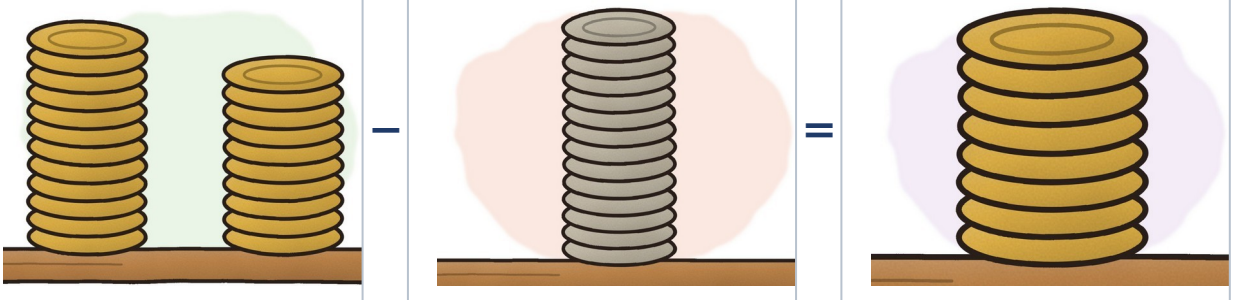
Item	Cost (currency units)
Raw materials	12.00
Energy and water	2.00
Packaging	3.00
Labor	5.00
Share of other costs	2.00
Total	**24.00**



40 soaps molded, 4 rejected: 36 sellable soaps. Cost per soap: 24 ÷ 36 ≈ 0.67 unit.

If the batch gives 40 sellable soaps, the unit cost is 0.60 unit. With 4 soaps rejected, the cost per sellable soap goes up: expenses must be divided by the number actually sellable, not the number molded.

Suppose these 36 soaps sell for 1.00 unit each. The revenue is 36.00 units. After subtracting the 24.00 units of expenses already counted, 12.00 units remain before any other costs and applicable taxes. This is not a promise of profit.



13.5 Price, revenue and profit



Revenue − expenses = profit (or loss).

Cost is the money spent to make and offer the soap. Revenue is the total of sales; profit is what is left after expenses. So selling a lot does not necessarily mean earning a lot.

The selling price is worked out from the full cost, the selling expenses, applicable taxes and what the local market can bear. Compare the full cost with the price customers are willing and able to pay. Take into account transport, time spent selling, unsold stock and local charges. A price that is too low can lose money; a price that is too high can make it hard to find buyers.

13.6 Before putting soap on sale



Check the country's rules before selling.

Check the intended use of the product: a soap meant for the body does not necessarily follow the same rules as a household product. Depending on the country, selling may require a safety assessment, a product file, regulatory labeling, notifications, hygiene rules and traceability records. Handmade production is not automatically exempt from these obligations.

In the European Union, soaps intended for cleaning the skin may fall under the Cosmetics Regulation (EC) No 1223/2009; their classification and the requirements that apply must be checked. For Madagascar and other countries concerned, check local rules before selling anything.

13.7 Calculation sheet to copy



Copy this sheet for each batch.

Item	To fill in
Date / batch number	
Number of soaps produced	
Number of sellable soaps	
Materials + energy + packaging	
Labor + other costs	
Full cost of the batch	
Cost per sellable soap	
Planned price and justification	

See also Appendix F.

Exercise — Unit cost

A batch costs 45 units and gives 60 compliant soaps. What is the unit cost? What does it become if 10 soaps have to be rejected?

13.8 Answering customers' questions

Answer with checked information, without promises.

Before selling, prepare a simple sheet for each soap: ingredients, intended use, useful precautions, batch number and the manufacturer's contact details, according to local rules.



Answer with checked information: ingredients, intended use, batch number, precautions.

Common questions: "What ingredients do you use?", "Is this soap suitable for the face?", "Does it contain fragrance or essential oils?", "How long does it keep?" Answer with checked information, without promising a medical effect or universal tolerance ("suitable for all skin types").

The words "natural", "organic" and "handmade" do not remove the need for proof when the regulations or the way the product is presented require it. Do not present a household soap as a body soap.

Check your learning

1. Why are the "number produced" and the "number sellable" different?
2. What is the difference between revenue and profit?
3. Is handmade production exempt from the rules on selling?

Key points

A worthwhile activity must cover its expenses and respect the rules of the target market.

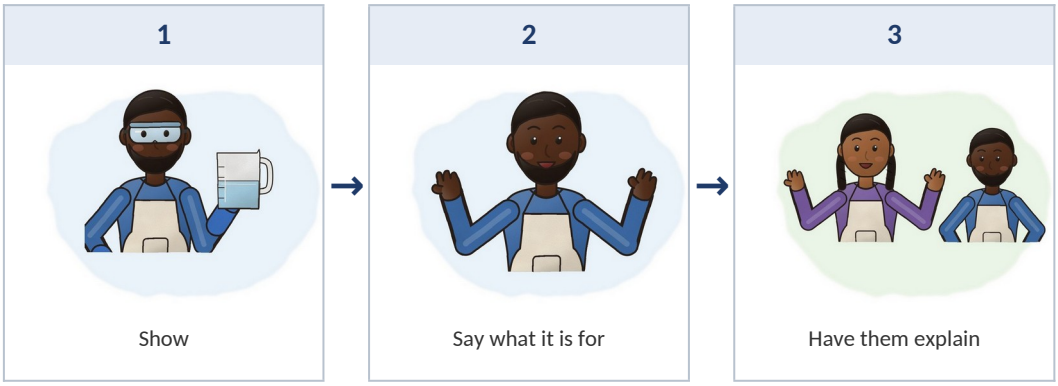
Answers

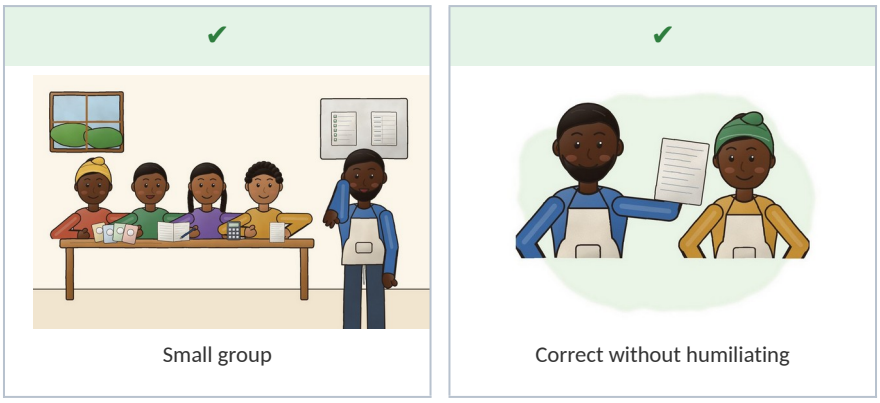
Exercise. 45 ÷ 60 = 0.75 unit. With 50 sellable soaps: 45 ÷ 50 = 0.90 unit. Fewer compliant soaps means a higher cost for each sellable soap.

Check your learning. 1. Soaps may be rejected at the check, damaged or kept as samples. 2. Revenue is the total of sales; profit is what is left after expenses. 3. No, not automatically.

14. Training and passing on skills

Key points in pictures





Someone who knows how to make soap does not automatically know how to teach it. Training someone means enabling them to understand, ask questions and check what they have learned.

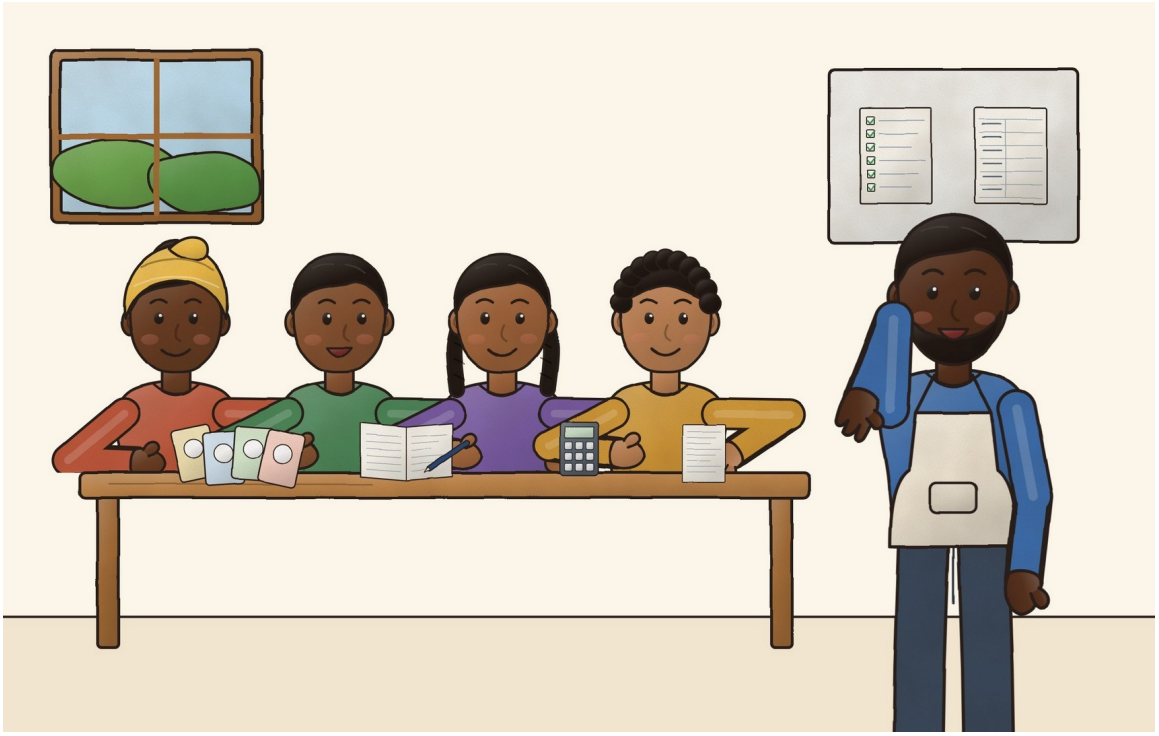
What you will learn

By the end of this chapter, you will be able to prepare a session for five or six adults, have them practice calculations without risk, observe what they have learned and decide when someone needs extra support.

14.1 Training is not just showing

Training means helping people understand and having them explain.

A good demonstration makes people want to try. Good training above all helps people understand why each step is done, recognize dangerous situations and check their results. The trainer invites participants to ask questions and to explain the steps themselves.



A small group: everyone can see, ask and explain.

14.2 Before welcoming the group

Five or six people. Prepare the venue, the equipment and the protection.

A group of five or six people allows everyone to take part. Define the expected learning outcomes: identify NaOH and KOH, read a label, recognize protective equipment, calculate simple percentages, explain the order for adding alkali, understand a batch record and name the limits of a visual check.

Before the session, ask which oils, containers, water sources and tools are really available. Have participants distinguish between what is available, what still needs checking and what is missing. Never replace an essential ingredient or protective item with a makeshift solution.

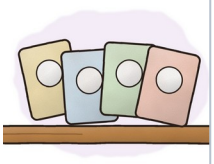
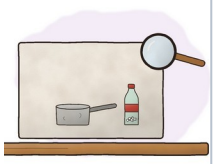
Prepare an accessible, ventilated and organized venue, water for rinsing, emergency contacts, printed sheets and a reserved demonstration area. Check the safety data sheets and the formula approved in advance. If conditions do not allow a demonstration with alkali, use illustrations, calculation exercises or a demonstration without caustic products.

14.3 Example of a five-session course

Five sessions, starting without caustic soda.

Session	Goal	Risk-free activity
Understand	Define soap and recognize the materials	Match “material” cards with “role” cards

Session	Goal	Risk-free activity
2. Safety	Recognize the risks, protective equipment and prohibitions	Spot the mistakes in a drawn scene
3. Calculate	Read percentages and check a 100% total	Paper exercises in small groups
4. Observe	Identify the steps of a production run	Watch a supervised demonstration or pictures
5. Check	Fill in a batch record and explain the checks	Study of a fictional batch and oral review

1	2	3	4	5
				
Understand: “material” and “role” cards	Safety: spot the mistakes	Calculate on paper	Watch a demonstration	Check: batch record

The length and number of sessions can be adapted. A first training course can take place without participants handling any caustic soda. Taking part in real soapmaking depends on supervision, demonstrated skills and safety conditions.

14.4 Preparing a repeatable session plan

One sheet per session.

For each session, prepare a session sheet stating: the observable goal, the length, the number of participants, the equipment, the protective equipment available, the trainer’s role, a risk-free exercise, the points to check and the assessment method (template in Appendix H).

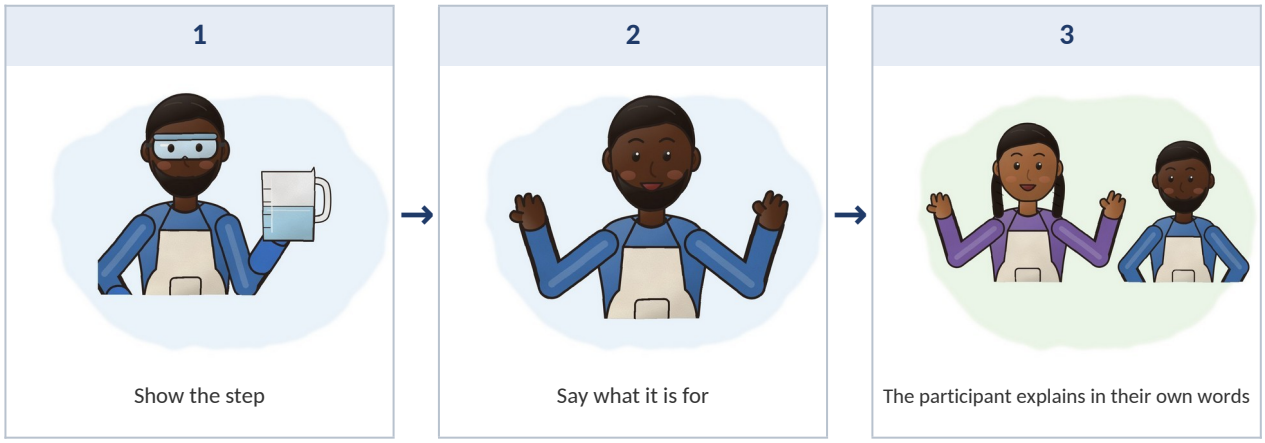
Example goal: “By the end of the session, each participant can explain why alkali is poured into water, identify two incompatible materials and check that a formula adds up to 100% fats.” Have participants restate the answers individually, without handling caustic soda during the assessment.

