



# FORMULATION MANUAL AND GUIDE FOR DETERGENTS



## Samson Napo

MSc. Chemistry, BSc Hons. Chemistry & BSc. Applied Chemistry, UKZN

## **Written and edited by Samson Napo**

No part of this book may be sold, reproduced, stored in a retrieval system or transmitted in any form or by any means, electronically, mechanically, recording, scanning or otherwise, without the prior written permission of the author.

For general information on our trainings and formulation optimization, please contact us at 0721236589/0722248578 or [info@mchemacademy.co.za](mailto:info@mchemacademy.co.za)

**Disclaimer:** This manual, general advice and formula and methods contained within have been developed and written by a Qualified Chemist. Costs associated with producing a sample of any of these formulas are the user's responsibility, including any reworks or failures.

Please refer to supplier Safety Data Sheets (SDS/MSDS) to ensure safe handling of all raw materials. MChem Academy holds no responsibility for inappropriate use of materials selected, the formulations or methods, in part, or as a whole.

It is a condition of use of any guidance, formulas or methods within this book that the user holds full responsibility for ensuring safe and correct use and storage of any materials they source and use, as well as ensuring compliance with local regulations and 'clean product preparation' steps are followed when producing samples, especially for use by others. Evaluations of the safety, stability, regulatory compliance and suitability of any formulas, methods and finished products are the sole responsibility of the user and/or Brand putting the product onto the market.

The information provided is for general nature and does not represent brand or product specific advice. MChem Academy shall not be responsible for any damage resulting from the use of reliance on this information. However, if you seek clarity in any of our formulations you are allowed to contact us via our email address provided and will assist.

**Text copyright by MChem Academy. All rights reserved.**

## About the Author



Samson Napo is the founder and Director of MChem Academy operating as Napolians Group Pty Ltd. He has consulted for various clients on the range of services from the development, manufacturing and formulations of detergents and cosmetics for over 2 years. He also manufactures and distributes cleaning products from small and bulk orders. Samson is an experienced Chemist in field of quality, manufacturing, GMP, GLP, Research and Development and formulation optimization and regulatory compliance of detergent products. He has over 2 years' experience in academia as Laboratory demonstrator, where he taught first- and second-year BSc Chemistry and

Chemical engineering students with Chemical experiments and technical work. In addition, he has 2 years working experience in industry as a junior industrial Chemist in mining and mineral compliance and water treatment industry.

His research interest stretches from petrochemical applications in detergents, synthesis of catalyst for production of industrial chemicals, applications of enzymes and their interaction in detergent performance and cleaning efficiency, and other chemical constituents to designing and manufacturing effective cleaning products.

He has an MSc. Chemistry, BSc. Hons Chemistry and BSc. Applied Chemistry from the University of KwaZulu Natal, Durban Westville campus. He is a candidate Chemical Scientist, registered with South African Council for Natural Scientific Professions (SACNASP).

## Contents

<b>Chapter 1: Introduction to formulation</b>	<b>5</b>
Common ingredients in soap and detergent formulations	5
Considerations during formulation of detergents	8
<b>Chapter 2: Formulations</b>	<b>11</b>
Laundry care	11
Dish washing liquid	18
<b>Chapter 3: Floor and bathroom cleaning formulations</b>	<b>32</b>
Liquid bleach	32
Thick Bleach formulation	33
Acidic Toilet bowl cleaner	36
Tile cleaner formulation	39
Hard surface floor cleaner formulation	45
Tile cleaner formulation (High performance)	46
Tile cleaner formulation (Standard cleaner)	47
All Purpose Hard Surface Cleaner	49
Disinfection detergent (Floor cleaner)	50
Detergent for cleaning food processing equipment	53
Enzymatic based detergents for cleaning food processing equipment	54
Aqueous based metal cleaning detergent	55
Ammoniated surface cleaner	57
Formulation of pine gel made from sulfonic acid	58
<b>Chapter 4: Automotive cleaning formulation</b>	<b>61</b>
Car detergent wash	61
Car shampoo	62
Car interior cleaner (plastic cleanser)	66
Car interior cleaner (Leather cleanser)	67
Car Rim cleaner formulation (Alkaline)	68
Car Rim cleaner formulation, Active	69
<b>Chapter 5: Window cleaning formulations</b>	<b>72</b>
Glass cleaners 1	72
Glass cleaner 2	74
Windows cleaner	75
<b>Chapter 6: Heavy duty cleaning detergents</b>	<b>77</b>
Surface corrosion cleaner	77
Floor striping detergent	79
Heavy duty degreaser	80
Engine degreaser	82
<b>Chapter 7: Personal care detergents</b>	<b>84</b>
Saponification value	84
Bar soap	85
Shower gel	88
Face wash	90
Hand soap	92

## Chapter 1: Introduction to formulation

---

Detergent formulations are materials that consist of complex mixtures of more than 95% of inorganic alkaline metals, referred to as builders, and a system of surfactants composed of anionic and nonionic organic molecules and other minor constituents. Detergent is commonly packed in powdery form.



### Properties:

- Promote removal of material from the surface, e.g., soil from a fabric, food from a dish, or soap scum from a hard surface.
- Disperse and stabilize materials in a bulk matrix, e.g., suspension of oil droplets in a mobile phase like water.

**Table 1.** Common ingredients in soap and detergent formulations.

Chemical Class Type	Chemical name	Function
Nonionic Surfactant	Ethoxy Sulphate (AES)	Removes greasy stains from garments.
	Alkyl Sulphate (AS)	
	Ethoxylated alcohols	
	Fatty Acid Esters	
	Amine oxide	
	Alkyl monoethanolamide	
	N-methyl Glycosamide	

---

<b>Anionic Surfactant</b>	Linear Alkyl Benzene Sulfonate (LAS) Linear Alkyl Benzene Sulphonic Acid Sodium Lauryl Sulfate (SLS) Ammonium Lauryl Sulfate (ALS) Paraffin Sulfonate Alkyl Ether Sulfate Methyl Ester Sulfonate	Removes stain from garments.
<b>Cationic Surfactant</b>	Benzethonium Chloride Cetylpyridinum Chloride Quaternary monoalkyl Ammonium Chloride	Used to soften fabric material.
<b>Amphoteric Surfactant</b>	Cocamidopropyl betaine Amidopropyl betaine Alkyl Sulfobetaine	Used in personal care detergent due to less irritation.
<b>Builders/Fillers</b> (sequestering agents)	Citric acid Boric acid Polycarboxylate Sodium Tripolyphosphate (STPP) Sodium nitrilotriacetate Sodium Carbonate Sodium Sulfate Noncrystalline sodium silicates Sodium pentahydrate silicate Borax EDTA	Bind $\text{Ca}^{2+}$ , $\text{Mg}^{2+}$ in hardwater to prevent the formation of scum.

	Zeolite A Sodium silicate Metasilicate	
<b>Bleaching Agents</b> Used in Laundry powder, Dish washing liquid, & hard surface cleaning)	Sodium perborate Sodium hypochlorite Tetraacetythylenediamine	Decolorize or removes not affected by surfactant (e.g., red wine)
<b>Solvents</b>	Water Ethanol (co-solvent) Glycerol (co-solvent) 1,2-Propanediol (co-solvent)	Dissolve and merge all the chemicals together as a mixture.
<b>Hydrotrope</b> Coupling agents	Sodium Xylene Sulfonate Sodium Toluene Sulfonate Sodium Cumene Sulfonate	Increase the ability of water to dissolve other ingredients.
<b>Enzymes</b>	Proteases (protein) Lipases (lipids and oils) Amylases (starch) Cellulase (plants residue)	Help to dissociate difficult stains from food residues.
<b>Anti-redeposition agents</b>	Carboxymethyl cellulose (CMC)	Irreversible binding of dirt to clothing fibers, preventing dirt from reattaching.
<b>Foam regulators</b> (Applied in automatic dishwashing machine)	Dimethylsiloxane Alkyl ethoxylate	Reduce excessive foam quantity that will interfere with rotation of spray in auto- dish washing machine.
<b>Foam boosters &amp; stabilizers</b> (used in hand dishwashing, shampoos, laundry powder, facial wash).	Monodiathanolamide Diaethanolamide	Used to improve foam stability of the detergent.

<b>Optical brighteners</b>	4,4-diaminostilbene-2,2-disulfonic acid Distyrylbiphenyl	Enhance the visual appearance of white cotton fabrics by reflecting UV radiation.
<b>Thickeners</b>	Sodium chlorite (NaCl) Clay (Iaponite or hectorite) Carboxymethyl cellulose (CMC) Guar Xanthan gum Carbomer	To help suspend phosphates and others would separate from the solution.
<b>Fragrances/Perfume</b>	Butylphenyl methylpropional	Add a pleasant smell to the detergents.
<b>Buffers</b>	Sodium carbonate	Maintain the optimal pH of the detergent.
<b>Preservatives</b>	EDTA Benzothiazolinone Phenoxyethanol	Hinders and suppress microbial growth, increasing shelf life.

## 1. Considerations during formulation of detergents

### 1.1. Cost of raw chemicals and packaging materials.

The cost of raw chemicals and packaging materials determines the cost of your final product. When you formulate consider using cheaper raw chemical and packaging materials, however, they should have a reasonable quality to formulate a good quality product. Finding affordable starting materials, you need to request quotations for at least more than two suppliers selling the same products.

### 1.2. Choice of chemicals

Choosing raw chemicals will depend on the type of detergent product you intend to manufacture. For example, when you want to produce a body shampoo, the type of surfactant

to select will not be the same as the one for producing dish washing liquid. You will use nonirritant surfactants, emollients, foam boosters and delicate cleaning chemicals that will not interfere with skin cells and chemistry. The dermatological nature of the skin is a tool that you will use to choose the right type of chemicals suitable for the skin. Moreover, the intention of the outcome of your product also plays a role in choosing the right chemicals.

### **1.3. Quality of raw chemicals**

There is a saying that when using spoiled starting materials will result in spoiled products. Therefore, the quality and performance of each raw chemical determines if the product will be competitive.

### **1.4. Production process**

It is important and crucial to understand the properties and basic chemistry of each chemical you will process when manufacturing your intent product.

To develop a successful process, it is required that you understand the physical properties of the chemicals for example, boiling point, flash point (flammability), solubility, pH and to understand its basic chemistry when mixed with other chemicals, for example water. When you understand this, you will be able to design your own process and mix all the chemicals to avoid producing a product that is not a complete mixture, which will have poor performance or competitiveness.