14.5 Demonstrating accurately

Show, say what it is for, have them explain.

Present the equipment before the demonstration. Explain the steps in order and say what is observed and what must be measured.

Show the step, say what it is for, then ask a participant to explain it in their own words. Use real objects, clear pictures and everyday examples rather than long definitions.



Never ask a beginner to handle a caustic solution just to “build confidence”. The trainer stays in control of dangerous operations.

14.6 Checking learning without humiliating

Check with a concrete task, without humiliating.

Do not just ask “Have you understood?”. Give a concrete task: restate the safety rules, add up the percentages in a formula, explain the order for mixing caustic soda and water, identify a forbidden container or fill in a fictional batch record.

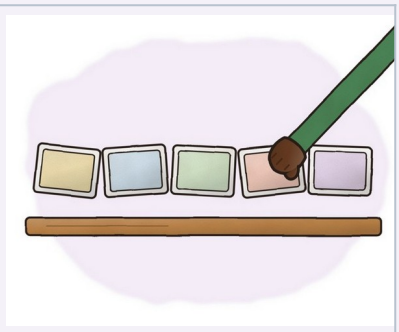
If someone makes a mistake, explain again without humiliating them, then have them redo the exercise. A skill is acquired when the person can explain it and apply it correctly, not when they seem confident.


If there is a mistake: explain again without humiliating, then redo the exercise

Observable skill	Acquired?
Explains the difference between NaOH and KOH	Yes / Review
Says “alkali into water” and “never aluminum”	Yes / Review
Chooses protective equipment and knows how to react to a splash	Yes / Review
Checks that the oil proportions add up to 100%	Yes / Review
Tells apart trace, curing and safety checks	Yes / Review
Fills in a batch record without made-up data	Yes / Review
Explains why a doubtful batch is not sold	Yes / Review

For the trainer — Two-way self-reliance test

Assessment without reading: show only the soapmaking pictures (for example the numbered images in section 7.3, printed as cards) and ask the learner to put the steps back in order, point out the protective equipment and identify the situations where they must stop.



Assessment without reading: put the pictures back in order

Assessment without pictures: give the printed text, a recipe sheet and a fictional batch. Ask the learner to explain the process, check the calculations and state the criteria that rule out starting or distributing the batch.

Passing both tests shows how well the handbook teaches; it does not qualify anyone to handle alkalis alone.

14.7 Worked exercises for the trainer

Four situations to practice correcting.

- **Situation A:** a participant wants to pour water into a container holding solid caustic soda. *Correction:* stop the operation immediately; remind them that alkali is added gradually to water, using suitable equipment.
- **Situation B:** a recipe contains 50% + 20% + 20% + 5% oils. *Correction:* the total is 95%. 5% is missing; no weighing should start before it is corrected.
- **Situation C:** a soap hardened after four weeks. Can we say it is safe? *Correction:* no; hardness and curing time prove neither the absence of free alkali nor that the product is compliant.
- **Situation D:** a learner wants to turn a bar soap recipe made with caustic soda (NaOH) into a liquid soap by replacing the caustic soda with potash (KOH). *Correction:* refuse the direct substitution. A new formula must be drawn up, using SAP values suited to KOH, taking its purity into account and planning the checks needed for liquid soap.

Key points

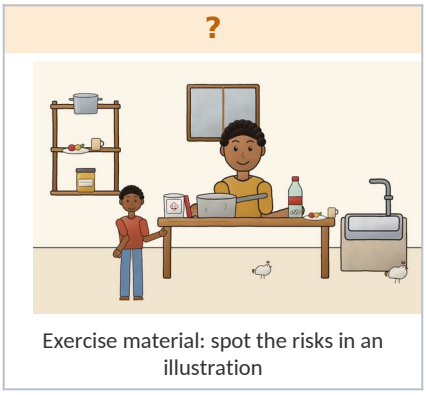
The success of a training course is not measured by the number of soaps produced, but by what participants understand and can repeat with good judgment.

14.8 Training future trainers

Passing on skills also means knowing your limits.

Invite each experienced participant to lead a short explanation, explain a step, correct an exercise, present a batch record and identify a risk in an illustration. A person ready to pass on skills can explain their choices, recognize a mistake and ask for help when their knowledge is not enough. Ask them to distinguish what they can check themselves from what requires specialist advice: passing on skills also means recognizing your limits.

Give one instruction at a time. Adapt explanations to the group's language, without changing the safety requirements. Use illustrations without built-in text, captions that can be translated and clearly written units. Do not confuse a teaching demonstration with permission to handle an alkali.



Exercise material: spot the risks in an illustration

Mini-exercise — Available, to check, missing

Each group prepares a list in three columns: "available / to check / essential but missing". If an essential protective item is missing, the soapmaking session with alkali is postponed; paper exercises can continue.

Key points

Successful training builds self-reliance step by step, based on understanding, supervised practice and observable checks.

14.9 Leading a group and solving problems

A problem? Stop, make safe, look for the cause.

For your first session as a trainer, start with a small group of five or six people. Welcome questions, involve everyone and adapt the pace. Share out the roles (reading the sheet, preparing equipment, checking weighings, observing, recording results), then

rotate them. Ask everyone to explain the safety rule before moving on to practice. Dangerous operations remain reserved for the competent, equipped person.

If a batter thickens too quickly, trace takes too long or a batch looks abnormal, stop improvising: make the workstation safe, record the quantities and working conditions, then look for the cause before making another batch. Never fix a batch at random by adding caustic soda, water or oil.

If participants disagree, go back to the safety instructions and the goals of the session. Value accurate observations rather than speed of production.

14.10 Certificate and follow-up after training

A certificate of attendance is not an official certification.

A certificate of attendance can state the participant's name, the dates, the venue, the content covered and the trainer's name. It must not be presented as an official certification if it is not one.



Certificate of attendance: this is not an official certification

After the training, hand out a recipe sheet, a batch record template, a checklist, a recipe calculation sheet and the contact details of someone to answer questions. Ask participants to present a correctly completed batch record before carrying out a new trial.

15. Practical appendices

Key points in pictures



You do not need to memorize everything. The following sheets help you prepare your workshop, follow a production run, record your expenses and trace a batch. You can print them or copy them into a notebook.

Purpose: to have simple documents, usable with a notebook, for preparing a session, recording a production run, monitoring stock, calculating costs and deciding what happens to a batch. These sheets do not replace safety procedures, proper testing or regulatory obligations.

15.1 How to use the appendices

Each sheet meets a specific need. Before making soap, use the checklist (Appendix B). During production, fill in the batch record (Appendix A). Afterwards, follow the curing (Appendix C) and

decide what happens to the batch (Appendix D). For a small business activity, use the cost sheet (Appendix F) and the sales register (Appendix G).

Never fill in a box with a made-up number. If you do not know a piece of data, write “not known” and find out how to check it.

Appendix A — Batch record

To fill in during each production run.

Field	Information to record
Identification	Date, batch code, person in charge, use of the soap
Formula	Version, masses and percentages of each oil
Materials	Supplier, batch number, date received, observations
Alkali	NaOH or KOH, stated purity, calculated mass and weighed mass
Water	Origin, mass, concentration convention
Production	Equipment, times, temperatures if useful, observations
Check	Method, results, deviations
Decision	On hold / released / rejected; date and signature

Exercise — Tracing the origin of an oil

Find on the record the three pieces of information needed to trace the origin of an oil used in a batch.

Appendix B — Checks before making soap and before handling alkali

Even one empty box: do not start.

To fill in for each new batch. Tick each line before you start:

- ☐ Recipe dated and identified; oils and percentages adding up to 100%.
- ☐ SAP values, type of alkali (NaOH or KOH), purity and calculation independently checked.
- ☐ Materials identified, labeled and suitable for the intended use; supplier batch numbers recorded.
- ☐ Scale, compatible containers, goggles, gloves and rinsing station ready.
- ☐ Work area ventilated, clear, inaccessible to children and animals.
- ☐ Water measured; alkali added to water, never the other way round; no aluminum.

☐ Batch record available to note weighings, observations, deviations and the final decision.

Before handling the alkali, also check: the formula, the weighings, the labels, the safety data sheets, splash goggles, compatible gloves, closed shoes, ventilation, immediate access to running water, no unauthorized people present and container compatibility.

NEVER USE ALUMINUM. ALWAYS add alkali to water, never the other way round. Do not improvise a container. If there is a splash on the skin or in the eyes, rinse immediately with plenty of running water; a splash in the eyes needs urgent medical care. Do not neutralize with vinegar.



Appendix C — Curing log

Monitor each batch during curing.

Batch	Start	Storage conditions	Observation	Planned check

Curing can improve the characteristics of a bar soap. On its own, it does not prove the absence of free alkali or that the product is compliant.

Appendix D — Deciding on a batch

Written decision: on hold, released or rejected.

Item	To fill in
Batch	

Item	To fill in
Intended use	
Suitable checks	
Results	
Abnormality	
Decision	☐ on hold ☐ released ☐ rejected
Date and person in charge	

A suspect batch is set aside and documented. Neither appearance, trace, cooking nor a single pH reading is enough to prove safety.

Appendix E — Stock tracking



In, out, balance: always up to date.

Date	Material / batch	In	Out	Balance

Keep accepted materials, doubtful materials and finished products separate. Write down the dates, supplier batch numbers and storage conditions.

Appendix F — Calculating the real cost




The true cost of a sellable soap.

Item	Amount
Materials	
Water and energy	
Packaging	
Labor	
Cleaning and transport	
Share of fixed costs	
Total cost	

Item	Amount
Number of sellable soaps	
Unit cost = total cost ÷ number sellable	
Proposed price	
Margin before other costs and taxes	

Example: for 4,000 currency units of costs and 80 sellable soaps, the unit cost is 50 units. If the 80 soaps sell for 65 units each, the revenue is 5,200 units and the provisional profit is 1,200 units, before any costs or taxes left out.

Appendix G — Sales and complaints register



Record every sale and every complaint.

Date	Batch	Quantity	Price	Sales channel	Complaint, if any	Action taken

Only collect the personal data you need.

Appendix H — Preparing a training session (session sheet)



Preparing a training session.

Item	To fill in
Audience and group size	
Goals	
Length	
Prior knowledge	
Illustrated materials	
Exercises without alkali	
Competent person in charge	
Protective equipment	
Checking learning	

For five or six adults, start with recognizing ingredients, calculating percentages, dry runs of the steps and reading a batch record. Real soapmaking with alkalis requires a separate, supervised and checked module.

Appendix I — Understanding ash lye



Ash lye: corrosive and of unknown strength.

Wood ash can contain soluble alkaline compounds, especially potassium carbonates. Extracting it with water gives a lye (alkaline solution) whose composition and concentration vary with the plants, the burning and the extraction conditions. This liquid can be corrosive; it must not be treated as a measured solution of KOH or NaOH, nor used directly in place of commercial caustic soda of known concentration.

For training, present the historical process as background information: identifying clean ashes, extraction with water, separating the solids, characterizing the solution and checking its concentration. These operations require competent supervision.

This appendix is for understanding a historical process and its limits. No soap recipe for beginners is given using uncharacterized ash lye.

Appendix J — Finding the cause of a defect



Defect: set the batch aside, then look for the cause.

Record: batch code; defect observed; when it appeared; recipe and version; origin of materials; masses actually weighed; production conditions; checks carried out; decision on the batch. Do not suggest any improvised fix for potentially caustic soap.

If there is a defect, set the batch aside and record the facts. The grid below guides the investigation; it is neither a safety test nor permission to sell or use the soap.

Observation	Useful checks	Careful decision
Soft soap after unmolding	Formula, water, weighings, temperature, time elapsed	Set the batch aside; check the data and monitor how it changes without using it
Cracks or overheating	Temperature, insulation, mold size, acceleration of the reaction	Avoid all contact; document the process and temperatures
Separation, pockets or liquid	Weighings, mixing, trace, order of adding ingredients	Do not touch or use; suspect uneven distribution of the alkali
Suspect spots or crystals	Appearance, added materials, batch history	No testing on the skin or tongue; have it checked
Rancid smell or spots	Age and condition of the oils, storage, humidity, packaging	Set aside; identify the cause before any new trial
Too little lather	Fatty acid composition, test water, curing time	Assess performance only after the safety check
Cloudy or separated liquid soap	KOH formula, dilution, water, stability and preservation	Set aside; examine stability and suitable checks

Rule: a single measured pH, a long cure or a good appearance are not enough to rule out excess alkali. Never try to "save" a doubtful batch by adding vinegar or making an improvised fix.

Appendix K — Used cooking oils

Used oil: never without identification.

Recycling can reduce waste, but a used oil may contain unknown blends, oxidation products, food residues or contaminants. Its real SAP value may be uncertain. Do not automatically apply a formula designed for fresh oil, and do not recommend it for a body soap that will be distributed without proper characterization and approval.