### **1.5. Customer needs**

Without customers you have no business, therefore it is crucial to listen to the needs of your customers and satisfy them. What they want is what they buy from you and what they don't want leads to no business. Create a platform either on social media or any system you have in place of engagement with your customers on the performance of your product, where to fix and what they prefer in that type of product. Customers know very well what they need because they use their money to buy your products, and it needs to be of the same value as their cost. Older people, for example, judge a detergent's competitiveness or performance based on foaming properties or creating stable foam. Therefore, as an entrepreneur you need to do research and produce a detergent that has good foaming character and has good performance.

## **1.6. Research and development (R&D)**

A company that does not engage in research and development will not be sustainable. R&D is a very crucial aspect of every business globally because research will help your company to be competitive and optimistic because as a company you will be alert and informed about new trends and changes in market dynamics that drive what people require or need at that period. R&D will help you stay up to date with your formulations, designing and patenting cutting edge technologies and innovations, improving your product quality, reducing production cost, and maximizing profitability.

## **1.7. Impact on product quality and cost**

### **1.7.1. Profitability**

The quality and cost of the product should have a balance; however, it is difficult and challenging to manufacture a good quality product that is cheaper. You need to strive to maintain quality and the price of the product must correlate with its quality.

### **1.7.2. Customer base**

There are many dynamics that drive customers to buy your products. Some customers are driven by the quality of the product (competitiveness), the cost of the product, the branding of your product or product awareness and marketing, product traceability and many other factors. Therefore, you need to design the product that can satisfy the following: product quality, competitiveness (customer & market based) and profitability.

## Chapter 2: Formulations

### 2.1. Laundry care

Laundry care detergents are cleaning agents designed to remove dirt, stains, and odors from laundry during the washing process. They come in various forms, including powders, liquids, and pods, and are formulated to be effective in different water temperatures and for various fabric types.



**Table 2.1.** Hand washing powder (Formular 1).

No	Ingredients	Composition (%)	Masses (g) (1000 g)
1	Sodium carbonate light	40.00	400.00
2	Sodium sulphate	27.50	275.00
3	Sodium metasilicate	5.00	50.00
4	Borax	5.00	50.00
5	CMC	2.00	20.00
6	SDBS	10.00	100.00
7	SLS	8.00	80.00
8	Perfume	0.50	5.00
9	Speckless	2.00	20.00

#### Calculations:

Mass of Sodium carbonate light =  $\frac{40}{100} \times 1000 \text{ g} = 400\text{g}$  of sodium carbonate to be measured

✓ **1000g** represents the theoretical mass or bulk mass of our intent production output.

✓ **1kg = 1000g**

Detergent Formulation Manual, 2024, V1

✓ **1L = 1000 millilitres**

**Note:** follow the same calculation as above to calculate the rest of all respective masses of the chemicals required to manufacture 1000g (1kg) of laundry washing powder.

**Method:**

- Combine all the ingredients according to the order into a stainless steel or high-density polyethylene bucket and mix the powders evenly and homogeneously.
- Add surfactants (SDBS and SLS) slowly with thorough mixing to avoid formation of coagulants or clogging of powder. Add slowly with continuous mixing.
- Add perfume and color speckless with thorough mixing.
- Wait for at least 2 hours before packaging to allow the powder to dry a bit.

**Equipment:** use a wooden stick or blender

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Property**

- Appearance: white dry powder with colorful speckless
- pH-value = 9 -12
- ✚ Use pH meter for measuring pH value of the detergent

**Table 2.2.** Fabric softener formula 1 with calculated amount of each chemical.

Part	Ingredients	Weight %	Mass/ g
			<b>To make 1000 L</b>
<b>A</b>	Water	41.49	414.9

	C13-15 Alkyl Alcohol Ethoxylate	20.0	200.0
	C12-14 Amine oxide surfactant	5.0	50.0
	Citric acid	6.0	60.0
	Ethanol	1.0	10.0
	Polydimethylsiloxane silicone	1.0	10.0
	Diethylene triamine pentamethylene phosphonic acid	0.40	4.0
	Hydroxyethanedimethylenephosphonic acid	0.45	4.5
<b>B</b>	Polyethyleneimine ethoxylate	2.65	26.5
	Boric Acid	2.00	20.0
	Calcium chloride	0.02	0.2
	Propanediol	18.00	180.0
<b>C</b>	Monoethanolamine	q.s	to pH
<b>D</b>	Proteases	0.77	7.7
	Amylases	0.06	0.6
	Cellulases	0.16	1.6
	Fragrance	1.00	10.0

## Method

We chose to manufacture 1 L (1000 ml) Fabric softener.

**Note:** you can scale up your formula using this method.

### Mass Calculations:

Example we use C13-15 Alkyl Alcohol Ethoxylate =  $\frac{20}{100} \times 1000 \text{ g} = 200 \text{ g} = 0.2 \text{ kg}$

Use the same above calculation to determine the composition of other chemicals of the formulation.

### Process:

- Mix part A in a reactor tank.
- Add part B in the listed order to Part A and mix until formulation appears clear.
- Adjust pH-value with Part C.
- Add Part D and mix thoroughly.

**Equipment:** use a wooden stick or blender

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Property

Appearance: colorless, clear viscous liquid

pH-value = 8.5 -9.0

✚ Use pH meter for measuring pH value of the detergent

**Table 2.3.** Fabric softener formula 2. with calculated amount of each chemical.

Part	Ingredients	Weight %	Mass/ g
			To make 1000 L
<b>A</b>	Water	50.69	506.90
	Linear Alkyl Benzene sulphonic acid (LABSA)	6.50	65.00
	Sodium silicate	1.00	10.00
	Sodium Carboxymethyl Cellulose	0.10	1.00
	C12-14 Amine oxide surfactant	1.00	10.00
	C13-15 Alkyl Alcohol Ethoxylate	2.50	25.00
	Clay (kaolin, bentonite)	5.00	50.00
	Sodium tripolyphosphate	22.80	228.00
	Borax	3.10	31.00
	Silicone oil	0.16	1.60
<b>B</b>	Fluorescent agent	0.10	1.00
	Glycerol	4.85	48.50
<b>C</b>	Monoethanolamine	q.s	to pH 8.5-9.0
<b>D</b>	Proteolytic enzyme	0.80	8.00

Preservative	0.40	4.00
Perfume	1.00	10.00

## Manufacturing procedure

Follow the same steps used in formulation 1 above.

### Process:

- Boil about 90% of total water to 100 °C and then add kaolin clay and mix until it dissolves.
- Cool the kaolin-water to about 70°C and add sodium silicate and Sodium Carboxymethyl cellulose and mix thoroughly until the water cools to room temperature.
- After cooling to room temperature, add all the chemicals in Part **A** to the reactor tank in listed order and slowly mix until it forms a clear solution.
- Adjust the pH-value with Part C.
- Lastly add Part D and mix thoroughly. The remaining water is used to dissolve the enzymes, preservatives, and fragrance before transferring into the reactor tank.

**Equipment:** use a wooden stick or mixing machine

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Property

Appearance: colorless, clear viscous liquid

pH-value = 8.5 -9.0

- ✚ Use pH meter for measuring pH value of the detergent

**Table 2.4.** Fabric Refresher Odor Neutralizer with calculated amount of each chemical.

Part	Active Ingredients	Weight %	Mass/ g
			To make 1000 L
<b>A</b>	Water	83.80	838.00
	Zinc Ricinoleate	5.00	50.00
<b>B</b>	Ethanol	10.00	100.00
<b>C</b>	Fragrance	3.00	30.00
	Preservative	0.20	2.00
	Colorant	q.s	q.s

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{83.80}{100} \times 1000 \text{ g} = 838 \text{ g} = 0.838 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.4.

- Mix Part **A**
- Add Part **B** and mix until formulation is clear
- Add Part **C**

**Equipment:** use a wooden stick or mixing machine

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Property

Appearances: colorless, clear liquid

pH value: 9.5-10.5

✚ Use pH meter for measuring pH value of the detergent

**Table 2.5:** Fabric softener with a base.

Ingredients	Composition (%)	Masses (g) (1000 g)
Fabric softener base	68.00	680.00
Water	30.00	300.00
Perfume	1.00	10.00
Preservative (isothiazolinones)	1.00	10.00
Colorant	q.s	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{68}{100} \times 1000 \text{ g} = 680 \text{ g} = 0.680 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.5.

## Method:

- In a reaction tank, add fabric softener base and water with continuous mixing.
- Dissolve the preservative portion of water and add to the mixture.
- Add perfume in the mixture.
- Add the color to the mixture and mix thoroughly.
- Package the content after a few hours to allow for complete settling.

**Equipment:** use a wooden stick or mixing machine

✓ Wear a nose mask

- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Property

Appearances: colorless, clear viscous liquid

pH value: 9-10

- ✚ Use pH meter for measuring pH value of the detergent

## 2.2. Dish washing liquid

Dishwashing liquid, also known as dish soap or dish detergent, is a liquid detergent used for washing dishes. It's formulated to effectively cut through grease and food residue, allowing for thorough cleaning of dishes, glassware, and utensils.



**Table 2.6:** Dish washing liquid formula 1.

Ingredients	Composition (%)	Masses (g) (1000 g)
Distilled water	66.00	660.00
Sles 25%	16.00	160.00
Sulfonic acid	10.00	100.00
Sodium hydroxide (45%)	3.00	30.00

CDE	2.00	20.00
Sodium chloride	1.00	10.00
Perfume	1.00	10.00
Preservative (benzyl benzoate)	1.00	10.00
Color	q.s	
Citric acid (pH adjuster)	q.s	

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{66}{100} \times 1000 \text{ g} = 660 \text{ g} = 0.660 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.6.

### Method:

Solution of 45% sodium hydroxide:

Let's assume we make 100g of sodium hydroxide solution

$$\text{Mass of sodium hydroxide} = \frac{45}{100} \times 100 = 45\text{g NaOH}$$

Therefore, mass of water = 100g-45g = 55g of water

Preparation of 45% sodium hydroxide solution(NaOH):

Step 1: Add 55g of water in a HDPE container and add 45g of sodium hydroxide pellets and mix till it dissolves. Please note an exothermic reaction proceeds with generation of heat and care should be exercised when preparing this solution. Safety measures must be applied when dealing with sodium hydroxide solutions.

### **Process of making dish washing liquid:**

- In a reaction tank add approximately 80% of water and put 20% portion aside for dissolving salt and preservative.
- Add sulfonic acid slowly with continuous mixing
- Neutralize sulfonic acid with solution of sodium hydroxide (45% NaOH) by adding a base solution slowly with continuous stirring.
- Use a pH meter to test for pH and when it is around 7-8 then add SLES 25% slowly with thorough mixing
- Dissolve salt and sodium benzoate salt in a separate container using the remaining 20% portion of water.
- Add CDE slowly with thorough mixing till the viscosity increases
- Take a portion of detergent sample from the tank and transfer in a container and add perfume and then mix thoroughly.
- Transfer the mixture of perfume and detergent prepared into the reaction tank slowly with continuous mixing to avoid collapsing the viscosity of the detergent.
- Add a solution of salt prepared slowly into the reaction tank with continuous mixing till the viscosity increases gradually.
- Add a solution of the preservative prepared above slowly into the reaction tank slowly with continuous stirring.
- Test for the pH and if it is within 7-10 then add green color and if it is less than 6 then carefully add increment amount of sodium hydroxide solution of 45% and above 10 pH values then add increment amount of citric acid.
- Allow enough for the liquid detergent to settle before packaging.

### **Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Equipment:** use a wooden stick or mixing machine

## Property

Appearances: colorless, clear viscous liquid

pH value: 6-10

✚ Use pH meter for measuring pH value of the detergent

**Table 2.7:** Dish washing liquid formula 2.

Ingredients	Composition (%)	Masses (g) (1000 g)
Distilled water	65.00	650.00
Sles 25%	16.00	160.00
Sulfonic acid	10.00	100.00
Sodium hydroxide (45%)	3.00	30.00
CDE	2.00	20.00
Disodium EDTA	0.50	5.00
Perfume	1.00	10.00
CMC	0.50	5.00
Preservative (Phenoxyethanol)	1.00	10.00
Color	q.s	
Citric acid (pH adjuster)	q.s	

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{65}{100} \times 1000 \text{ g} = 650\text{g} = 0.650\text{kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.7.

## Method

- Boil portion of water to 100 °C and dissolve CMC and put aside to cool.

- In a reaction tank add approximately 90% of water and put 10% portion aside for dissolving preservative.
- Add sulfonic acid slowly with continuous mixing
- Neutralize sulfonic acid with solution of sodium hydroxide (45% NaOH) by adding a base solution slowly with continuous stirring.
- Use a pH meter to test for pH and when it is around 7-8 then add SLES 25% slowly with thorough mixing
- Dissolve Phenoxyethanol and EDTA in a separate container using the remaining 10% portion of water.
- Add EDTA slowly into a reaction tank with continuous stirring
- Add CDE slowly with thorough mixing till the viscosity increases
- Take a portion of detergent sample from the tank and transfer in a container and add perfume and then mix thoroughly.
- Transfer the mixture of perfume and detergent prepared into the reaction tank slowly with continuous mixing to avoid collapsing the viscosity of the detergent.
- Add a CMC solution prepared slowly into the reaction tank with continuous mixing till the viscosity increases gradually.
- Add a solution of the preservative prepared above slowly into the reaction tank slowly with continuous stirring.
- Test for the pH and if it is within 7-10 then add green color and if it is less than 6 then carefully add increment amount of sodium hydroxide solution of 45% and above 10 pH values then add increment amount of citric acid.
- Allow enough for the liquid detergent to settle before packaging

### **Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Equipment:** use a wooden stick or mixing machine

**Property**

Appearances: colorless, clear viscous liquid

pH value: 6-10

✚ Use pH meter for measuring pH value of the detergent

**Table 2.8:** Hand dishwashing soap formula 3.

Part	Ingredients	Weight %		
		A	B	C
A	Water	50.00	66.60	73.80
	Linear Alkyl Benzene sulphonic acid (LABSA)	15.00	5.00	8.00
	Sodium Lauryl Sulphate (SLS)	5.00	5.00	2.00
	Sodium Lauryl Ether Sulfate (SLES)	4.00	3.00	2.00
	Dimethyl amine oxide (foam booster)	3.00	2.00	2.00
	Quaternary monoalkyl Ammonium Chloride	3.00	-	1.00
B	Sodium perborate tetrahydrate	4.00	4.00	2.00
	Tetra Acetyl Ethylene Diamine (TAED)	2.00	2.00	0.80
	Sodium Xylene Sulfonate	4.50	4.00	2.00
	Ethanol	4.30	4.00	2.00
	Sodium chlorite (thickener)	3.00	3.00	3.00
C	Monoethanolamine	to pH	to pH	to pH
D	Benzothiazolinone (preservative)	0.40	0.40	0.40
	Proteases	0.20	-	-
	Lipases	0.20	-	-
	Amylases	0.20	-	-
	Cellulases	0.20	-	-
	Dye	q.t	q.t	q.t
	Fragrance	1.00	1.00	1.00

**Manufacturing procedure**

Detergent Formulation Manual, 2024, V1

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{50}{100} \times 1000 \text{ g} = 500\text{g} = 0.500\text{kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.8.

**Process:**

- Add **Part A:** take about 70% of total water into a reactor tank and then add all other chemicals in sequential listed order and mix thoroughly.
- Add **Part B:** take a portion of remaining water and dissolve sodium chloride, Sodium perborate tetrahydrate, and Tetra Acetyl Ethylene Diamine (TAED) and mix until it dissolves and put it aside. Now add Sodium Xylene Sulfonate and ethanol to Part A and mix thoroughly. Add the prepared salt solution in Part B and add it in Part A with thorough mixture until the mixture is clear.
- **Part C:** Take a sample of soap and test for pH between 8.5-9.0 and if it is significantly lower you can add Monoethanolamine to adjust it.
- Add **Part D:** take the remaining water and dissolve Benzothiazolinone (preservative), enzymes, dye and fragrance in separate containers and mix. The different solutions are then transferred into Part A with mixing.

**Equipment:** use a wooden stick or mixing machine

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Property**

Appearances: colorless, clear viscous liquid

pH value: 8.5-9.0

✚ Use pH meter for measuring pH value of the detergent

**Table 2.9.** Hand dishwashing soap.

Part	Ingredients	Weight %
<b>A</b>	Water	59.50
	SLES	23.00
	C <sub>12</sub> -C <sub>14</sub> Polyhydroxy fatty acid amine	4.00
	C <sub>14</sub> Amine oxide	5.00
	C13-15 Alkyl Alcohol Ethoxylate	1.00
<b>B</b>	MgCl <sub>2</sub>	0.70
	Calcium citrate	0.40
	Dimethyl amine oxide (foam booster)	0.50
	Sodium chloride	3.00
	Ethanol	1.00
	Sodium cumene sulfonate	0.50
<b>C</b>	Monoethanolamine	to pH
<b>D</b>	Fragrance	0.50
	Colorants	q.t
	Enzymes	0.50
	Preservative	0.40

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{59.50}{100} \times 1000 \text{ g} = 595\text{g} = 0.595\text{kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.9.

## Process

- Mix Part A. Use about 80% of cold water to mix the ingredients.
- Add Part B in the listed order to Part A and Mix until the formulation is clear. Dissolve sodium chloride, MgCl<sub>2</sub>, calcium citrate and dimethyl amine oxide in the portion of water in separate containers.
- Adjust pH-value with Part C. Before, check if the pH is within 8.5-9.0.
- Add Part D to Part A. Use the remaining water portion to dissolve each ingredient separately.

**Equipment:** use a wooden stick or mixing machine

## Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Property

Appearances: colorless, viscous clear liquid gel.

pH value: 8.5-9.0

✚ Use pH meter for measuring pH value of the detergent

**Table 2.10.** Hand Dishwashing Detergent.

Part	Active Ingredients	Weight %
<b>A</b>	Water	75
	EDTA	0.50
	Sodium Laureth Sulfate (SLS)	15.00
	Sodium Lauroyl Sarcosinate	2.00
<b>B</b>	Cocamidopropyl Betaine	2.00
	Glycerin	2.00

	Sodium chloride	2.00
<b>C</b>	Citric Acid	q.s to pH
<b>D</b>	Preservative	0.5
	Fragrance	1.00
	Colorant	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{75}{100} \times 1000 \text{ g} = 750\text{g} = 0.750\text{kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.10.

### Process:

- Mix Part **A**. Use about 80% of water.
- Add Part **B** in the listed order to Part A and mix until the formulation is clear. Use small portions to dissolve sodium hydroxide and citric acid separately before transferring it to the reactor tank.
- Adjust pH-value with Part **C**. verify first if the pH is within 7.5-8.5
- Add Part **D**. Use the remaining water portion to dissolve fragrance, preservative, and colorant separately.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit

- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Property

Appearance: clear, colorless, viscous liquid

pH-value: 7.5-8.5

✚ Use pH meter for measuring pH value of the detergent

**Table 2.11.** Household Dishwasher Rinse Aid.

Part	Active Ingredients	Weight %
<b>A</b>	Water	66.80
	Sodium Lauroyl Sarcosinate (30%)	2.00
<b>B</b>	Alcohol ethoxylate	20.00
	Propylene Glycol	10.00
<b>C</b>	Citric Acid	q.s to pH
<b>D</b>	Fragrance	1.00
	Preservative	0.20
	Colorant	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{66.80}{100} \times 1000 \text{ g} = 668 \text{ g} = 0.668 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.11.

## Process:

- Mix Part **A**. Use about 90% of water.

- Add Part **B** in listed order to Part A and mix until the formulation is clear
- Adjust pH-value with Part **C**
- Add Part **D**. Use the remaining portion of water to dissolve fragrance, preservative, and colorant in separate containers.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Property**

Appearance: colorless, clear liquid

pH-value: 2.5-3.5

🔧 Use pH meter for measuring pH value of the detergent

**Table 2.12.** Oven Cleaner.

Part	Active Ingredients	Weight %
<b>A</b>	Water	75.80
	Sodium Hydroxide (10%)	15.00
	EDTA	2.00
<b>B</b>	Sodium Lauryl sulfate (SLS)	2.00
	Coco Glucoside	2.00
<b>C</b>	Alcohol Ethoxylate	2.00
<b>D</b>	Fragrance	1.00
	Preservative	0.20

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{75.80}{100} \times 1000 \text{ g} = 758 \text{ g} = 0.758 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.12.