Exercise — Unlabeled oil

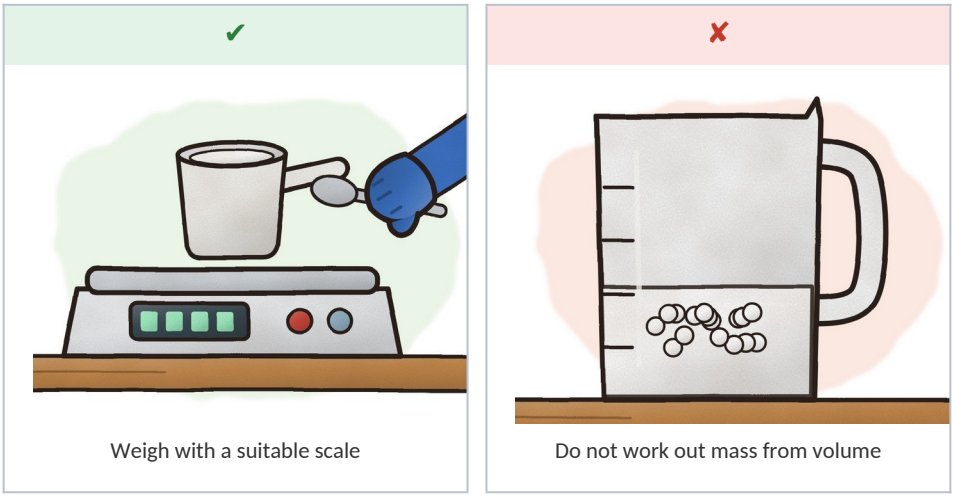
A recovered oil has no identification. Can it replace the olive oil in a recipe?

Appendix L — Useful conversions and measuring rules

Always weigh, never measure by volume.

- **Mass:** 1 kilogram (kg) = 1,000 grams (g); 1 gram = 1,000 milligrams (mg); 1 pound (lb) ≈ 453.6 g; 1 ounce (oz) ≈ 28.35 g.
- **Volume:** 1 liter (L) = 1,000 milliliters (mL); 1 centiliter = 10 mL; 1 deciliter = 100 mL. Cups and spoons are not precise enough to measure the ingredients of a soap recipe.
- **Temperature:** °F = (°C × 9/5) + 32; °C = (°F − 32) × 5/9. Examples: 30 °C = 86 °F; 40 °C = 104 °F; 60 °C = 140 °F.

Always weigh fats, water and alkalis with a suitable scale. Never work out the mass of caustic soda or potash from the volume taken up by pellets: their bulk density varies with the packaging.



✔ Weigh with a suitable scale

✘ Do not work out mass from volume

Appendix M — Cut-out cards: the 8 steps

Cut out the cards, shuffle them, then ask learners to put them back in order.

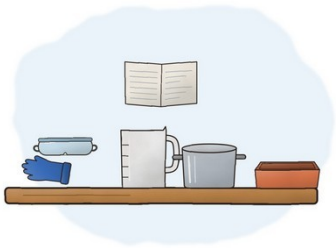
This exercise checks, without reading, that a learner knows the order of the steps (see the two-way self-reliance test, Chapter 14). Print this page, stick it on card and cut along the frames. For a harder exercise, hide the numbers before cutting.

1



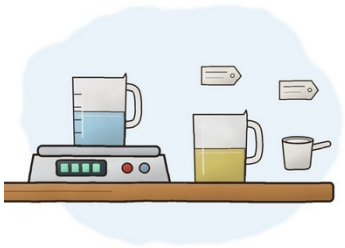
Read the recipe

2



Prepare the workshop

3



Weigh separately

4



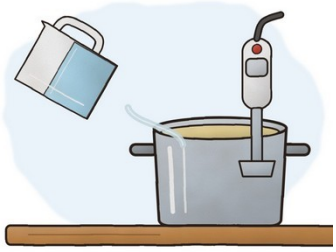
Caustic soda into water

5

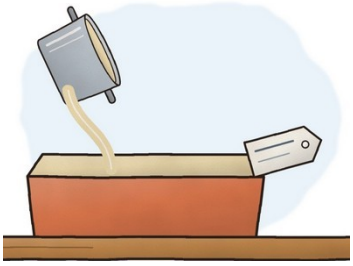
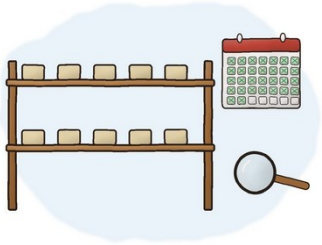


Prepare the oils

6



Mix, watch for trace

7	8
 Pour, label the batch	 Wait, then check

Answers

Appendix A. The oil supplier, its batch number and its date of receipt (as well as the mass used in the batch).

Appendix K. No, not without identification and a suitable calculation.

16. Glossary and resources

Purpose: to quickly find the meaning of technical words, calculation units and the resources needed to learn more.

16.1 Glossary

Term	Definition
Additive	An ingredient added for a particular property; its safety and compatibility must be checked.
Alkali	In this handbook: the caustic soda (NaOH) or potash (KOH) used for saponification.
Alkaline solution	A mixture of water and dissolved alkali; preparing it can give off a lot of heat.
Antioxidant	A substance that can slow down some oxidation reactions, without fixing a raw material that has already deteriorated.
Batch	A quantity of product made under defined conditions and identified for traceability.
Batch record	A record of the materials, weighings, operations, observations, checks and decision for a production run (template in Appendix A).
Batch status	On hold (yellow), released (green) or rejected (red).
Concentration of the alkaline solution	The ratio between the mass of alkali and the total mass of the solution (alkali + water), according to a stated convention (see 6.6).
CP	Cold process saponification.
Curing	The period during which a bar soap dries and matures after it is made; it is not a safety test.
Dilution	Adding a liquid to lower the concentration of a solution; the amount is calculated from the formula.
Emulsion	A dispersion of two phases that do not mix easily, such as water and oil.
Essential oil	A concentrated mixture of aromatic plant compounds, sometimes irritating or allergenic.
Fats	Oil, butter or fat that provides the components that react with an alkali to form soap.
Fatty acid	A component of fats; its alkaline salts form soap.
Fragrance	A perfume blend that may be subject to restrictions depending on its components and the product's use.
Free alkali	Alkali that has not been used up by the reaction; its amount is measured by a suitable analytical method and is not the same as pH.
Glycerol	A substance produced by saponification, also called glycerin.
Hardness	The mechanical strength of the soap; it depends in particular on the formula and drying.
HP	Hot process saponification.
INCI	International Nomenclature of Cosmetic Ingredients; it does not replace local labeling obligations.

Term	Definition
KOH	Potassium hydroxide, or caustic potash: an alkali used especially for soft or liquid soaps. In this handbook, “potash” always means KOH.
Labeling	Information required on a product; obligations vary with the country and the use.
Lye	In “ash lye”, an alkaline extract of ashes (see 10.4 and Appendix I). In “lye discount” (see 6.4), the quantity of NaOH or KOH is reduced. An alkaline solution is alkali dissolved in water.
Lye discount (calculated superfat)	A deliberate reduction of the amount of alkali compared with the theoretical need; on its own, it does not guarantee the absence of free alkali.
Melt & Pour	A method that consists of melting a ready-made soap base, then molding it.
NaOH	Sodium hydroxide, or caustic soda: an alkali usually used for bar soaps.
Oxidation	A possible chemical deterioration of fats, which can lead to smells and changes in appearance.
pH	A measure of acidity or alkalinity under defined conditions; on its own, it does not prove the absence of free alkali.
PPE	Personal protective equipment: suitable goggles, appropriate gloves, covering clothes and closed shoes.
Precision scale	An instrument suited to small weighings; its calibration and measuring range must be checked.
Process temperature	Temperature measured during preparation; it affects the reaction speed and the risks.
Purity	The actual proportion of active substance in a commercial material; essential for alkali calculations.
Rocket Stove	A stove with optimized combustion that can reduce fuel use, provided it is properly designed and ventilated.
Sale	Putting a product on the market, subject to the rules that apply to its use and the country concerned.
Saponification	The chemical reaction of fats with an alkali, producing fatty acid salts (soaps) and glycerol.
Saponification value (SAP)	The theoretical amount of alkali (NaOH or KOH, depending on the value used) needed to saponify 1 g of a fat.
SDS	Safety data sheet: it shows in particular the hazards, protective measures and emergency measures.
Session sheet	A sheet for preparing a training session (template in Appendix H).
Solubility	The ability of soap to dissolve in water; it affects its use and how long it lasts.
Stability	The ability of a product to keep its characteristics over a defined period and under defined conditions.
Trace	Thickening of the batter during mixing; it does not mean that saponification is complete.
Traceability	All the records that make it possible to trace the origin of the materials, the operations and where a batch went.
Unmolding	Removing the soap from its mold; the batter may still be an alkaline hazard.
Water bath	Indirect heating method: a container is placed in a heated bath; it does not remove the risk of splashes.

16.2 Units and checks

- **Percentages:** check that the oil percentages add up to 100%. Mass of one oil = total mass of oils × percentage ÷ 100.
- **Purity:** mass of commercial product = mass of pure NaOH ÷ purity. Example: 133.814 g ÷ 0.99 = 135.17 g of 99% product. This conversion does not replace checking the SAP value and the lye discount.
- **Unit conversions:** see Appendix L.

16.3 Technical and regulatory resources

Safety data sheets for the alkalis and materials used; regulations of the country of manufacture and sale; suitable analytical methods; standards bodies and reliable technical sources. For the European Union market, check in particular Regulation (EC) No 1223/2009 on cosmetic products and its updates.

Standards and local requirements must be checked as of the date you use this handbook. A teaching document is neither a certification nor an authorization to place a product on the market.

16.4 APISARA soapmaking software

The APISARA calculator, available at apisara.org, helps you prepare formulation calculations. Check the raw material data, the units and the purity of the alkali before using the result. An app does not replace production checks.

Final exercise — Are you ready to pass it on?

Explain to another adult: why NaOH and KOH cannot replace each other at equal mass; why curing does not prove safety; how to track a batch; how to calculate the cost per sellable soap. If any answer is still uncertain, go back to the relevant chapter (Chapters 2, 7, 11 and 13).

Practice workbook — six recipes explained

These six recipes are examples that build step by step. Read each sheet in full, check the raw materials and follow the safety precautions before making anything.

The six sheets follow the same layout, so you can find your way around easily:

1. Goal and level
2. STOP: do not start if…
3. Ingredients
4. Calculation explained in four lines: theoretical need → lye discount → purity → water
5. Equipment and protection
6. Numbered steps
7. Visual cues and checks
8. In case of an accident
9. Batch record
10. Exercises, with answers given separately

The calculations have been checked arithmetically. The SAP values are indicative teaching values: the formula, process, checks and intended use must be assessed before any production or distribution.

Recipe 01 — Cold process body soap

Bar soap for the body · cold process · supervised beginner

1. Goal and level

This sheet completes Chapter 7. You will learn to weigh four fats, calculate the amount of caustic soda, prepare an alkaline solution safely, recognize trace, mold the soap and organize curing.

Level: beginner, in supervised learning. This teaching formula does not guarantee mildness or suitability for sale.

2. STOP: do not start if...

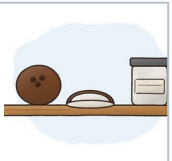
⚠ **Stop if even one of these conditions applies**

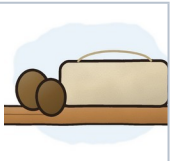
- ✘  the formula, raw materials or calculations have not been checked;
- ✘  you are missing any protection: goggles, gloves, covering clothes or closed shoes;
- ✘  the workshop is not ventilated or running water is not immediately accessible;
- ✘  children, animals or untrained people are present;
- ✘  a container is aluminum, glass (for the hot solution) or unidentified.

3. Ingredients — 1,000 g of fats

Ingredient	Mass	Share of oils	Role
Olive oil	500 g	50%	Mildness
Coconut oil	250 g	25%	Lather and cleansing power
Shea butter	150 g	15%	Firmness and hardness
Sunflower oil	100 g	10%	Mildness; prone to oxidation
Total oils and butter	**1,000 g**	**100%**	**—**
99% commercial caustic soda NaOH	135.17 g	—	Alkali (see calculation)
Demineralized water	315.39 g	—	Dissolves the caustic soda (30% concentration)


Olive 500 g


Coconut 250 g


Shea 150 g


Sunflower 100 g


NaOH 99%: 135.17 g


Water: 315.39 g

The recipe depends on the exact identity of the oils and the verified purity of the caustic soda. A different oil, SAP value or purity requires a new calculation. Do not replace caustic soda (NaOH) with potash (KOH).

4. Calculation explained in four lines

Theoretical need − discount − purity − water.

NaOH SAP values used for teaching (g of NaOH per g of oil): olive 0.134; coconut 0.183; shea 0.128; sunflower 0.135.

1. **Theoretical need:** (500 × 0.134) + (250 × 0.183) + (150 × 0.128) + (100 × 0.135) = 145.45 g of pure NaOH.
2. **8% lye discount:** 145.45 × 0.92 = 133.814 g of pure NaOH.
3. **99% purity:** 133.814 ÷ 0.99 = 135.1657 g, i.e. 135.17 g of commercial caustic soda.
4. **Water (Convention A, 30% concentration):** 135.1657 × 0.70 ÷ 0.30 = 315.39 g of water.

SAP values can vary between batches and references: check the data before making soap.

5. Equipment and protection

- ☐ Suitable, checked scale.
- ☐ Two containers compatible with a hot alkaline solution (suitable polypropylene/HDPE or compatible stainless steel) — never aluminum, no glass for the hot solution.
- ☐ Spatula, suitable thermometer and a stick blender kept only for this purpose.
- ☐ Suitable mold, batch label and batch record.
- ☐ Alkali-resistant gloves, wraparound goggles, covering clothes and closed shoes.
- ☐ Ventilated workshop, running water within reach, no children or animals.