## Process:

- Mix Part **A**. Use about 90% of water.
- Add Part **B** in listed order to Part A and mix until the formulation is clear
- Add Part **C** and mix thoroughly.
- Add Part **D**. Use the remaining portion of water to dissolve fragrance, preservative, and colorant in separate containers.

**Equipment:** use a wooden stick or mixing machine

## Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Property

Appearance: colorless, clear liquid

pH-value: 12.5-13.0

✚ Use pH meter for measuring pH value of the detergent

**Table 2.13:** Hand wash soap formula 1.

Ingredients	Composition (%)	Masses (g) (1000 g)
Distilled water	67.00	670.00
Cocamidopropyl betaine	14.00	140.00
SDBS	10.00	100.00
Sodium hydroxide (45%)	2.00	20.00
CDE	2.00	20.00
Salt	1.00	10.00
Glycerin	3.00	30.00
Disodium EDTA	0.50	5.00
Citric acid (pH adjuster)	q.s	q.s
Perfume	0.50	5.00
Preservative (benzyl benzoate)	0.50	5.00
Color	q.s	

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{67}{100} \times 1000 \text{ g} = 670 \text{ g} = 0.670 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 2.13.

### Method

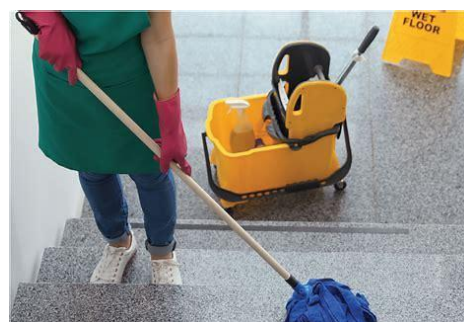
- In a reaction tank, add cold water, and color of your choice, sodium hydroxide and disodium EDTA with continuous stirring to acquire a homogenous mixture. Mix slowly to avoid over production of foam.
- Add SDBS and Cocamidopropyl betaine surfactants with continuous stirring.
- Confirm and verify the pH of the mixture using pH meter or pH paper. For a pH paper you must get the green color to signify pH 7-8 units or use a pH meter.
- Add glycerin and mix thoroughly.
- Take a small amount of solution from the tank and dissolve perfume and preservative and transfer it back to the tank with continuous mixing.
- Package the content after a few hours to allow for complete settling

## Chapter 3: Floor and bathroom cleaning formulations

Bathroom cleaners are cleaning products that are used to clean different areas of your bathroom. They are made in different forms such as liquids, foam, wipes, and scrubbers. Some bathroom cleaners are environmentally safe and can be used as disinfectants. They can be formulated for specific bathroom stains, such as mold and hard water.

Floor care products are found in different forms for example, floor cleaning detergents and floor polish. Floor cleaning detergents contain disinfectants such as sodium hypochlorite or perborates to kill micro-organism and removes stains on the floor or tile. Floor polishes are used to make the floor smooth and shiny and forms a protective coat against corrosion or stain formation.

Bleach is type of detergents that are used to remove tough stains and soil residues from fabrics. Through oxidation, process bleach transforms soil particles into soluble ones which are removed by aid of detergent during washing. Bleaches also provide whitening and brightening of clothes. Other bleaches are used to kill bacteria. It is essential to know how much bleach to use in laundry to clean material, remove stains, and fabric whitening.



**Table 3.1:** Liquid bleach formulation.

Ingredients	Composition (%)	Masses (g) (1000 g)
Distilled water	70.00	700.00
Sodium hypochlorite solution	28.00	280.00
Sodium hydroxide (45%)	2.00	20.00

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{70}{100} \times 1000 \text{ g} = 670 \text{ g} = 0.670 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.1.

### Method:

- Add water in a reaction vessel, followed by adding sodium hypochlorite liquid solution slowly with through mixing.
- Add a solution of 45% sodium hydroxide into the reaction tank slowly with continuous stirring
- Package it directly.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Property

Appearance: colorless, clear liquid

pH-value: 11.0-13.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.2:** Thick Bleach formulation.

Ingredients	Composition (%)	Masses (g) (1000 g)
Distilled water	68.00	680.00
Sodium hypochlorite	20.00	200.00

SLES 70%	10.00	100.00
Sodium hydroxide (45%)	2.00	20.00

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{68}{100} \times 1000 \text{ g} = 680 \text{ g} = 0.680 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.2.

### Method:

- Add water in a reaction vessel
- Add SLES 70% into the reaction tank slowly with continuous stirring
- Add sodium hypochlorite solution slowly with continuous stirring
- Add sodium hydroxide solution (45%) slowly with continuous stirring
- Package it after a few hours.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Property

Appearance: colorless, clear liquid

pH-value: 11.0-13.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.3:** Bathroom cleaner.

Part	Ingredients	Weight %	
		A	B
A	Water	60.00	50.00
	Hydrochloric acid (33%)	8.00	15.00
	Linear Alkyl Benzene sulphonic acid (LABSA)	10.00	10.00
	Sodium carbonate	5.00	5.00
	Sodium silicate	3.00	3.00
	EDTA	1.00	1.00
B	Sodium Lauryl Sulphate	6.00	8.00
	Ethanol	3.00	4.00
	Sodium chloride	3.00	3.00
C	Fragrance	1.00	1.00
	Colorant (optional)	q.s	q.s

## Manufacturing procedure

### Process: Formula A

Let's assume we are making 1000g or 1 kg of the product.

$$\text{Water} = \frac{60}{100} \times 1000 \text{ g} = 600 \text{ g} = 0.6 \text{ kg}$$

Use the same above calculation to determine the composition of other chemicals of the formulation.

### Step 1:

- Add Part A in reaction tank with continuous mixing to form a clear liquid.
- Add Part B into Part A: Some portions of pure water are used to dissolve sodium chloride and put aside.

- Then sodium Lauryl Sulphate and xylene sulphonate are added successively with continuous mixing, then after a solution of sodium hydroxide is added.
- Add Part C to Part A: The remaining water is used to dissolve fragrance and color in separate containers.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Property**

Appearance: colorless, clear liquid

pH-value: 2.0-4.0

🔧 Use pH meter for measuring pH value of the detergent

**Table 3.4:** Acidic Toilet bowl cleaner.

Part	Ingredients	Weight %	
		A	B
A	Water	39.50	20.00
	Hydrochloric acid (33%)	20.00	24.50
	Linear Alkyl Benzene sulphonic acid (LABSA)	8.00	10.00
	Sodium lauryl sulphate	12.00	9.00
B	Sodium perborate tetrahydrate	15.00	30.00
	Tetra Acetyl Ethylene Diamine (TAED)	4.00	5.00
C	Fragrance	1.00	1.00

Colorant	0.50	0.50
----------	------	------

### Manufacturing procedure: Formula A

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{39.50}{100} \times 1000 \text{ g} = 395 \text{ g} = 0.395 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.4.

- Add Part **A** in reaction tank with continuous mixing to form a clear liquid.
- Add Part **B** into Part **A**: take portion of pure water and dissolve Sodium perborate tetrahydrate and Tetra Acetyl Ethylene Diamine (TAED)
- Add Part C into Part A. Use the remaining water and dissolve fragrance and colorant in their order.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Property

Appearance: colorless, clear liquid

pH-value: 2.0-3.0

 Use pH meter for measuring pH value of the detergent

**Table 3.5:** Acidic bowel cleaner.

Ingredients	Composition (%)	Masses (g) (1000 g)
Distilled water	52.00	520.00
Citric acid	3.00	30.00
Hydrochloric acid (33%)	30.00	300.00
NP9	5.00	50.00
SLES 25%	10.00	100.00
Color	q.s	

**Manufacturing procedure:**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{52.00}{100} \times 1000 \text{ g} = 520 \text{ g} = 0.520 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.5.

**Method:**

- Pour water into the reaction tank (stainless steel) and add citric acid and followed by HCL solution of 33% strength with continuous stirring.
- Add surfactant (SLES 25% and NP9) with continuous stirring.
- You may add color but it's optional.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Property

Appearance: colorless, clear liquid

pH-value: 2.0-3.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.6:** Tile cleaner formulation.

Part	Ingredients	Weight %	
		A	B
A	Water	57.00	63.00
	Sodium hydroxide (45%)	3.00	3.00
	Linear Alkyl Benzene sulphonic acid (LABSA)	5.00	5.00
B	Amine oxide	5.00	4.00
	Sodium lauryl sulphate	2.00	4.00
	Sodium carbonate	1.00	4.00
	Sodium hypochlorite	3.00	2.00
	Sodium silicate	4.00	1.00
	ethanol	15.00	10.00
	Polyethylene glycol	4.00	3.00
C	Citric acid	q.s	q.s
D	Fragrance	1.00	1.00
	Colorant	q.s	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{57.00}{100} \times 1000 \text{ g} = 570 \text{ g} = 0.570 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.6.

### Step 1:

- Mix Part **A**: Portion of water is used to dissolve sodium hydroxide solutions please refer to number 1.4 for calculations of making the solution. After, the sodium hydroxide solution is left to cool.
- Portion of water is then transferred into a reaction tank, followed by a solution of sodium hydroxide prepared above.
- The Linear Alkyl Benzene sulphonic acid (LABSA) is then added with continuous stirring.

### Step 2:

Add Part **B** into Part **A**: From portion of water, dissolve amine oxide, sodium carbonate and sodium silicate in separate vessels. If they don't dissolve, please gently apply heat temperature.

- Add Sodium Lauryl Sulphate, Ethanol, Sodium hypochlorite and polyethylene glycol into Part A sequential with mixing to form a clear mixture.
- Now slowly add each solution prepared in step 2 into Part A with continuous stirring.