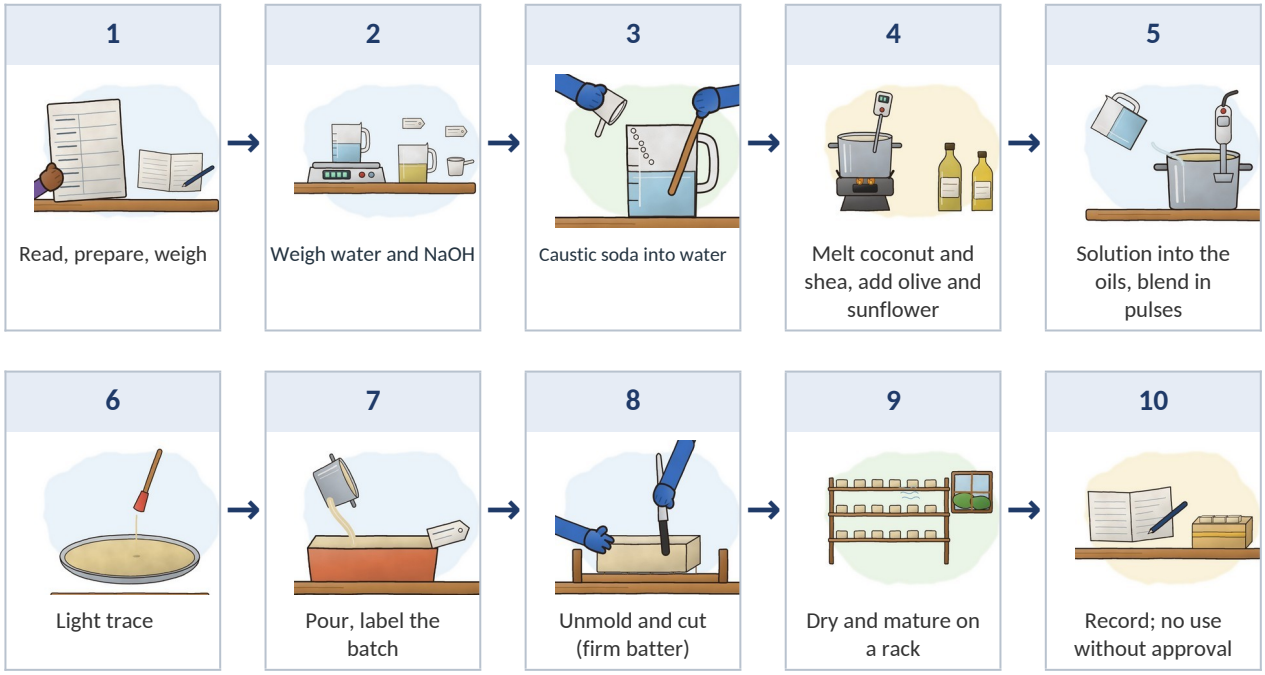
6. Cold process steps



Protection, caustic soda into water, never aluminum.

1. Read the whole sheet. Prepare the workstation, protection and mold. Identify and weigh each material separately.
2. Weigh 315.39 g of water in a compatible container. Separately weigh 135.17 g of 99% NaOH, without breathing in the dust.

3. Slowly pour the caustic soda into the water, stirring carefully — never water onto caustic soda. Dissolving gives off a lot of heat: let it cool where no one can touch it by accident.
4. Gently melt the coconut oil and shea butter without overheating, then add the olive and sunflower oils. Check the temperature of both preparations: a working range of about 30 to 40 °C may suit this formula, to be confirmed by trial (temperature is not a universal criterion).
5. Carefully add the alkaline solution to the fats. Mix with the spatula, then with short pulses of the blender, without splashing.
6. Stop at light trace: the batter thickens slightly and leaves a brief mark on its surface. Do not wait for a very thick trace before pouring.
7. Pour into the compatible mold; protect it from contact and label the batch. Watch for any excessive heating; do not leave the batch unattended during the first hours.
8. Unmold and cut only when the batter is firm enough, wearing suitable protection; the time varies with the formula and conditions.
9. Leave to dry and mature on a rack, in a clean, ventilated place out of reach of children.
10. Record the measurements and observations. Do not use the soap on the skin or distribute it without proper approval of the formula, process and checks.



7. Visual cues and checks



Trace, curing or pH do not, on their own, prove that the soap is safe.

- **Light trace:** the batter thickens and holds a brief mark. It does not prove that saponification is complete.
- **Curing:** 4 to 6 weeks is a common guideline, not proof of safety.

Before any use: confirm the SAP values with reliable technical references; check the properties and tolerance of the formula; carry out supervised trials; define the batch checks and safety assessment suited to the country and use; check the equipment, working times and observed temperatures. This sheet does not replace these steps.

8. In case of an accident

⚠ **In case of an accident**

- **Skin:** remove affected clothing and rinse immediately with plenty of running water for at least 15 minutes; seek medical advice.
- Eyes: rinse immediately with running water, eyelids open, for at least 15 minutes, and call emergency services: urgent medical care is needed.
- **Swallowing:** do not make the person vomit; immediately call a poison center or emergency services.
- **Never use vinegar** on the skin or in the eyes to "neutralize" the alkali.

9. Batch record



Fill in the record during production.

Also record the temperatures measured, observations at trace and molding, and the decision not to use or to release after checks.

Field	To fill in
Batch code and date	
Person in charge	
Fats: name, supplier, batch number, mass weighed	
Alkali: type, purity, batch number, mass weighed	
Water: origin and mass weighed	
Temperatures and observations (trace, cooking or dilution)	
Molding and unmolding dates	
Abnormalities	
Checks carried out and results	
Decision: on hold / released / rejected — date and person in charge	

10. Exercises

✎ **Exercise**

If the coconut oil is replaced by another oil, can you keep 135.17 g of caustic soda? Explain why.

Answer

No: the caustic soda (and the water) must be recalculated with the SAP value of the new oil.

Recipe 02 — Coconut oil household soap

Household soap · cold process · supervised beginner · never on the skin

1. Goal and level

Make a bar soap for cleaning surfaces or washable laundry, and understand the difference between a household formula and a soap for the skin (see Chapter 8).

Level: beginner, in supervised learning. **Do not use this recipe as a body soap.** Check that this highly alkaline soap is compatible with the materials and fabrics concerned; avoid wool, silk and surfaces sensitive to alkalis.

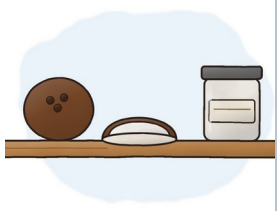
2. STOP: do not start if...

⚠ **Stop if even one of these conditions applies**

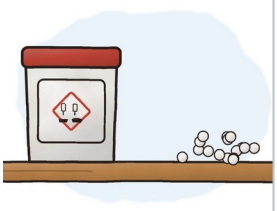
- ✘  the formula, raw materials or calculations have not been checked;
- ✘  you are missing any protection: goggles, gloves, covering clothes or closed shoes;
- ✘  the workshop is not ventilated or running water is not immediately accessible;
- ✘  children, animals or untrained people are present;
- ✘  a container is aluminum, glass (for the hot solution) or unidentified.

3. Ingredients — 500 g of oil

Ingredient	Mass	Share of oils	Role
Identified coconut oil	500.00 g	100%	Lather and cleansing power
99% commercial caustic soda NaOH	89.65 g	—	Alkali (3% lye discount)
Demineralized water	209.19 g	—	Dissolves the caustic soda (30% concentration)



Coconut 500.00 g



NaOH 99%: 89.65 g



Water: 209.19 g



Household use only

Assumption: NaOH SAP value of coconut oil = 0.183 g/g, an indicative value to be confirmed for the actual oil. Do not replace this oil with another without recalculating the formula.

4. Calculation explained in four lines

Theoretical need − discount − purity − water.

1. **Theoretical need:** 500 × 0.183 = 91.50 g of pure NaOH.
2. **3% lye discount:** 91.50 × 0.97 = 88.755 g of pure NaOH.
3. **99% purity:** 88.755 ÷ 0.99 = 89.6515 g, i.e. 89.65 g of commercial caustic soda.
4. **Water (Convention A, 30% concentration):** 89.6515 × 0.70 ÷ 0.30 = 209.19 g of water.

Values are rounded to the hundredth of a gram; use a suitable scale.

5. Equipment and protection

- ☐ Suitable, checked scale.
- ☐ Containers resistant to alkalis and heat (compatible stainless steel, suitable PP/HDPE) — never aluminum, no glass for the hot solution.
- ☐ Spatula, thermometer and a stick blender kept only for this purpose.
- ☐ Compatible mold, batch label and batch record.
- ☐ Wraparound goggles, alkali-resistant gloves, covering clothes and closed shoes.
- ☐ Good ventilation, running water within reach, children and animals kept away.

6. Cold process steps

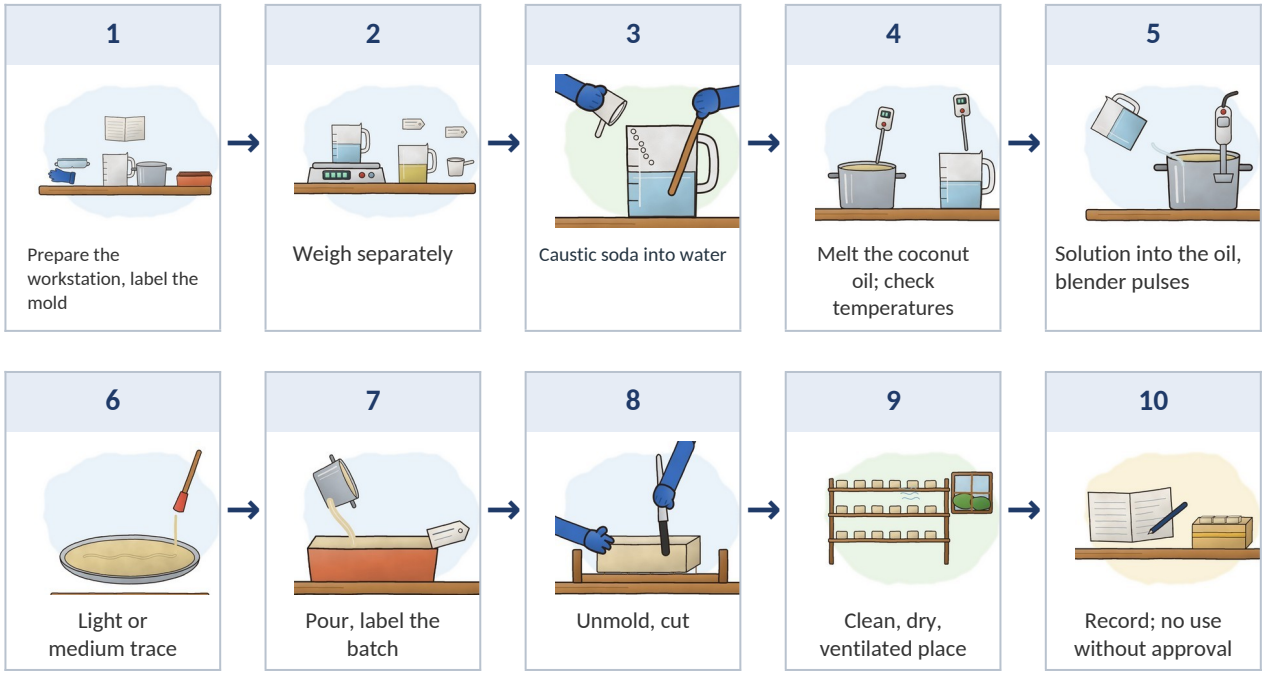


Protection, caustic soda into water, never aluminum.

1. Read the whole sheet. Prepare and protect the workstation; put on your protective equipment. Label the mold and prepare the batch record.
2. Separately weigh 500.00 g of coconut oil, 209.19 g of water and 89.65 g of 99% NaOH. Check the labels twice.

3. Slowly pour the caustic soda into the water, never the other way round, stirring without splashing. The solution gets very hot: let it cool safely.
4. Gently melt the coconut oil without overheating it. Check the temperature of both preparations; a range of about 30 to 40 °C must be confirmed by trials and does not replace watching the batter.

5. Carefully add the alkaline solution to the oil. Mix with the spatula, then with brief pulses of the blender, avoiding splashes.
6. Stop at light or medium trace, when the batter thickens evenly.
7. Pour into the mold. Label the batch and watch for any excessive heating. Do not handle anything without protection.
8. Unmold and cut only when the batter is firm enough, wearing suitable protection. The time depends on the conditions.
9. Place the soaps in a clean, dry, ventilated space out of reach of children.
10. Record your observations. Do not use or distribute the soap before the formula, process and checks suited to household use have been approved.



7. Visual cues and checks



Trace, curing or pH do not, on their own, prove that the soap is safe.

- **Trace:** it is not proof that saponification is complete.
- **Drying:** a period of about 4 to 6 weeks can improve drying, but does not prove safety.

- **Checks:** check the product's stability and the absence of free alkali using a suitable method. pH alone, appearance and curing are not enough.
- **Storage and label:** store in a dry place and label clearly "household soap — do not use on the skin". Regulatory and labeling requirements depend on the country and the product's intended use.

Points to check before any trial: identity and SAP value of the locally available oil; NaOH purity; suitability of the process and mold; workshop observations; method for checking free alkali; effectiveness and compatibility with the intended household uses; labeling.

8. In case of an accident

⚠ **In case of an accident**

- **Skin:** remove affected clothing and rinse immediately with plenty of running water for at least 15 minutes; seek medical advice.
- Eyes: rinse immediately with running water, eyelids open, for at least 15 minutes, and call emergency services: urgent medical care is needed.
- **Swallowing:** do not make the person vomit; immediately call a poison center or emergency services.
- **Never use vinegar** on the skin or in the eyes to "neutralize" the alkali.

9. Batch record



Fill in the record during production.

Field	To fill in
Batch code and date	
Person in charge	
Fats: name, supplier, batch number, mass weighed	
Alkali: type, purity, batch number, mass weighed	
Water: origin and mass weighed	
Temperatures and observations (trace, cooking or dilution)	
Molding and unmolding dates	
Abnormalities	
Checks carried out and results	
Decision: on hold / released / rejected — date and person in charge	

10. Exercises

Exercises

A. For 1,000 g of the same oil, what masses of commercial NaOH and water are needed with the same assumptions?

B. Why must you not replace coconut oil with palm oil without recalculating?

C. Fill in a fictional batch record with the ingredients, masses, dates and abnormalities.

Answers

A. Theoretical need: 1,000 × 0.183 = 183.00 g; after a 3% discount: 177.51 g of pure NaOH; commercial caustic soda: 177.51 ÷ 0.99 = 179.30 g; water: 179.303 × 7 ÷ 3 = 418.37 g.

B. The SAP values of the two oils differ: the amount of caustic soda changes.

C. Compare the completed record with the fields of the batch record (part 9 and Appendix A).

Recipe 03 — Shea butter soap

Shea bar soap · cold process · supported beginner

1. Goal and level

Discover the role of shea butter in a bar soap made by cold process saponification. Shea butter provides saturated fatty acids in particular, which affect the hardness and texture of the soap. A balanced recipe depends on all the oils together, not on a single ingredient; a “natural” formula is not automatically mild or safe.

Level: supported beginner. Learning batch: 1,000 g of oils and butters.

2. STOP: do not start if...

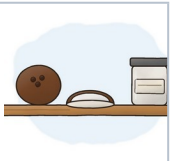
⚠ **Stop if even one of these conditions applies**

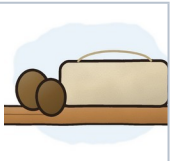
- ✘  the formula, raw materials or calculations have not been checked;
- ✘  you are missing any protection: goggles, gloves, covering clothes or closed shoes;
- ✘  the workshop is not ventilated or running water is not immediately accessible;
- ✘  children, animals or untrained people are present;
- ✘  a container is aluminum, glass (for the hot solution) or unidentified.

3. Ingredients — 1,000 g of fats

Ingredient	Mass	Share of oils	Role
Olive oil	400 g	40%	Mildness
Coconut oil	250 g	25%	Lather and cleansing power
Shea butter	250 g	25%	Firmness, hardness and texture
Sunflower oil	100 g	10%	Mildness; prone to oxidation
Total	**1,000 g**	**100%**	**—**
99% commercial caustic soda NaOH	136.07 g	—	Alkali (see calculation)
Water	317.50 g	—	Dissolves the caustic soda (30% concentration)


Olive 400 g


Coconut 250 g


Shea 250 g


Sunflower 100 g


NaOH 99%: 136.07 g


Water: 317.50 g

4. Calculation explained in four lines

Theoretical need → discount → purity → water.

Fat	Mass	NaOH SAP used	Theoretical NaOH
Olive oil	400 g	0.134	53.60 g
Coconut oil	250 g	0.183	45.75 g
Shea butter	250 g	0.128	32.00 g
Sunflower oil	100 g	0.135	13.50 g
Total	**1,000 g**	**—**	**144.85 g**

1. **Theoretical need:** 144.85 g of pure NaOH (table above).
2. **7% lye discount:** 144.85 × 0.93 = 134.7105 g, i.e. 134.71 g of pure NaOH.
3. **99% purity:** 134.7105 ÷ 0.99 = 136.07 g of commercial caustic soda.
4. **Water (Convention A, 30% concentration): 136.0712 × 70 ÷ 30 = 317.50 g of water.**

These SAP values are indicative teaching values. Real oils, their origin and composition may differ. Check the SAP values, purity and rounding in a reliable calculator before any trial. Never substitute an oil or alkali without recalculating.

5. Equipment and protection

- ☐ Precise scale suited to the weighings.
- ☐ Two containers compatible with caustic soda (suitable PP, HDPE or stainless steel) — never aluminum.
- ☐ Spatula, thermometer and a stick blender kept only for this purpose.
- ☐ Suitable mold, labels and batch record.
- ☐ Wraparound goggles, chemical-resistant gloves, covering clothes and closed shoes.
- ☐ A ventilated, stable place, out of reach of children and animals, with immediate access to running water and free space for the alkaline solution to cool.

6. Cold process steps

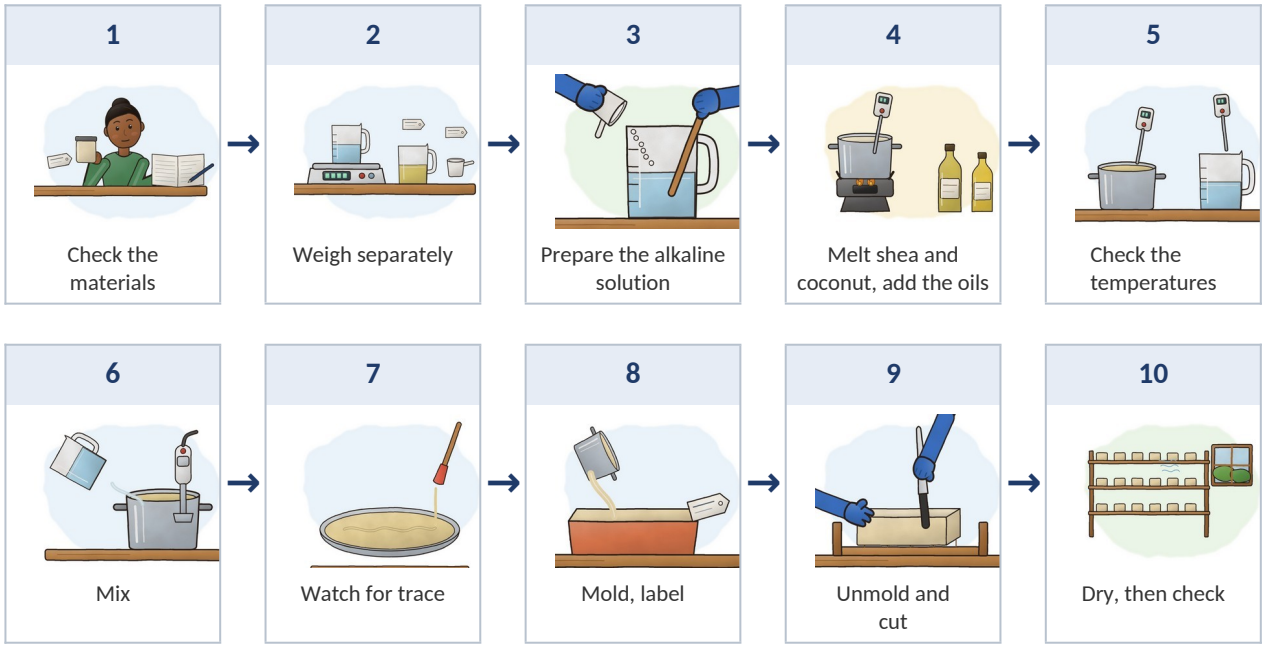


Protection, caustic soda into water, never aluminum.

1. **Check the raw materials.** Check the identity, condition, chosen SAP value and stated purity of the caustic soda. Record the batch numbers on the sheet.
2. **Weigh separately** the four fats, the water and the caustic soda in suitable, labeled containers. Check the masses a second time.
3. **Prepare the alkaline solution.** Wearing protection, slowly add the caustic soda to the water, never the other way round, stirring without splashing. The solution gets very hot: let it cool safely.

4. **Prepare the fats.** Gently melt the shea butter and coconut oil without overheating, then add the liquid oils.
5. **Check the temperatures.** Wait for temperatures that suit the formula and the tested method. As a starting point for trials, work at around 30 to 40 °C for both preparations; watch out for the butters setting too early.
6. **Mix.** Carefully pour the alkaline solution into the fats, without splashing, then mix with short pulses of the blender and with the spatula.
7. **Watch for trace,** that is, the gradual thickening of the batter.
8. **Mold.** Pour into a stable mold. Label the batch, keep it in a secure area and watch for any heating.

9. **Unmold and cut** only when the soap is firm enough to handle safely, after a time that varies with the formula and the environment.
10. **Let it dry, then check.** Dry on airy racks. Before any use or distribution, carry out suitable checks, especially for free alkali.



7. Visual cues and checks



Trace, curing or pH do not, on their own, prove that the soap is safe.

- **Trace:** it is not proof that saponification is complete or that there is no free caustic soda.
- **Drying:** 4 to 6 weeks is often a guideline for cold process, not a safety test.

- **Checks and limits:** do not sell or distribute a batch without proper approval: identification of materials, checking of the calculation, checks on the finished product and the requirements that apply in the country concerned. A single pH measurement does not prove the absence of free alkali. The values and times given here are starting points for trials, not results of trials already carried out.

8. In case of an accident

⚠ **In case of an accident**

- **Skin:** remove affected clothing and rinse immediately with plenty of running water for at least 15 minutes; seek medical advice.
- Eyes: rinse immediately with running water, eyelids open, for at least 15 minutes, and call emergency services: urgent medical care is needed.
- **Swallowing:** do not make the person vomit; immediately call a poison center or emergency services.
- **Never use vinegar** on the skin or in the eyes to “neutralize” the alkali.

9. Batch record

Fill in the record during production.

Also record the SAP values used, the lye discount, the purity and the calculator used.

Field	To fill in
Batch code and date	
Person in charge	
Fats: name, supplier, batch number, mass weighed	
Alkali: type, purity, batch number, mass weighed	
Water: origin and mass weighed	
Temperatures and observations (trace, cooking or dilution)	
Molding and unmolding dates	
Abnormalities	
Checks carried out and results	
Decision: on hold / released / rejected — date and person in charge	

10. Exercises (without handling caustic soda)

Exercises

A. Check that the four fats add up to 1,000 g.

B. Calculate the oil masses for a batch half the size.

C. Explain why replacing coconut oil with palm oil requires a new caustic soda calculation.

D. Name things that do not, on their own, prove the absence of free caustic soda.

Answers

A. 400 + 250 + 250 + 100 = 1,000 g.

B. Olive 200 g, coconut 125 g, shea 125 g, sunflower 50 g; also recalculate the caustic soda and water with the checked parameters.

C. The SAP values of the two oils are different.

D. Trace, curing time passed, a single pH measurement or the appearance of the soap.

Recipe 04 — Local oils soap

Bar soap with local oils · cold process · intermediate

1. Goal and level

Learn to formulate with identified, locally available raw materials, without replacing one oil with another without recalculating.

Level: intermediate. Check the applicable requirements before selling anything.

2. STOP: do not start if...

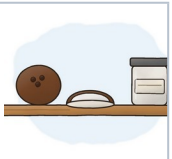
⚠ **Stop if even one of these conditions applies**

- ✘  the formula, raw materials or calculations have not been checked;
- ✘  you are missing any protection: goggles, gloves, covering clothes or closed shoes;
- ✘  the workshop is not ventilated or running water is not immediately accessible;
- ✘  children, animals or untrained people are present;
- ✘  a container is aluminum, glass (for the hot solution) or unidentified.

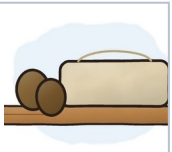
3. Ingredients — 1,000 g of fats

Ingredient	Mass	Share of oils	Role
Palm oil (refined, identified)	400 g	40%	Hardness and long-lasting bar
Coconut oil	200 g	20%	Lather and cleansing power
Sunflower oil	300 g	30%	Mildness; prone to oxidation
Shea butter	100 g	10%	Firmness and texture
Total oils	**1,000 g**	**100%**	**—**
99% commercial caustic soda NaOH	137.81 g	—	Alkali (see calculation)
Clean water	321.55 g	—	Dissolves the caustic soda (30% concentration)


Palm 400 g


Coconut 200 g


Sunflower 300 g


Shea 100 g


NaOH 99%: 137.81 g


Water: 321.55 g

Adapt to local resources, without improvising. This formula is a precise example, not permission to freely replace an oil. Palm oil, coconut oil, sunflower oil and shea butter are not available everywhere and their quality varies. Any substitution, even partial, requires recalculating the caustic soda and water with suitable SAP values; it can also change the hardness, lather, speed of trace and shelf life.

Palm oil can raise environmental and traceability issues: choose responsible sourcing whenever possible. Do not confuse palm oil with palm kernel oil: their SAP values are different.

4. Calculation explained in four lines



Theoretical need → discount → purity → water.

Indicative NaOH SAP values: palm 0.142; coconut 0.183; sunflower 0.135; shea 0.128.

1. **Theoretical need:** (400 × 0.142) + (200 × 0.183) + (300 × 0.135) + (100 × 0.128) = 146.70 g of pure NaOH.
2. **7% lye discount:** 146.70 × 0.93 = 136.431 g of pure NaOH.
3. **Actual purity of 99%:** 136.431 ÷ 0.99 = 137.8091 g, i.e. 137.81 g of commercial caustic soda.
4. **Water (Convention A, 30% concentration):** 137.8091 × 0.70 ÷ 0.30 = 321.5546 g, i.e. 321.55 g of water.

Confirm the SAP values and purity of the materials actually used.

5. Equipment and protection

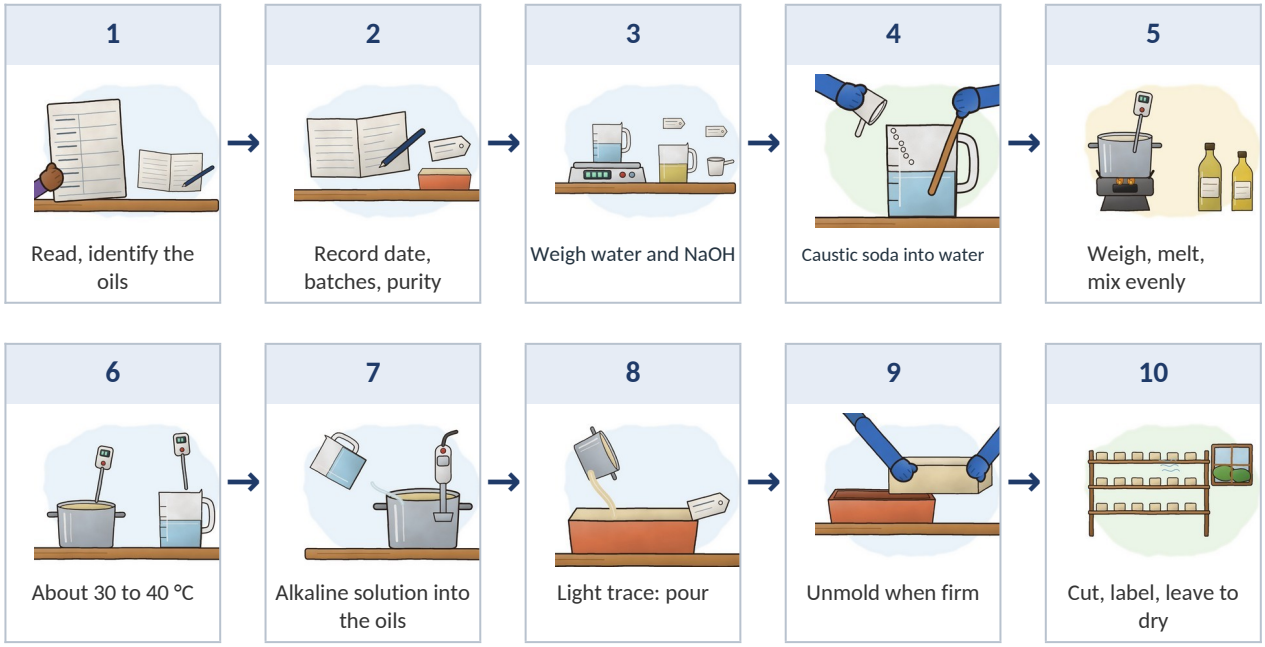
- ☐ Reliable scale and thermometer.
- ☐ Two containers compatible with caustic soda (suitable PP/HDPE or stainless steel) — never aluminum, no glass for the hot alkaline solution.
- ☐ Spatula, stick blender and compatible mold.
- ☐ Paper and pencil for the batch record.
- ☐ Splash goggles, suitable gloves, covering clothes and closed shoes.
- ☐ Ventilated place, no children or animals, with running water within reach.