### Step 3:

- Adjust the pH-value with Part **C** into Part **A**: Before adjusting check if the pH range is within 9-11. Citric Acid is dissolved in portion of water and added into Part A.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Property

Appearance: colorless, clear viscous liquid

pH-value: 8-10

✚ Use pH meter for measuring pH value of the detergent

**Table 3.7:** Eco Friendly Tile and Bath cleaner.

Part	Active Ingredient	Weight %
<b>A</b>	Water	82.40
	Linear alkyl Benzene Sulfonic acid	8.00
	Sodium Lauryl Sarcosinate (30%)	2.00
	Coco Glucoside (52%)	1.50
	Sodium Citrate	4.50
	GLDA (47%)	0.20
<b>B</b>	Citric Acid	q.s to pH
<b>C</b>	Fragrance	1.00
	Preservative	0.40
	Colorant	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{82.40}{100} \times 1000 \text{ g} = 824 \text{ g} = 0.824 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.7.

### Procedure:

- Add Part **A** in listed order and mix until formulation is clear
- Adjust the pH with Part **B** while stirring
- Add Part **C**

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Property**

Appearances: colorless, clear liquid

pH value: 9.0-11.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.8:** Tile cleaner (Good performance).

Part	Active Ingredient	Weight %
<b>A</b>	Water	31.60
	Sodium Hydroxide (50%)	3.00
<b>B</b>	Myristyldimethylamine Oxide (25%)	3.50
	Linear alkyl Benzene Sulfonic acid	8.00
	Sodium Lauryl Sarcosinate (30%)	1.50
	Sodium Hypochlorite (15%)	50.00
	GLDA (47%)	1.00
<b>C</b>	Fragrance	1.00
	Preservative	0.40
	Colorant	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{31.60}{100} \times 1000 \text{ g} = 316 \text{ g} = 0.316 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.8.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Process:

- Mix Part **A**
- Add Part **B** in the listed order to Part A and mix until formulation is clear
- Add Part **C**

### Property

Appearances: colorless, clear liquid

pH value: 11.0-12.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.9:** Hard surface floor cleaner formulation.

Part	Ingredients	Weight %	
		A	B
A	Water	53.50	60.50
	Sodium hydroxide (45%)	3.00	3.00
	Linear Alkyl Benzene sulphonic acid (LABSA)	10.00	10.00
	Sodium Lauryl Sulphate	4.00	4.00
B	Amine oxide	5.00	4.00
	Sodium hypochlorite (15%)	5.00	2.00
	Ethanol	5.00	5.00
	Polyethylene glycol	2.00	3.00
	Sodium silicate	4.00	1.00
	Sodium carbonate	5.00	4.00
	Sodium chloride	3.00	3.00
C	Citric acid	q.s to pH	q.s to pH
D	Fragrance	0.50	0.50
	Colorant	q.s	q.s

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{53.50}{100} \times 1000 \text{ g} = 535 \text{ g} = 0.535 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.9.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask

- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Process:

- Mix Part **A**
- Add Part **B** in the listed order to Part A and mix until formulation is clear
- Adjust the pH-value with Part **C**
- Add Part **D**

### Property

Appearances: colorless, clear liquid

pH value: 9.0-11.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.10.** Tile cleaner formulation (High performance).

Part	Ingredients	Weight %
<b>A</b>	Water	71.15
	Decylethoxylate/butoxylate	10.00
	PEG-5-Cocomonium methosulfate	1.00
	Sodium ethylhexyl sulfate	9.00
<b>B</b>	Sodium stearate	1.20
	Decylaminoxide	4.35
	Triethanolamine (EMULSIFIER)	2.00
	IDS (SALT)	0.90
<b>C</b>	Preservative	0.40
	Perfume	1.00

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{71.15}{100} \times 1000 \text{ g} = 711.5 \text{ g} = 0.7115 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.10.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Process:

- Mix Part **A**
- Add Part **B** in the listed order to Part A and mix until formulation is clear
- Add Part **C**

### Property

Appearances: colorless, clear liquid

pH value: 9.0-11.0

 Use pH meter for measuring pH value of the detergent

**Table 3.11:** Tile cleaner formulation (Standard cleaner).

---

Part	Ingredients	Weight %
------	-------------	----------

---

<b>A</b>	Water	80.00
	Sodium ethylhexyl sulfate	8.80
	Sodium Diethylhexyl sulfosuccinate	3.90
<b>B</b>	PEG-5-Cocomonium methosulfate	4.00
	Sodium phosphate	1.90
<b>C</b>	Preservative	0.40
	Colorant	q.s
	Perfume	1.00

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{80.00}{100} \times 1000 \text{ g} = 800 \text{ g} = 0.800 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.11.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Process:

- Mix Part **A**
- Add Part **B** in the listed order to Part A and mix until formulation is clear
- Add Part **C**

## Property

Appearances: colorless, clear liquid

pH value: 9.0-11.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.12:** All Purpose Hard Surface Cleaner.

Part	Active Ingredients	Weight %
A	Water	83.10
	Propylene Glycol n-Butyl Ether	5.00
	Potassium hydroxide (45%)	2.00
B	Sodium Cocoyl Sarcosinate (30%)	3.50
	Alcohol Alkoxylate	3.00
	GLDA (47%)	2.00
C	Fragrance	1.00
	Preservative	0.40
	Colorant	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{83.10}{100} \times 1000 \text{ g} = 831 \text{ g} = 0.831 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.12.

**Equipment:** use a wooden stick or mixing machine

## Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles

- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Process:

- Mix Part **A** in listed order
- Add Part **B** in the listed order and mix until formulation appears clear
- Add Part **C**

### Property

Appearances: colorless, clear liquid

pH value: 10.0-12.0

 Use pH meter for measuring pH value of the detergent

**Table 3.13:** Disinfection Detergent (Floor cleaner).

Part	Active Ingredients	Weight %
<b>A</b>	Water	50.60
	EDTA	1.00
	Isopropyl Alcohol	32.00
	Sodium Lauroyl Sarcosinate (30%)	2.00
	C13-15 Alkyl Alcohol Ethoxylate	6.00
	Hydroxyethyl Laurdimonium Chloride	5.00
	Zinc Ricinoleate	2.00
<b>B</b>	Fragrance	1.00
	Preservative	0.40
	Colorant	q.s

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{50.60}{100} \times 1000 \text{ g} = 506 \text{ g} = 0.506 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.13.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Process:**

- Mix Part **A** in listed order and mix until the formulation appears homogeneous
- Add Part **B** in Part **A**

**Property:**

Appearances: clear liquid

pH-value: 10.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.14:** Floor Cleaner.

Part	Active Ingredients	Weight %
<b>A</b>	Water	93.10
	Propylene Glycol	0.50
	GLDA (47%)	2.00

<b>B</b>	Sodium Cocoyl Sarcosinate (30%)	3.00
<b>C</b>	Citric Acid	q.s to pH
<b>D</b>	Fragrance	1.00
	Preservative	0.40
	Colorant	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{93.10}{100} \times 1000 \text{ g} = 931 \text{ g} = 0.931 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.14.

**Equipment:** use a wooden stick or mixing machine

## Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Process:

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Adjust pH-value with part **C** while stirring
- Add Part **D**

## Property

Detergent Formulation Manual, 2024, V1

Appearances: colorless, clear liquid

pH-value: 6.0-10

✚ Use pH meter for measuring pH value of the detergent

**Table 3.15:** Detergent for cleaning food processing equipment.

Part	Ingredients	Weight %		
		A	B	C
A	Water	79.50	79.00	78.50
	Sodium hydroxide (45%)	15.00	15.00	15.00
	1-hydroxyethylidene-1.1-diphosphonic acid	-	0.30	0.80
B	Sodium hypochlorite (15%)	2.00	3.00	3.00
	1,2,4 Tricarboxylic acid	0.80	-	-
	Sodium polyacrylate	2.70	2.70	2.70
C	Citric acid	q.s	q.s	q.s

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{79.50}{100} \times 1000 \text{ g} = 795 \text{ g} = 0.795 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.15.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots

- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Process:**

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Add Part **C** into the mixture of part **A** and **C**.

**Property**

Appearances: colorless, clear liquid

pH-value: 10.0-12.5

🛠️ Use pH meter for measuring pH value of the detergent

**Table 3.16:** Enzymatic based detergents for cleaning food processing equipment.

Part	Ingredients	Weight %			
		A	B	C	D
A	Water	33.70	33.70	33.90	33.90
	Ethoxylated propoxylated nonionic	25.00	25.00	25.00	25.00
	Propylene glycol	12.00	12.00	15.00	15.00
	Triethanolamine	2.00	2.00	2.00	2.00
	Sodium xylene sulfonate	20.00	20.00	20.00	20.00
B	Sodium metabisulfite	1.00	1.00	1.00	1.00
	Protease	6.30	6.30	3.10	3.10

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{33.70}{100} \times 1000 \text{ g} = 337 \text{ g} = 0.337 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.16.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Process:**

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear

**Property**

Appearances: colorless, clear liquid

pH-value: 8.0-11.0

 Use pH meter for measuring pH value of the detergent

**Table 3.17:** Aqueous based metal cleaning detergent.

Part	Ingredients	Weight %			
		A	B	C	D
<b>A</b>	Water	80.30	82.30	78.30	71.30
	Sodium hydroxide (50%)	0.50	0.50	0.50	0.50
	Sodium Nonanoate	6.50	6.50	10.50	15.50
	Sodium carbonate	3.00	3.00	3.00	3.00
<b>B</b>	Borax	0.30	0.30	0.30	0.30

	C13-C15 Alkyl Alcohol ethoxylate	6.00	4.00	4.00	4.00
	N-octylpyrrolidone	-	-	-	2.0
	Sodium silicate	2.00	2.00	2.00	2.00
	Sodium polyacrylate	0.50	0.50	0.50	0.50
<b>C</b>	Citric acid	q.s	q.s	q.s	q.s
<b>D</b>	Fragrance	0.50	0.50	0.50	0.50
	1,2,3-Benzotriazole	0.40	0.40	0.40	0.40

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{80.30}{100} \times 1000 \text{ g} = 803 \text{ g} = 0.803 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.17.

**Equipment:** use a wooden stick or mixing machine

## Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Process:

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Adjust pH-value with part **C** while stirring
- Add Part **D**

## Property

Appearances: colorless, clear liquid

pH-value: 8.0-12.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.18:** Ammoniated surface cleaner.

Ingredients	Composition (%)	Masses (g) (1000 g)
Distilled water	65.00	650.00
Kulu 10	15.00	150.00
SLES 25%	10.00	100.00
L31-Alcogum	10.00	100.00

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{65}{100} \times 1000 \text{ g} = 650 \text{ g} = 0.650 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.18.