6. Production steps



Protection, caustic soda into water, never aluminum.

1. Read the whole sheet, identify the four oils and check their condition, labeling and quantities.
2. Write the date, the batch numbers and the purity shown on the caustic soda packaging on the batch record.
3. Separately weigh the water (321.55 g) and the caustic soda (137.81 g) in suitable containers.
4. Wearing protection, gradually pour the caustic soda into the water — never the other way round — stirring carefully, without breathing in the fumes; let it cool in a secure place.
5. Weigh the oils. Gently melt the shea butter and mix the palm oil thoroughly before measuring it out; add the coconut and sunflower oils.
6. Let both preparations reach compatible working temperatures, as a guide about 30 to 40 °C; adjust according to how runny the fats are.
7. Slowly pour the alkaline solution into the oils; mix first with the spatula, then with short pulses of the submerged blender.
8. At a stable emulsion or light trace, pour into the mold; avoid blending for too long.
9. Protect the mold from accidental contact and watch for any overheating. Unmold only when the soap is firm enough, often after 24 to 72 hours.
10. Cut with suitable protection, label the batch and leave to dry in a ventilated place.



7. Visual cues and checks



Trace, curing or pH do not, on their own, prove that the soap is safe.

- **Trace and curing:** correct trace, a long cure (4 to 6 weeks as a guide) or a single pH reading do not prove the absence of free caustic soda.
- **To record:** masses actually weighed, temperatures, time to emulsion, appearance, any separation, heating, unmolding, losses and mass obtained.
- **If something looks wrong** (separated mixture, caustic seeping, liquid pockets or strong overheating): set the batch aside, do not use it, do not distribute it and ask for a competent assessment.

Before distribution or sale, define suitable checks with a professional and apply the rules of the destination country.

8. In case of an accident

⚠ **In case of an accident**

- **Skin:** remove affected clothing and rinse immediately with plenty of running water for at least 15 minutes; seek medical advice.
- Eyes: rinse immediately with running water, eyelids open, for at least 15 minutes, and call emergency services: urgent medical care is needed.
- **Swallowing:** do not make the person vomit; immediately call a poison center or emergency services.
- **Never use vinegar** on the skin or in the eyes to "neutralize" the alkali.

9. Batch record



Fill in the record during production.

Field	To fill in
Batch code and date	
Person in charge	
Fats: name, supplier, batch number, mass weighed	
Alkali: type, purity, batch number, mass weighed	
Water: origin and mass weighed	
Temperatures and observations (trace, cooking or dilution)	
Molding and unmolding dates	
Abnormalities	
Checks carried out and results	
Decision: on hold / released / rejected — date and person in charge	

10. Exercises

✎ **Exercises**

A. Calculate the theoretical amount of pure NaOH needed for 400 g of palm oil with a SAP value of 0.142.

B. Why can't the 200 g of coconut be replaced with 200 g of palm kernel oil without recalculating?

C. What should be recorded if a batch separates after molding?

Answers

A. 400 × 0.142 = 56.8 g of pure NaOH.

B. Palm kernel oil does not have the same SAP value or composition as coconut oil: the caustic soda, the water and the properties of the soap change.

C. The batch code, the masses actually weighed, the temperatures, the mixing time, when the separation happened and what it looked like, the storage conditions, then the decision (batch set aside, awaiting assessment).

Recipe 05 — Hot process soap

Bar soap · hot process · intermediate

This recipe uses the same quantities as Recipe 04: only the process changes.

1. Goal and level

Discover saponification with cooking, its visual cues and the risks linked to heat.

Level: intermediate, after mastering cold process. Before using it in training or putting it on the market, check the formula, the checks and the applicable requirements.

2. STOP: do not start if...

⚠ **Stop if even one of these conditions applies**

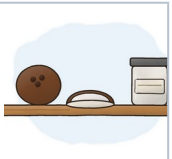
- ✘  the formula, raw materials or calculations have not been checked;
- ✘  you are missing any protection: goggles, gloves, covering clothes or closed shoes;
- ✘  the workshop is not ventilated or running water is not immediately accessible;
- ✘  children, animals or untrained people are present;
- ✘  a container is aluminum, glass (for the hot solution) or unidentified.

3. Ingredients — 1,000 g of fats

Ingredient	Mass	Share of oils	Role
Identified palm oil	400 g	40%	Hardness and long-lasting bar
Coconut oil	200 g	20%	Lather and cleansing power
Sunflower oil	300 g	30%	Mildness; prone to oxidation
Shea butter	100 g	10%	Firmness and texture
Total oils	**1,000 g**	**100%**	**—**
99% commercial caustic soda NaOH	137.81 g	—	Alkali (see calculation)
Clean water (at the start)	321.55 g	—	Dissolves the caustic soda (30% concentration at the start)



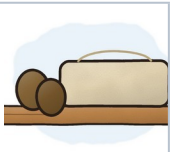
Palm 400 g



Coconut 200 g



Sunflower 300 g



Shea 100 g



NaOH 99%: 137.81 g



Water at the start: 321.55 g

4. Calculation explained in four lines

Theoretical need → discount → purity → water.

Indicative NaOH SAP values: palm 0.142; coconut 0.183; sunflower 0.135; shea 0.128.

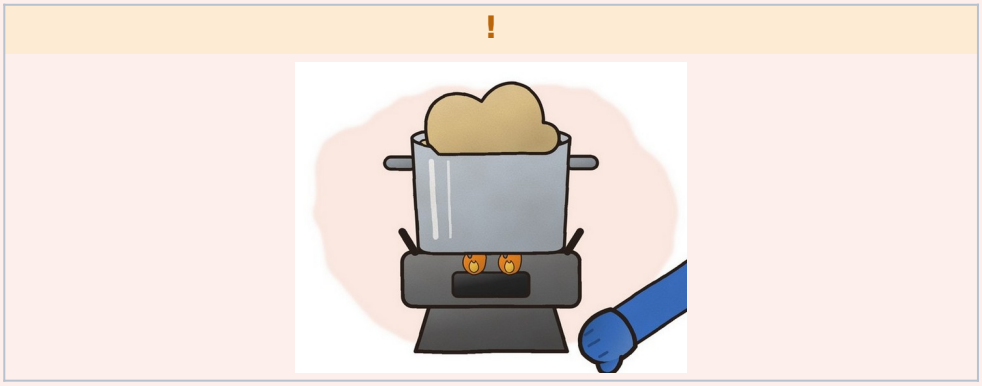
1. **Theoretical need:** 400 × 0.142 + 200 × 0.183 + 300 × 0.135 + 100 × 0.128 = 146.70 g of pure NaOH.
2. **7% lye discount:** 146.70 × 0.93 = 136.431 g of pure NaOH.
3. **Actual purity of 99%:** 136.431 ÷ 0.99 = 137.8091 g, i.e. 137.81 g of commercial caustic soda.
4. **Starting water (Convention A, 30% concentration):** 137.8091 × 70 ÷ 30 = 321.5546 g, i.e. 321.55 g of water.

During cooking, some of the water evaporates: the final concentration does not stay at 30%. Do not make up for this loss blindly. SAP values are indicative values, not certificates of analysis: confirm the type of oils, the SAP values and the real purity of the caustic soda before any trial.

5. Equipment and protection

- ☐ Precise scale, thermometer and long, sturdy spatula.
- ☐ Compatible stainless steel cooking pot and a stable, adjustable heat source — never aluminum, no glass for the hot alkaline solution.
- ☐ Loose-fitting lid if suitable, compatible mold and batch record.
- ☐ Splash goggles, suitable gloves, covering clothes and closed shoes.
- ☐ Ventilation and immediate access to running water; stable workstation, no children or animals.

Caution: hot batter can swell, spit and cause serious burns. Never leave the cooking unattended.



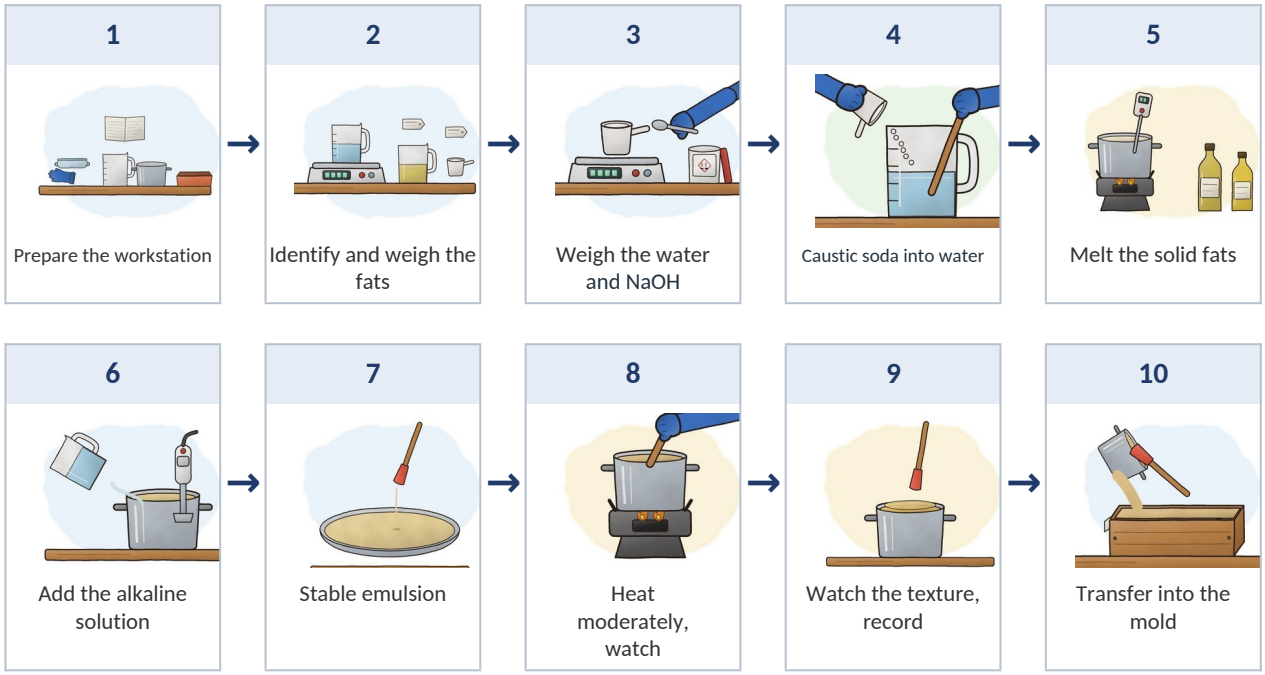
If the batter swells: reduce the heat immediately; never take your eyes off the cooking

6. Hot process steps



Protection: NaOH into water; never aluminum.

1. Read the whole sheet. Prepare a stable workstation, with no children or animals, and check the equipment.
2. Identify and separately weigh the four fats; mix the palm oil evenly before measuring it out.
3. Separately weigh 321.55 g of water and 137.81 g of commercial caustic soda, after checking the stated purity.
4. Wearing protection, gradually pour the caustic soda into the water — never the other way round — stirring carefully; let it cool safely.
5. Gently melt the solid fats in the cooking pot; add the other oils.
6. When both preparations are at compatible working temperatures, slowly add the alkaline solution to the oils.
7. Mix carefully until you get a stable emulsion; avoid adding air or causing splashes.
8. Heat at a moderate, controlled level, under constant watch; stir carefully and reduce the heat immediately if the batter swells.
9. Watch how the texture changes and record the times and temperatures.
10. When the defined and controlled cooking process is complete, carefully transfer the hot batter into the suitable mold; let it cool, label the batch and keep it for checks before use.



7. Visual cues and checks



Trace, curing or pH do not, on their own, prove that the soap is safe.

The batter can go from an emulsion to a thicker mass, then take on a gel-like or translucent look. These changes vary with the formula, the pot and the heat. Neither appearance, cooking nor pH alone proves the absence of free caustic soda; there is no universal cooking time that guarantees a safe soap.

After cooking, record the real masses, the heating power, the temperatures, observations, evaporation losses and the final weight. Set aside any batch showing separation, liquid pockets or any abnormality. Hot process does not remove the need for proper product checks or for suitable drying and settling time: the product is not ready to use as soon as cooking ends. To distribute or sell, have a competent person define the relevant checks and apply the regulations of the country concerned.

8. In case of an accident

⚠ **In case of an accident**

- **Skin:** remove affected clothing and rinse immediately with plenty of running water for at least 15 minutes; seek medical advice.
- Eyes: rinse immediately with running water, eyelids open, for at least 15 minutes, and call emergency services: urgent medical care is needed.
- **Swallowing:** do not make the person vomit; immediately call a poison center or emergency services.
- **Never use vinegar** on the skin or in the eyes to “neutralize” the alkali.

9. Batch record



Fill in the record during production.