**Equipment:** use a wooden stick or mixing machine

## Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Process:

### Method

- Add Kulu-10 in water and mix thoroughly till it dissolves
- After complete dissolution, add sles 25% with continuous blending.
- Now add L31-Alcogum thickener and blend well.
- Allow the mixture to settle for 4-8 hours before packaging.

### Property

Appearances: viscous, white abrasive liquid

pH-value: 10.0-12.0

✚ Use pH meter for measuring pH value of the detergent

**Table 3.19:** Formulation of pine gel made from sulfonic acid

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	60.00	600.00
Sulphonic acid	20.00	200.00
Sodium hydroxide (45%)	3.00	30.00
Np9	7.00	70.00
Pine oil	10.00	100.00
Colorant (green)	q.s	q.s

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{60}{100} \times 1000 \text{ g} = 600 \text{ g} = 0.600 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 3.19.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Process:**

- In reaction tank add water
- Add sulfonic acid slowly and mix thorough
- Add a solution of sodium hydroxide (45%) slowly with stirring till a white color form which shows that sulfonic acid is neutralized.
- Take a sample from the tank and verify the pH using a pH meter. The pH should be around 7-9. When the pH is lower than 6 add small amount of sodium hydroxide (45%) to raise it to 7-9 and above 12 add citric acid to lower it to the respective range.
- Add pine oil with continuous mixing till a thick product is formed.
- Add Np9 surfactant to form a gel like final product.
- Add a color pigment
- Allow for some time before packaging.

**Property**

Appearances: green viscous and free-standing gel

pH-value: 8.0-10.0

 Use pH meter for measuring pH value of the detergent



## Chapter 4: Automotive cleaning formulation

**Table 4.1:** Car detergent wash.

Part	Ingredients	Weight %	
		A	B
A	Water	49.60	61.60
	Sodium hydroxide (45%)	3.00	3.00
	Dodecylbenzene sulphonic acid (DDBSA)	15.00	10.00
	Sodium lauryl sulphate	15.00	10.00
B	Isopropyl alcohol	8.00	5.00
	Amine oxide	2.00	4.00
	Sodium Xylene sulphonate	3.00	2.00
	Sodium chloride	3.00	3.00
C	Fragrance	1.00	1.00
	Preservative	0.40	0.40
	Colorant	q.s	q.s

### Manufacturing procedure

To the batch tank, add water, caustic soda and DDBSA. At this point, the pH should be greater than 7.0. If not, immediately add more caustic soda. Add all other ingredients in a successive order.

### Note:

The viscosity of the finished product can be adjusted by adding sodium xylene sulphonate or sodium chloride.

**Table 4.2:** Car shampoo.

Part	Ingredients	Weight %
<b>A</b>	Water	57.60
	Sodium alkylbenzene sulphonate	20.00
	Sodium lauryl ether sulfate	10.00
<b>B</b>	Cocamidopropyl hydroxysultaine	5.00
	Sodium carbonate	2.00
	Sodium metasilicate	3.00
	EDTA	1.00
<b>C</b>	Preservative	0.40
	Fragrance	1.00

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{57.60}{100} \times 1000 \text{ g} = 576 \text{ g} = 0.576 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.2.

**Equipment:** use a wooden stick or mixing machine

### Process:

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Adjust pH-value with part **C** while stirring
- Add Part **D**

## Property

Appearances: colorless, clear liquid

pH-value: 7.0-9.0

✚ Use pH meter for measuring pH value of the detergent

**Table 4.3:** Car shampoo 2.

Part	Ingredients	Weight %	
		A	B
A	Water	58.60	57.60
	Sodium alkylbenzene sulphonate	20.00	20.00
	Sodium lauryl ether sulfate	10.00	10.00
	Potassium Tripolyphosphate	2.00	-
B	EDTA	-	1.00
	Cocamidopropyl hydroxysultaine	-	5.00
	Sodium carbonate	-	2.00
	Sodium metasilicate	3.00	3.00
	Disodium coco amphopropionate	5.00	-
C	Preservative	0.40	0.40
	Fragrance	1.00	1.00

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{58.60}{100} \times 1000 \text{ g} = 586 \text{ g} = 0.586 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.3.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Add Part **C** while stirring

**Property**

Appearances: colorless, clear viscous liquid

pH-value: 7.0-9.0

🔧 Use pH meter for measuring pH value of the detergent

**Table 4.4:** Car shampoo 3.

Part	Ingredients	Weight %
<b>A</b>	Water	58.60
	Sodium alkylbenzene sulphonate	20.00
	Sodium lauryl ether sulfate	10.00
	Disodium coco amphopropionate	5.00
	Potassium tripolyphosphate	2.00
<b>B</b>	Sodium metasilicate	3.00
<b>C</b>	Preservative	0.40
	Fragrance	1.00

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{58.60}{100} \times 1000 \text{ g} = 586 \text{ g} = 0.586 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.4.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Add Part **C** while stirring

**Property**

Appearances: colorless, clear viscous liquid

pH-value: 7.0-9.0

✚ Use pH meter for measuring pH value of the detergent

**Table 4.5:** Mild Car Wash Shampoo 4.

Part	Active Ingredients	Weight %
<b>A</b>	Water	76.60
	MGDA (78%)	5.00
	GLDA (47%)	5.00
<b>B</b>	Sodium Lauroyl Sarcosinate (30%)	5.00
	Sodium Laureth Sulfate (30%)	5.00
	Cocamidopropyl betaine (38%)	2.00
<b>C</b>	Citric Acid	q.s to pH
<b>D</b>	Fragrance	1.00
	Preservative	0.40
	Colorant	q.s

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{76.60}{100} \times 1000 \text{ g} = 766 \text{ g} = 0.766 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.5.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A**
- Add Part **B** in the listed order and mix until formulation appears clear
- Adjust pH-value with Part **C**
- Add Part **D**

**Property**

Appearances: colorless, clear liquid

pH value: 8.5-9.0

🔧 Use pH meter for measuring pH value of the detergent

**Table 4.6:** Car interior cleaner (plastic cleanser)

Part	Ingredients	Weight %
<b>A</b>	Water	85.80
	Cocamidopropyl amine oxide	1.30
	PEG-5 Cocomonium methosulfate	0.50
<b>B</b>	Isopropanol	10.00
	Citric acid monohydrate	1.20
<b>C</b>	Preservative	0.20
	Fragrance	1.00

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{85.80}{100} \times 1000 \text{ g} = 858 \text{ g} = 0.858 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.6.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A**
- Add Part **B** in the listed order and mix until formulation appears clear
- Add Part **C**

**Property**

Appearances: colorless, clear liquid

pH value: 7.0-10.0

✚ Use pH meter for measuring pH value of the detergent

**Table 4.7:** Car interior cleaner (Leather cleanser)

Part	Ingredients	Weight %
<b>A</b>	Water	32.40
	Stearyl dimethicone	1.80
	Cetyl dimethicone copolyol	1.60
	Cyclomethicone	7.20
	Isopropylmyristate	3.60
	Silicone oil	1.80
	Glycerol	48.00
<b>B</b>	Sodium chloride	2.50
	Preservative	0.40
	Fragrance	0.50

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{32.40}{100} \times 1000 \text{ g} = 324 \text{ g} = 0.324 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.7.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A**
- Add Part **B** in the listed order and mix until formulation appears clear

**Property**

Appearances: colorless, clear liquid

pH value: 7.0-11.0

✚ Use pH meter for measuring pH value of the detergent

**Table 4.8:** Car Rim cleaner formulation (Alkaline)

Part	Ingredients	Weight %
<b>A</b>	Water	66.30
	Potassium hydroxide (45%)	13.00
	Disodium cocoamphopropionate	8.00
<b>B</b>	Potassium Tripolyphosphate	12.00
<b>C</b>	Preservative	0.20
	Fragrance	0.50

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{66.30}{100} \times 1000 \text{ g} = 663 \text{ g} = 0.663 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.8.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Add part **C** while stirring

**Property**

Appearances: colorless, clear liquid

pH-value: 8.0-12.0

🛠️ Use pH meter for measuring pH value of the detergent

**Table 4.9:** Car Rim cleaner formulation, Active.

Part	Ingredients	Weight %
<b>A</b>	Water	89.80
	Sodium lauryl sulfate	2.50
	Myristylaminooxide	6.30
<b>B</b>	Sodium carbonate	0.30
<b>C</b>	Preservative	0.40
	Fragrance	0.50

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{89.80}{100} \times 1000 \text{ g} = 898 \text{ g} = 0.898 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.9.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear
- Add pH-value Part **C** while stirring

**Property**

Appearances: colorless, clear liquid

pH-value: 8.0-11.0

✚ Use pH meter for measuring pH value of the detergent

**Table 4.10:** Automobile engine cleaner.

Part	Ingredients	Weight %
<b>A</b>	Water	60.10
	C18 tall oil	9.50
	Heavy aromatic naphtha	14.00
	Tetra potassium pyrophosphate	8.00
<b>B</b>	Dodecyl oxydibenzene disulfonate	6.00
	NP9	1.20
	Sodium orthosilicate	1.20

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{60.10}{100} \times 1000 \text{ g} = 610 \text{ g} = 0.610 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 4.10.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A** in listed order
- Add Part **B** to Part **A** and mix until the formulation is clear

**Property**

Appearances: colorless, clear liquid

pH-value: 7.0-9.0

✚ Use pH meter for measuring pH value of the detergent

## Chapter 5: Window cleaning formulations

Window cleaner are detergents that are used to clean dirt from glassy material used in homes, industries, institution or on the vehicles. They are normally produced as gel or liquid.



**Table 5.1:** Glass cleaners 1.

Part	Ingredients	Weight %	
		A	B
<b>A</b>	Water	58.60	62.60
	Sodium hydroxide (45%)	3.00	3.00
	Linear Alkyl Benzene sulphonic acid (LABSA)	5.00	5.00
	Sodium lauryl sulphate	2.00	4.00
<b>B</b>	Amine oxide	4.00	4.00
	Sodium carbonate	1.00	1.00
	Sodium silicate	1.00	1.00
	Isopropyl alcohol	-	15.00
	Ethanol	20.00	-
	Polyethylene glycol	4.00	3.00
<b>C</b>	Fragrance	1.00	1.00
	Preservative	0.40	0.40

---

Colorant	q.s	q.s
----------	-----	-----

---

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{58.60}{100} \times 1000 \text{ g} = 586 \text{ g} = 0.586 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 5.1.

**Equipment:** use a wooden stick or mixing machine

### Process:

#### Step 1:

- Mix Part **A**: Portion of water is used to dissolve sodium hydroxide solutions please refer to number 1.4 for calculations of making the solution. After, the sodium hydroxide solution is left to cool.
- Portion of water is then transferred into a reaction tank, followed by a solution of sodium hydroxide prepared above.
- The remaining ingredients in Part A are added into the reaction tank in listed order with continuous stirring.

#### Step 2:

Add Part **B** into Part **A**: From portion of water, dissolve amine oxide, sodium carbonate and sodium silicate in separate vessels. If they don't dissolve, please gently apply heat temperature.

- Add Isopropyl alcohol, ethanol, and polyethylene glycol into Part A sequential with mixing to form a clear mixture.
- Now slowly add each solution prepared in step 2 into Part A with continuous stirring.

### Step 3:

- Add Part **C** into Part **A**: Small portion of remaining water is used to dissolve the ingredients before transferring into Part **A**.

### Property

Appearances: colorless, viscous liquid

pH value: 6.0-8.0

🔧 Use pH meter for measuring pH value of the detergent

**Table 5.2:** Glass cleaner 2.

Part	Active Ingredient	Weight %
<b>A</b>	Water	77.05
	Linear alkyl Benzene Sulfonic acid	10.00
	Isopropyl alcohol	7.00
	Sodium Myristoyl Sarcosinate (30%)	0.75
	Propyl Glycol n-Butyl Ether	4.00
	Sodium Citrate	0.30
<b>B</b>	Fragrance	0.50
	Preservative	0.40
	Colorant	q.s

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{77.05}{100} \times 1000 \text{ g} = 770.5 \text{ g} = 0.7705 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 5.2.

**Equipment:** use a wooden stick or mixing machine

**Process:**

- Mix Part **A** until a homogeneous solution is made
- Add Part **B**

**Property**

Appearances: colorless, clear liquid

pH value: 7.0-8.0

✚ Use pH meter for measuring pH value of the detergent

**Table 5.3:** Windows cleaner.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	65.50	655.00
Isopropyl alcohol	20.00	200.00
SLES 25%	10.00	100.00
Propylene glycol	4.00	40.00
Perfume	0.50	5.00
Color (blue, red, pink)	q.s	

**Manufacturing procedure**

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{65.50}{100} \times 1000 \text{ g} = 655 \text{ g} = 0.655 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 5.3.

**Equipment:** use a wooden stick or mixing machine

Detergent Formulation Manual, 2024, V1

**Process:**

- Add water into the reaction tank. Add Isopropyl alcohol, propylene glycol and Sles 25% with continuous stirring.
- Take small amount of liquid mixture from the tank and dissolve perfume and color and add to the bulk mixture with continuous stirring.
- Allow the mixture to rest for a few hours before packaging.

**Property**

Appearances: colorless, clear liquid

pH value: 8.0-11.0

 Use pH meter for measuring pH value of the detergent

## Chapter 6: Heavy duty cleaning detergents

Heavy-duty cleaning detergents are formulated to remove stubborn, ingrained dirt, grease, and grime from various surfaces. They are typically more concentrated and potent than general-purpose cleaners and are designed for challenging cleaning tasks in industrial, commercial, and sometimes residential settings.



Table 6.1: Surface corrosion cleaner.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	56.00	560.00
Phosphoric acid 85%	30.00	300.00
NP9 surfactant	5.00	50.00
2-Butoxyethanol	5.00	50.00
Sodium borate	1.00	10.00
CMC	3.00	30.00

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{56}{100} \times 1000 \text{ g} = 560 \text{ g} = 0.610 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 6.1.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Process:**

- Add 2-Butoxyethanol in a reaction tank
- Add NP9 surfactant into a reaction tank and start mixing slowly and continuously till NP9 dissolves.
- Take portion of water and dissolve sodium borate(borax) and CMC in a separate container and let it dissolve and set aside.
- Add phosphoric acid slowly into the reaction tank and stir continuously.
- Add solution of borax with continuous stirring
- Add CMC slowly till the mixture thickens and mix homogeneously.
- Allow for some time before packaging.

**Packaging containers:**

- High-density polyethylene cans

**Property**

Appearances: clear, colorless, and viscous liquid.

pH value: 1.0-2.0

- ✚ Use pH meter for measuring pH value of the detergent

**Table 6.2:** Floor striping detergent.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water(solvent)	50.00	500.00
Propylene glycol n-butyl ether (solvent)	10.00	100.00
Sodium borate (corrosion inhibitor)	1.00	10.00
EDTA (Chelating agents)	1.00	10.00
Sodium hydroxide	20.00	200.00
NP9 (surfactant)	10.00	100.00
SLS (surfactant)	5.00	50.00
CMC (thickener)	3.00	30.00

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{50}{100} \times 1000 \text{ g} = 500 \text{ g} = 0.500 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 6.2.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

## Process:

- Add Propylene glycol n-butyl ether into the reaction tank
- Add NP9 and SLS surfactants successively into a reaction tank and start mixing slowly and continuously till they dissolve.
- Take a portion of water and dissolve sodium borate(borax), EDTA and CMC in a separate container and let it dissolve and set aside.
- Take the rest of the water and dissolve sodium hydroxide pellets and put aside for cooling.
- Add sodium hydroxide solution slowly into the reaction tank and stir continuously.
- Add a solution of EDTA into a reaction tank slowly with continuous stirring.
- Add solution of sodium borate with continuous stirring
- Finally Add CMC slowly till the mixture thickens and mix homogeneously.
- Allow for some time before packaging.

## Property

Appearances: clear, colorless, and viscous liquid.

pH value: 12.0-14.0

🔧 Use pH meter for measuring pH value of the detergent

## Packaging containers:

- High-density polyethylene cans

Table 6.3: Heavy duty degreaser.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	56.50	565.00
Propylene glycol n-butyl ether (solvent)	15.00	150.00
NP9	10.00	100.00
SLS	5.00	50.00
Sodium hydroxide (NaOH)	10.00	100.00
Sodium borate	0.50	5.00
CMC	3.00	30.00

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{56.50}{100} \times 1000 \text{ g} = 565 \text{ g} = 0.565 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 6.3.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Process:

- Add Propylene glycol n-butyl ether into the reaction tank
- Add NP9 and SLS surfactants successively into a reaction tank and start mixing slowly and continuously till they dissolve.
- Take a portion of water and dissolve sodium borate(borax) and CMC in a separate container and let it dissolve and set aside.
- Take the rest of the water and dissolve sodium hydroxide pellets and put aside for cooling.
- Add sodium hydroxide solution slowly into the reaction tank and stir continuously.
- Add solution of sodium borate with continuous stirring
- Finally Add CMC slowly till the mixture thickens and mix homogeneously.
- Allow for some time before packaging.

### Property

Appearances: clear, colorless, and viscous liquid.

pH value: 10.0-12.0

✚ Use pH meter for measuring pH value of the detergent

### Packaging containers:

- High-density polyethylene cans

Table 6.4: Engine degreaser.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	53.00	530.00
NP9	15.00	150.00
SLS	5.00	50.00
Propylene glycol n-butyl ether (solvent)	20.00	200.00
Sodium hydroxide	3.00	30.00
Sodium borate	1.00	10.00
CMC	3.00	30.00

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{53}{100} \times 1000 \text{ g} = 530 \text{ g} = 0.530 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 6.4.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask

- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### **Process:**

- Add Propylene glycol n-butyl ether into the reaction tank
- Add NP9 and SLS surfactants successively into a reaction tank and start mixing slowly and continuously till they dissolve.
- Take a portion of water and dissolve sodium borate(borax) and CMC in a separate container and let it dissolve and set aside.
- Take the rest of the water and dissolve sodium hydroxide pellets and put aside for cooling.
- Add sodium hydroxide solution slowly into the reaction tank and stir continuously.
- Add solution of sodium borate with continuous stirring
- Finally Add CMC slowly till the mixture thickens and mix homogeneously.
- Allow for some time before packaging.

### **Property**

Appearances: clear, colorless, and viscous liquid.

pH value: 9.0-12.0

✚ Use pH meter for measuring pH value of the detergent

### **Packaging containers:**

- High-density polyethylene cans

## Chapter 7: Personal care detergents

Personal care detergents encompass a range of cleaning and hygiene products designed for individual use, including soaps, body washes, hand sanitizers, and more. These products are formulated to be gentle on the skin while effectively removing dirt, germs, and odors.



### 7.1. Saponification value

The saponification value (SV) is the amount of potassium hydroxide (KOH), or sodium hydroxide (NaOH) needed to neutralize the fatty acids in one gram of fat or oil. It's a measure of the average molecular weight of the fatty acids present in a sample. Higher SV generally indicates shorter fatty acid chains.