Also record the cooking time and the mass obtained after cooking.

Field	To fill in
Batch code and date	
Person in charge	
Fats: name, supplier, batch number, mass weighed	
Alkali: type, purity, batch number, mass weighed	
Water: origin and mass weighed	
Temperatures and observations (trace, cooking or dilution)	

Field	To fill in
Molding and unmolding dates	
Abnormalities	
Checks carried out and results	
Decision: on hold / released / rejected — date and person in charge	

10. Exercises

Exercises

A. Why are the mass of water at the start and the mass of water remaining after cooking not the same?

B. If 100 g of sunflower oil is replaced by another oil, can you keep 137.81 g of NaOH? Explain.

C. Which signs mean you must stop or reduce the heating?

Answers

A. Some of the water evaporates during cooking.

B. No: you must recalculate with the right SAP value and check the new formula.

C. Swelling, the batter rising quickly, spitting, overheating or unusual behavior: reduce or turn off the heat source safely.

Recipe 06 — Liquid soap made with potash (KOH)

Liquid soap · potash KOH · advanced, supervised demonstration

1. Goal and level

Understand the difference between NaOH and KOH, calculate the amount of potash according to its purity, prepare a hot process soap paste, test its dilution on a small sample, then document the checks and storage.

Advanced level. Making liquid soap with potash requires a good command of calculations, KOH purity, heating and checks on the resulting product. Arrange competent supervision and controlled trials before any use or distribution. This recipe is done as a supervised demonstration.

2. STOP: do not start if...

⚠ **Stop if even one of these conditions applies**

- ✘  the formula, raw materials or calculations have not been checked;
- ✘  you are missing any protection: goggles, gloves, covering clothes or closed shoes;
- ✘  the workshop is not ventilated or running water is not immediately accessible;
- ✘  children, animals or untrained people are present;
- ✘  a container is aluminum, glass (for the hot solution) or unidentified.

3. Ingredients — 500 g of fats

Ingredient	Mass	Share of oils	Role
Olive oil	350.00 g	70%	Mildness
Coconut oil	100.00 g	20%	Lather and cleansing power
Sunflower oil	50.00 g	10%	Mildness; prone to oxidation
90% commercial potash KOH	109.92 g	—	Alkali (see calculation)
Demineralized water for the paste	329.77 g	—	Dissolves the potash (3 × mass of commercial KOH)
Final dilution water	Not fixed	—	To be determined by gradual trials



Olive 350.00 g



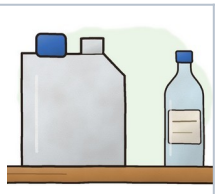
Coconut 100.00 g



Sunflower 50.00 g



KOH 90%: 109.92 g



Water for the paste: 329.77 g

No fragrance, colorant or preservative is planned in this learning formula. A water-based dilution meant to be stored needs a specific assessment of its stability and microbiological quality.

4. Calculation explained in four lines — to be checked before any trial

Theoretical need → discount → purity → water.

Indicative KOH SAP values (g of pure KOH per g of oil): olive 0.188; coconut 0.257; sunflower 0.189. They vary with the raw material and must be confirmed for the batches used.

1. **Theoretical need:** (350 × 0.188) + (100 × 0.257) + (50 × 0.189) = 100.95 g of pure KOH.
2. **2% discount:** 100.95 × 0.98 = 98.931 g of pure KOH.
3. **90% purity:** 98.931 ÷ 0.90 = 109.923 g, i.e. 109.92 g of commercial potash.
4. **Preparation water (3 × the mass of commercial KOH):** 109.923 × 3 = 329.77 g.

Caution: a different purity, SAP value or discount changes the mass of KOH. Never replace KOH with NaOH gram for gram. A 2% discount does not guarantee that the finished soap is safe.

5. Equipment and protection

- ☐ Precise scale.
- ☐ Compatible container for the alkaline solution (suitable PP/HDPE or appropriate stainless steel) and compatible utensils — no aluminum parts; no glass exposed to a hot or concentrated solution.
- ☐ Saucepan or water bath with controlled heating, loose-fitting lid, thermometer, spatula and suitable blender.
- ☐ Alkali-resistant gloves, wraparound goggles, covering clothes and closed shoes.
- ☐ Ventilated place, out of reach of children and animals, with running water within reach.

6. Steps (supervised demonstration)

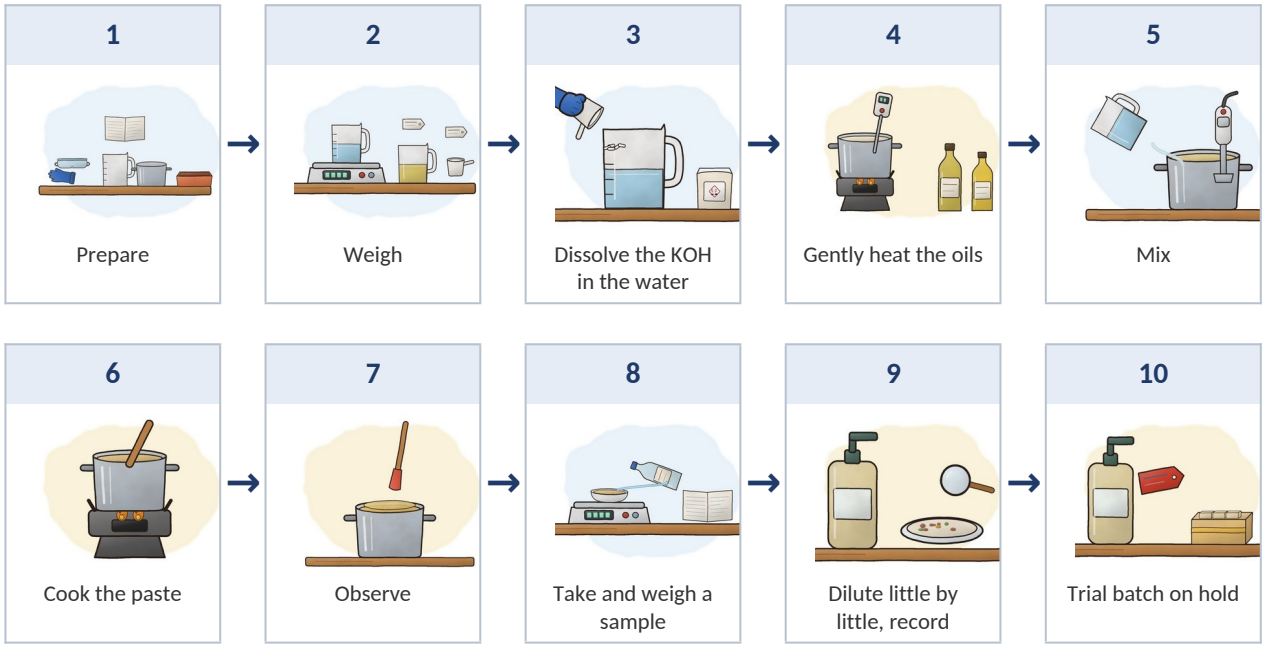


Protection, potash into water, never aluminum.

1. **Prepare.** Identify and label the raw materials; note the KOH purity; check the weighings, ventilation and protection.
2. **Weigh** the three oils, the KOH and the preparation water separately. Do not round the mass of alkali at random.
3. **Dissolve.** Gradually pour the KOH into the water — never the other way round — stirring carefully. Dissolving gives off a lot of heat; avoid splashes and breathing in the fumes.

4. **Prepare the oils.** Combine the oils in a compatible cooking pot. Heat gently and in a controlled way; avoid hot spots.
5. **Mix.** Carefully add the alkaline solution to the oils, keeping the temperature and splashes under control.
6. **Cook the paste.** Continue gentle, supervised cooking, stirring according to the consistency. The mixture can thicken, swell or change appearance: reduce or stop the heating if necessary.

7. **Observe** how the paste changes and record it.
8. **Take a sample.** Once it has cooled enough, take a small sample of paste for a dilution test in clean water, weighing both masses.
9. **Dilute gradually.** Add the water in small portions, let it dissolve and record the proportions tested. Do not impose a universal dilution: viscosity and stability vary.
10. **Put on hold.** Label it “trial batch — on hold, not released”. Do not use the soap on the skin, distribute it or sell it before proper technical, microbiological and regulatory approval.



7. Visual cues and checks



Trace, curing or pH do not, on their own, prove that the soap is safe.

The translucent look of the paste, its thickness or the cooking time do not prove the absence of free alkali. There is no cooking time or dilution that works for every formula: times and

temperatures are defined through documented trials, with specific equipment. The clarity of the liquid, its pH or the absence of noticeable irritation are not enough to prove safety. A concentrated paste and a diluted product do not raise the same storage issues.

Before any use, check: the identity and purity of the raw materials; the accuracy of the weighings; the consistency of the calculation; testing for free alkali with a suitable method; uniformity and stability after dilution; microbiological quality and whether a preservation strategy is needed; container compatibility; the requirements of the country of manufacture and sale. A pH measurement alone does not approve a batch.

8. In case of an accident

⚠ **In case of an accident**

- **Skin:** remove affected clothing and rinse immediately with plenty of running water for at least 15 minutes; seek medical advice.
- Eyes: rinse immediately with running water, eyelids open, for at least 15 minutes, and call emergency services: urgent medical care is needed.
- **Swallowing:** do not make the person vomit; immediately call a poison center or emergency services.
- **Never use vinegar** on the skin or in the eyes to “neutralize” the alkali.

9. Batch record



Fill in the record during production.

Also record the SAP values used and their source, the heating equipment, cooking observations and the dilution test (mass of paste : mass of water).

Field	To fill in
Batch code and date	
Person in charge	
Fats: name, supplier, batch number, mass weighed	
Alkali: type, purity, batch number, mass weighed	
Water: origin and mass weighed	
Temperatures and observations (trace, cooking or dilution)	
Dilution and packaging dates	
Abnormalities	
Checks carried out and results	
Decision: on hold / released / rejected — date and person in charge	

10. Exercises

Exercises

A. The supplier's potash is 85% pure instead of 90%. What commercial mass is needed to get 98.931 g of pure KOH?

B. Why can't a single mass of dilution water be set in advance for all liquid soaps?

C. A dilution test looks clear. Can it be put on sale right away? Name at least three missing checks.

Answers

A. 98.931 ÷ 0.85 = 116.39 g of 85% commercial KOH. The preparation water must also be recalculated according to the chosen convention.

B. The composition, concentration, temperature and properties of the paste affect dilution and viscosity.

C. No: checks for free alkali, stability, microbiological quality and preservation, container compatibility and regulatory compliance, among others.

What the trainer should demonstrate

Reading the purity label on the KOH, the difference between NaOH and KOH, the order for adding alkali to water, how the paste changes and a weighed dilution test.

About the author and the APISARA project

About the author. Éric Bertrand, a former trainer and project manager, has been interested in small-scale soapmaking and passing on practical skills for more than twenty years. He contributes to APISARA as a volunteer, designing free resources and teaching materials for both beginners and trainers.

Making of this document and artificial intelligence. This handbook was designed and directed by Éric Bertrand. Artificial intelligence tools helped with translation, editing, illustrations and layout. The teaching choices and editorial responsibility belong to the author.

About APISARA. An independent, volunteer project for freely sharing knowledge about small-scale soapmaking and natural cosmetics, APISARA encourages making good use of local resources, self-reliance and income-generating micro-projects. Its materials are aimed in particular at NGOs, associations, women's groups, cooperatives and training centers.

Free online resources. At apisara.org: teaching publications, downloadable documents and a recipe calculator. Free access, with no advertising and no compulsory registration.

Illustrations. The illustrated sequences help you recognize the steps and their order. The captions are separate from the images to make translation easier.

Disclaimer. This teaching handbook is neither a certification, nor a qualification to handle alkalis alone, nor an authorization to place products on the market. Check the local regulatory requirements in force.

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Natural resources and income-generating activities

Madagascar offers oils, plants, clays and beehive products that can be used in soapmaking and to create income-generating activities (IGAs). A resource is only useful if it is identified, regularly available and harvested without harming its regrowth.






Some resources to identify locally

Resource	Local name (to be confirmed)	Availability	Main use
Coconut	voanio	Varies by region and supply ◐	Oil: lather, cleansing power
Castor	kinana	✎	Oil: creamy lather, in small amounts
Moringa	ananambo	✎	Oil (seeds)
Baobab	renala, za, bozy…	Seasonal ✎	Oil (seeds)
Tamanu	foraha	✎	Oil (kernels)
Vanilla	lavanila	Seasonal	Scent: handle with care (p. 138)
Honey and wax	tantely	Seasonal	Wax: hardness; honey: small amount (p. 137)
Clays, kaolin	tany… ✎	✎	Color, texture
Turmeric, hibiscus	tamotamo; ✎	✎	Color (p. 138)

Before choosing a resource

- Available all year? If not: keep a stock, or use a recalculated substitute recipe.
- Consistent quality? Origin, freshness, storage (Chapter 5).
- Who harvests it, at what price? A fair income for harvesters is part of the project.
- Does harvesting damage the resource? Protected species: check before any collection ✎ .

◐ *Regions, seasons and local names are indicative and need local confirmation.*

Pencil symbol: information to fill in or confirm locally.

Half-circle symbol: availability varies with region and season.

Local oils and butters

Each oil has a saponification value (SAP) that can vary with the species, origin and batch. The figures below are indicative (g of pure alkali per g of oil) and must not be used on their own to dose a production run.



SAP values — indicative figures, not dosages

Oil	Botanical name	NaOH SAP	KOH SAP
Coconut	Cocos nucifera	0.183	0.257
Castor	Ricinus communis	0.128	0.180
Moringa	Moringa oleifera	0.136	0.191
Baobab	Adansonia spp.	Variable	Variable
Tamanu (foraha)	Calophyllum inophyllum	Variable	Variable
Peanut	Arachis hypogaea	0.137	0.192
Used cooking oils	—	Unreliable	Unreliable

The figures are reading guides, not a sufficient basis for calculating caustic soda. For baobab (Adansonia spp.) and tamanu, studies report variable values; the actual oil must be identified and characterized. Check the technical data sheet or a batch analysis, then recalculate any formula (Chapter 6).

To exclude from APISARA recipes: jatropha (physic nut) without specific expertise and approval; unknown, rancid or blended oils. References: Codex Alimentarius/FAO (coconut, peanut); studies on moringa (2016), baobab (2020, 2023) and tamanu (2021). No new recipe is proposed here.

Preparing an oil infusion

Madagascar Appendix — illustrated teaching sequence. An infused oil (macerate) is a preparation of plants in a carrier oil; it does not replace an essential oil or a safety assessment.

1. Identify and dry



Use a plant that is correctly identified, healthy and well dried.

2. Weigh and prepare



Weigh the plant and the carrier oil separately; record the masses.

3. Immerse



Place the plant in a clean container, then cover it completely with oil.

4. Leave to infuse



Close it, protect it from heat and light; watch its appearance and smell.

5. Filter



Filter carefully into a clean, dry container; discard any suspect batch.

6. Label and store



Record the plant, carrier oil, masses, dates and batch number.

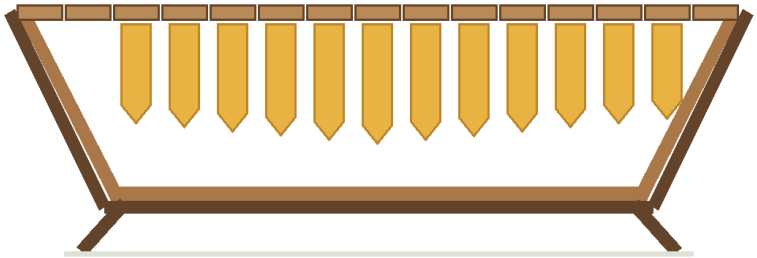
Key point: infused oils vary; do not automatically assume they will give the soap a color, a lasting scent or a therapeutic effect.

Making use of honey and beeswax

Madagascar Appendix — practical supplement for NGOs and cooperatives. Beekeeping can complement a soapmaking activity, but it is not a requirement to get started.

A complementary activity: the Kenyan hive

The Kenyan top-bar hive (KTBH) lets you remove the combs one at a time. It requires training in colony management, suitable protection and an appropriate location. The exact design must be adapted to local practices.



Two raw materials, two different uses

Material	Possible use	Useful precaution
Honey	Ingredient in some cosmetic or soap preparations	Dosage, hygiene and stability to be studied for each product.
Filtered wax	Balms and water-free preparations; small amounts in some soaps	Melt gently in a water bath; do not heat directly over a flame.



An income-generating activity to organize without overusing the hives

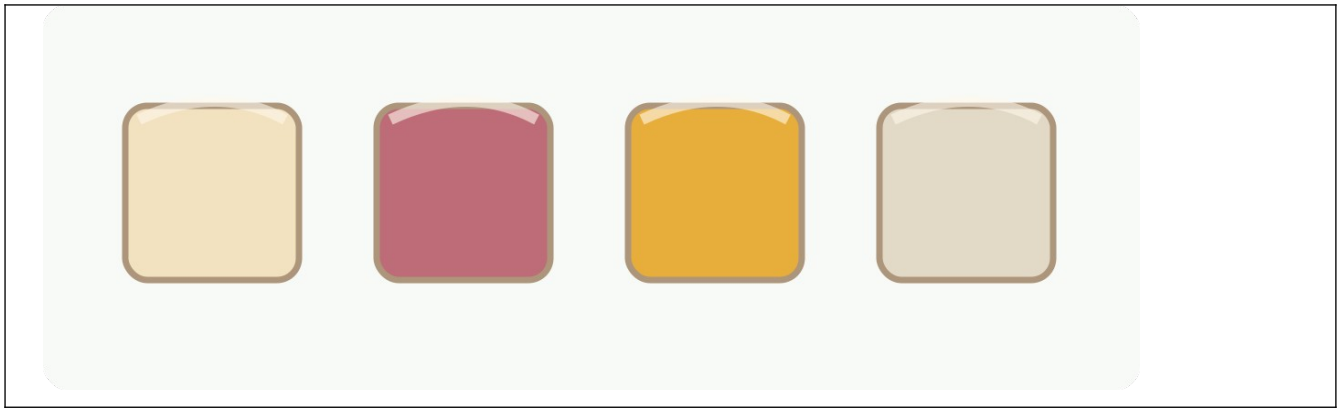
Take into account the season, the colonies' food supply, honey quality, equipment costs and the local market. Wax production is not guaranteed at every harvest.

Colors, clays and scents: careful trials

Plant and mineral materials can add color or texture, but how they behave in an alkaline soap is not always predictable.

Resource	Possible effect	Point to watch
Hibiscus	Color of the powder or infused oil before soapmaking	The pigments may change color or turn brown in alkaline conditions; do not promise a red soap.
Turmeric	Variable yellow to orange	The color may change and fade in light.
Kaolin	Light color and different feel	Use a suitable grade, with documented origin and purity.
Vanilla	Scent before saponification	The scent may disappear; vanilla compounds can turn the soap brown.

Do a trial before any production



Compare a small control with no additions and trials with just one ingredient at a time. Record the mass added, the date, the initial color and how it changes after curing. Do not use an attractive result to conclude that a product is safe.

Essential oils: no universal percentage

Limits depend on each essential oil, its composition, the product category and the applicable rules. A generic range of 1 to 3% is no guarantee of safety; ask for the supplier's documents and have the formula assessed for its use.

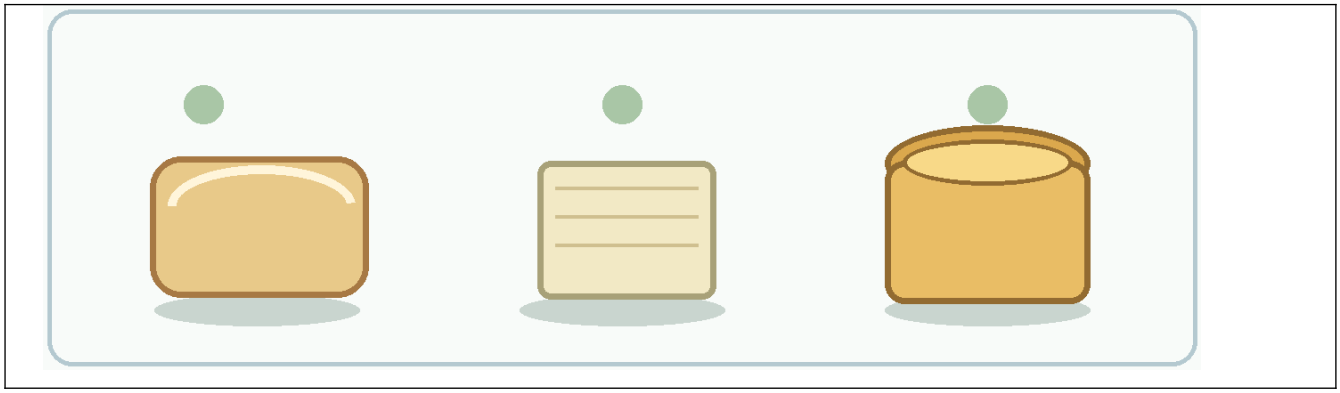
Madagascar: authorities and procedures to check

This page points business founders to the right contacts. Procedures and responsibilities may change; you must confirm the obligations that apply to the specific product and the place of sale.

Contact	Why contact them?
EDBM / business start-up one-stop shop	Identify the steps to set up a business, registration and guidance services.
Tax administration and trade register	Check the applicable identification numbers, declarations and business formalities.
Madagascar Bureau of Standards (BNM)	Ask which standards apply to household soaps or cosmetic products.
Ministry of Health and relevant services	Identify the authority responsible for requirements on products meant for the body.
Trade services and local authorities	Check the rules on selling, labeling and any local permits.
Environment and forestry services	Check the rules on harvesting, transporting and using plant resources.

Do not confuse product categories

A body soap, a household soap and a balm may be subject to different requirements. Before selling, prepare a precise description of the product, its ingredients, its labeling and its stated uses.



Questions to ask before selling

- Which authority is responsible for this specific product?
- Which documents, checks, label information and fees are required?
- Which rules apply to locally harvested ingredients?

Guidance to be confirmed with official bodies; this page is not legal advice.

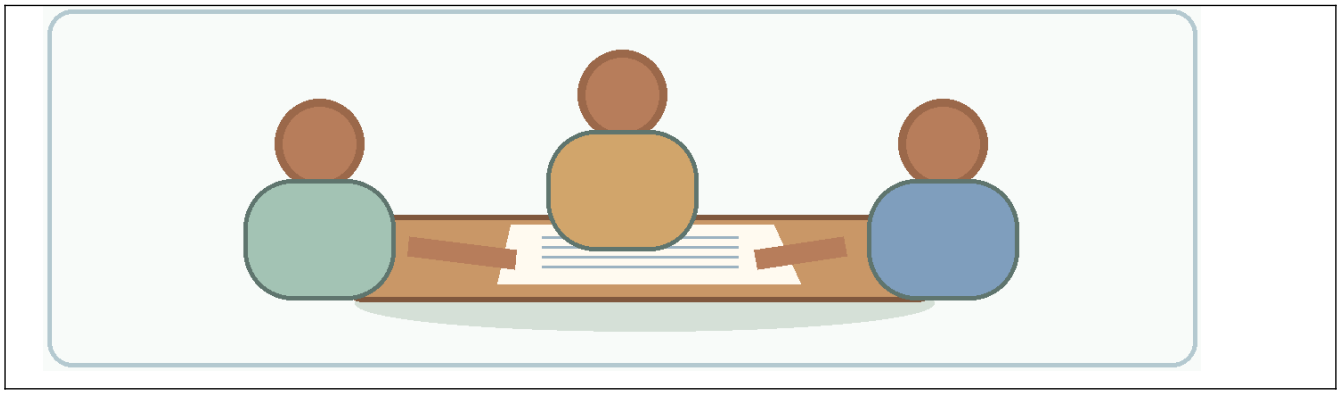
Support programs and partnership leads

The programs listed are leads for research, not a list of funding open today. Before making contact, check the period of activity, the area covered and the conditions of access with the organization concerned.

Organization or program	Research lead for an NGO
IFAD — DEFIS (Madagascar)	Development of agricultural value chains and markets; check the regions and phases of activity.
IFAD — FORMAPROD (Madagascar)	Rural vocational training; look for partner organizations and available resources.
Helvetas — local soapmaking initiatives	Examples of training and income generation; ask whether a program is still active.
Bees for Development	Training resources on low-cost beekeeping; check how well they fit local conditions.
ARSO — African Organisation for Standardisation	Information on regional standardization work, without assuming it applies directly in Madagascar.
Local associations and authorities	Access to trainers, shared equipment, suppliers and local markets.

How to approach a partner?

Present the group leading the project, the local resources, the planned product, the skills available, the specific need (training, equipment, market study) and a cautious cost estimate.



A useful project must also be viable

Favor complementary activities that do not compete with family food supplies or overuse raw materials. A limited pilot project is better than an unproven promise of income.

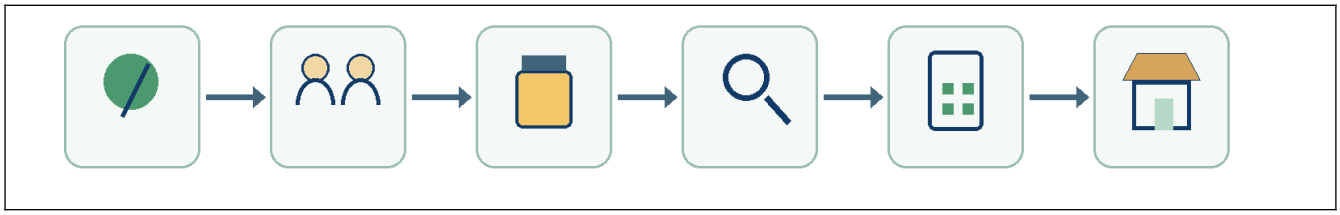
NGO sheet — Planning a sustainable income activity

An income-generating activity (IGA) must cover its expenses and provide lasting pay. Check the full cost, losses, real demand, applicable obligations and the impact on local resources.

Question to examine	Group's answer
Which resource is available, and in which season?	_____
Who supplies this resource? At what cost?	_____
Does the harvest respect local customs and the environment?	_____
What equipment, water and energy are available?	_____
Who provides training and quality control?	_____
What product do we want to sell, and to whom?	_____
Which formalities must be checked before selling?	_____
What is the full cost of a batch that is actually sellable?	_____

First trial: a group decision

Choose a simple product, plan a small batch, identify the risks, calculate the real costs and record observations. Do not treat the first trials as automatically sellable.



Follow-up after the trial

Quality control result: _____

Real expenses and losses: _____

Group decision: continue / improve / stop

Note: local data and procedures to be confirmed.

Field sheet — Assessing a local resource

Before making anything, a cooperative must know exactly what it buys, harvests and stores. This sheet adds to the batch tracking in the main handbook; it does not replace the checks suited to each raw material.

1. Identify and document

To fill in	Observation or document
Common name and botanical name if a plant	_____
Part used: seed, fruit, oil, wax, clay…	_____
Origin, supplier, place and date of harvest	_____
Batch number / quantity / purchase price	_____
Storage conditions and planned duration	_____

2. Check before use

- Check the identity of the raw material and make sure there is no botanical confusion.
- Discard batches showing signs of deterioration, contamination or uncertain origin.
- Check whether collection is authorized and sustainable, especially for protected species.
- For oils: record the characteristics needed for calculation and formulation; do not use an average SAP value instead of identifying the actual product.
- For clays and cosmetic ingredients: ask for the relevant quality and purity information.

3. Decide as a group

Decision	Justification	Person in charge / date
Accept for supervised trial	_____	_____
Ask for more information	_____	_____
Discard the batch	_____	_____

4. Keep a record

Keep together the resource sheet, the supplier's information, the results of checks, the approved calculations and the production record. This continuity helps learning, quality and the management of an income-generating activity.

Sheet to copy for each resource examined.