#### 7.1.1. Saponification table of various oils and butter.

**Table 7.1:** The saponification values of different oils and butters.

0.136	Almond Oil	0.074	Lanolin
0.135	Apricot kernel oil	0.139	Macadamia nut oil
0.136	Arachis oil, peanut oil, earthnut oil, katchung oil	0.136	Margarine
0.133	Avocado Oil	0.140	Mink oil
0.175	Babassu Oil	0.123	Mustard seed oil
0.069	Bayberry or myrtle wax	0.138	Mutton tallow, sheep tallow
0.140	Beef Fat (tallow)	0.141	Neat's foot oil, beef hoof oil
0.069	Beeswax	0.137	Neem tree oil
0.136	Borage oil	0.134	Olive oil
0.175	Brazil nut oil, babassu oil	0.156	Palm kernel oil, palm butter
0.124	Canola oil, rapeseed oil, colza oil, rape oil, ramic oil	0.141	Palm oil

0.069	Carnauba wax	0.136	Peanut oil, earhnut oil
0.128	Castor oil, Ricinus oil	0.135	Pistachio oil
0.138	Chicken fat	0.138	Poppy seed oil
0.137	Cocoa butter	0.135	Pumpkin seed oil
0.190	Coconut oil	0.128	Rice bran oil
0.132	Cod liver oil	0.136	Safflower oil
0.136	Corn oil, maize oil	0.135	Sardine oil, Japan fish oil
0.138	Cottonseed oil	0.133	Sesame seed oil, gigely oil
0.139	Deer tallow, venison fat	0.128	Shea butter, African karite butter
0.136	Evening primrose oil	0.138	Sheep fat, sheep tallow
0.135	Flax seed oil	0.074	Sheep wool fat, lanolin
0.139	Goat tallow, goat fat	0.136	Shortening, vegetable shortening, hydrogenated vegetable oil
0.136	Goose fat	0.135	Soybean oil, Chinese bean oil
0.123 to 0.135	Grape seed oil, grapefruit seed oil (varies widely)	0.134	Sunflower oil
0.136	Hazelnut oil	0.137	Theobroma oil, cocoa butter
0.137	Hemp oil, hemp seed oil	0.137	Tung oil, soybean oil, China wood oil
0.136	Herring oil, fish oil	0.138	Venison fat, deer fat,
0.137	Java cotton, Kapok oil	0.136	Walnut oil, <i>Juglans regia</i> oil
0.069	Jojoba oil	0.138	Whale: baleen whale
0.128	Karite butter, shea butter	0.092	Whale: sperm whale, body, blubber oil
0.135	Kukui oil	0.102	Whale: sperm whale, head
0.138	Lard, pork tallow, pork fat	0.132	Wheatgerm oil, <i>Triticum vulgare</i> oil
0.136	Linseed oil, flax seed oil	0.074	Wool fat, lanolin

\*adapted from *Handmade Soap Book, Updated Second Edition* by Melinda Cross

## 7.2. Superfatting in soap production

Superfatting in soap making refers to adding more fat or oil to a soap recipe than the lye can react with, resulting in some unreacted oils remaining in the final bar of soap. This process increases the moisturizing and emollient qualities of the soap, making it gentler and more skin-nourishing.

**Table 7.2:** Bar soap.

Ingredients	Composition (%)	Masses (g) (1000 g)	Superfating
Water	9.50	95.00	
Palm oil	30.00	300.00	
Shea butter	15.00	150.00	
Castor oil	30.00	300.00	
Aloe vera	3.00	30.00	
Sodium hydroxide	10.00	100.00	95.00g NaOH
CDE	2.00	20.00	
Perfume	0.50	5.00	
Color	q.s	q.s	

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{9.50}{100} \times 1000 \text{ g} = 95.00 \text{ g} = 0.095 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 7.2.

### Manufacturing 1000g or 1 kg of bar soap:

Calculation of the total amount of oil for neutralizing oils and butters during the formation of a bar soap.

Amount of sodium hydroxide = Mass of (oil/butter) x SV (butter/oil)

$$\text{Palm oil:} = 300\text{g} \times 0.141 \text{ (palm oil) refer}$$

$$= 42.30\text{g of sodium hydroxide pellets (NaOH)}$$

**Castor oil:** = 300g x 0.128 = 38.40g NaOH

**Shea butter:** 150g x 0.128 = 19.20g

Total amount of NaOH required to neutralize all butter and oil = 42.30g + 38.40g + 19.20g

= 99.90g NaOH = 100g NaOH

**5% Superfatting** = 100% - 5% = 95%

$$= \frac{95\%}{100\%} \times 100\text{g NaOH} = 95\text{g NaOH}$$

Therefore, instead of weighing 100g of Sodium hydroxide (NaOH) measure 95g of sodium hydroxide pellets. This means 5% of oils are not saponified and can be used to nourish our skin.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Process:**

- Add shear butter and all the oils in a stainless-steel pot and melt at 40-60 °C.
- Dissolve sodium hydroxide pellets in a high-density polyethylene (HDPE) bucket or container and put aside to cool since an exothermic reaction will result.
- When the butter and oils are melted remove the pot from the stove and add sodium hydroxide solution slowly with continuous stirring till a trace forms (formation of soap)
- Use a thermometer to check the temperature of the soap in a reaction pot or tank to be around 40-30 °C.

- Add Aloe vera with continuous stirring
- Add perfume and CDE then mix continuously
- Add color and perfume and mix continuously
- Add the viscous liquid into a silicon mold to shape into a bar soap.
- Let it harden as the temperature cool down and pack it in 10-24 hours.

## Property

Appearances: clear and solid product.

pH value: 6.0-10.0

✚ Use pH meter for measuring pH value of the soap

Table 7.3: Shower gel.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	68.00	680.00
Decyl glucoside	5.00	50.00
SLES 70%	10.00	100.00
Shea butter	5.00	50.00
Glycerin	4.00	40.00
CDE	2.00	20.00
Cocamidopropyl betaine	5.00	50.00
Citric acid (pH adjuster)	q.s	q.s
Perfume	0.5	5.00
Preservative (Phenoxyethanol)	0.5	5.00
Color	q.s	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{68}{100} \times 1000 \text{ g} = 680 \text{ g} = 0.680 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 7.3.

**Equipment:** use a wooden stick or mixing machine

**Safety:**

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

**Process:**

- Melt shea butter at approximately 40°C in a stainless-steel pot and put aside
- Add water in a reaction tank
- Add SLES 70% slowly in reaction tank and mix continuously. Preferably use an electric mixer to homogenize completely.
- Add Decyl glucoside slowly with continuous stirring.
- Add Cocamidopropyl betaine into the reactor slowly with continuous stirring.
- Add glycerin slowly with continuous mixing.
- Take a portion of sample from the tank and dissolve the perfume then transfer slowly back into the reaction tank with continuous stirring.
- Check and adjust the pH to 5.5.
- Dissolve a preservative in a small sample of the detergent and mix then transfer the mixture slowly back into the reactor to avoid collapsing the viscosity.
- Add CDE slowly with continuous mixing to get thick mixture.
- From the reaction tank, take a sample of detergent and dissolve your color of choice and mix continuously then transfer back into the reaction tank and mix continuously.

**Note:** If the pH is higher than 6 use citric acid to adjust it to between 5.5-6.0 and if lower than 5 then add sodium hydroxide (45%) slowly to adjust it to the allowed pH range.

## Property

Appearances: clear, colorless, and viscous gel.

pH value: 5.5-6.0

✚ Use pH meter for measuring pH value of the detergent

Table 7.4: Face wash.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	65.80	658.00
SLES 70%	5.00	50.00
Shea butter	3.00	30.00
Glycerin	5.00	50.00
Aloe vera	3.00	30.00
CDE	2.00	20.00
Cocamidopropyl betaine	15.00	150.00
Citric acid (pH adjuster)	q.s	q.s
Perfume	0.20	2.00
Preservative (Phenoxyethanol)	1.00	10.00
Color	q.s	q.s

## Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{658}{100} \times 1000 \text{ g} = 658 \text{ g} = 0.658 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 7.4.

**Equipment:** use a wooden stick or mixing machine

## Safety:

✓ Wear a nose mask

- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### **Process:**

- Melt shea butter at approximately 40°C in a stainless-steel pot and put aside
- Add water in a reaction tank
- Add SLES 70% slowly in reaction tank and mix continuously. Preferably use an electric mixer to homogenize completely.
- Add Cocamidopropyl betaine into the reactor slowly with continuous stirring.
- Add glycerin slowly with continuous mixing.
- Add aloe vera with continuous stirring.
- Take a portion of sample from the tank and dissolve the perfume then transfer slowly back into the reaction tank with continuous stirring.
- Check and adjust the pH to 5.5.
- Dissolve a preservative in a small sample of the detergent and mix then transfer the mixture slowly back into the reactor to avoid collapsing the viscosity.
- Add CDE slowly with continuous mixing to get thick mixture.
- From the reaction tank, take a sample of detergent and dissolve your color of choice and mix continuously then transfer back into the reaction tank and mix continuously.

**Note:** If the pH is higher than 6 use citric acid to adjust it to between 5.5-6.0 and if lower than 5 then add sodium hydroxide (45%) slowly to adjust it to the allowed pH range.

### **Property**

Appearances: clear, colorless, and viscous gel.

pH value: 5.5-6.0

🛠️ Use pH meter for measuring pH value of the detergent

Table 7.5: Hand soap.

Ingredients	Composition (%)	Masses (g) (1000 g)
Water	70.50	705.00
SLES 70%	10.00	100.00
Cocamidopropyl betaine	10.00	100.00
Glycerin	5.00	50.00
CDE	2.00	20.00
Salt	1.00	10.00
Perfume	0.50	5.00
Preservative (Phenoxyethanol)	1.00	10.00
Colorant	q.s	q.s
Citric acid (pH adjuster)	q.s	q.s

### Manufacturing procedure

**Note:** Calculations of different masses please follow the previous formulations above.

For example, if you want to manufacture 1000g or 1kg of detergent follow this calculation:

$$\text{Mass of water} = \frac{705}{100} \times 1000 \text{ g} = 705 \text{ g} = 0.705 \text{ kg}$$

Follow this equation to account for all masses for your specific formulation masses in the above Table 7.5.

**Equipment:** use a wooden stick or mixing machine

### Safety:

- ✓ Wear a nose mask
- ✓ Wear protective goggles
- ✓ Wear safety boots
- ✓ Wear a lab coat or work suit
- ✓ Wear protective gloves
- ✓ Work in a well-ventilated and aerated area

### Process:

- Add about 90% of water in a reaction tank
- Add SLES 70% slowly in reaction tank and mix continuously. Preferably use an electric mixer to homogenize completely.
- Take the remaining 10% of water to dissolve salt and put aside.
- Add Cocamidopropyl betaine into the reactor slowly with continuous stirring.
- Add glycerin slowly with continuous mixing.
- Take a portion of sample from the tank and dissolve the perfume then transfer slowly back into the reaction tank with continuous stirring.
- Check and adjust the pH to 5.5.
- Dissolve a preservative in a small sample of the detergent and mix then transfer the mixture slowly back into the reactor to avoid collapsing the viscosity.
- Add CDE slowly with continuous mixing to get thick mixture.
- Add a solution of sodium chloride slowly into the reactor with continuous stirring.
- From the reaction tank, take a sample of detergent and dissolve your color of choice and mix continuously then transfer back into the reaction tank and mix continuously.

**Note:** If the pH is higher than 7 use citric acid to adjust it to between 5.5-7.0 and if lower than 5.0 then add sodium hydroxide (45%) slowly to adjust it to the allowed pH range.

### **Property**

Appearances: clear, colorless, and viscous gel.

pH value: 5.5-7.0

 Use pH meter for measuring pH value of the detergent