

The image features three rectangular bars of light purple soap stacked on a white marble surface. The top bar is slightly offset to the left, the middle bar is centered behind it, and the bottom bar is in front. Sprigs of lavender flowers, including some with pinkish-purple buds, are scattered around the soap bars. The text 'Lavender Heaven' is written in a black cursive font across the middle of the image, and 'By: Alwin, Waleed, Chris & Tarun' is written in a black typewriter font below it.

Lavender Heaven

By: Alwin, Waleed, Chris & Tarun

About our Soap

- The soap consists of 6 oils which are coconut oil, olive oil, sunflower oil, cocoa butter, castor oil, and palm oil.
- Our soap is designed in a way that we achieve the optimal range of soap properties
- As we like to call it Lavender Heaven Soap, it prides itself in having a great moisturizing ability due to the addition of cocoa butter.
- It also contains 3 essential oils: lavender (soothe and calming effect that helps during sleep), patchouli (great antibacterial properties) , and grapefruit (the smell reduces stress and anxiety)

About



Why Should You Buy Our Soap

- On a day to day basis, the average consumer pays little to no attention to the soap that they use
- “Lavender Heaven” stands out in a manner because it will quickly become an essential part of people’s morning routine
- The unique essential oils incorporated in our soap will deliver a therapeutic aroma, allowing consumers to relax and destress
- This will allow users of the soap to start their day off in a calm and relaxed manner that will propel them to feeling and performing at their peak through the rest of their day

The Logo



Infused with Lavender, Patchouli, and Grapefruit oil | Net Wt :40g

The Ingredients Page

Indulge in the best and the most luxurious handcrafted soap

Infused with variety of essential oils and natural organic cocoa butter
which has been chosen carefully to provide a nourishing and fresh
experience.

Through this soap encounter the soothe and calming effect of lavender,
healing and antibacterial properties of patchouli and hydrating nature of
grapefruit.

Go on! Treat yourself with the best and luxurious...

Ingredients : Coconut Oil, Olive Oil, Sunflower Oil, Organic Cocoa Butter,
Castor oil, Organic Red Palm oil, Sodium Hydroxide, Distilled Water, Lavender
Essential Oil, Patchouli Essential Oil, Grapefruit Essential Oil.

MADE BY GROUP 39

Context and Background of our Soap

Lavender Heaven

- The soap that the group has chosen to produce and present at the symposium is “Lavender Heaven”. It is made up of a variety of essential oils and scents which has been chosen carefully to promote relaxation and comfort. The group decided on this soap after consultations with professors, as well as research from multiple books and articles.
- Apart from promoting relaxation and comfort, the ingredients of our soap were also chosen for its unique properties and were chosen to cater to our audience’s wants and needs. These properties include hardness, cleansing, conditioning, creamy lather, and bubbly lather.

making



Chemistry behind the process of soap making

- We used the cold process of making soap as opposed to the hot process, or the melt and pour process, since the cold process gave us more freedom in choosing the individual components of our soap.
- The cold process involves using saponification to produce the soap. Saponification is a hydration reaction in which free OH^- molecules breaks the ester bonds between the fatty acid and glycerol of a triglyceride, resulting in glycerol and free fatty acids(soap). This process involves the reaction of lipids.



Design constraints

- Throughout the process of the project, we ran into multiple design constraints while designing our soap.
- These constraints were due to the accessibility of certain materials, price, or other factors.
- We overcame these constraints by researching alternative materials and soap making processes.
- To bring the price down and remain eco friendly, we decided to use red palm oil instead of the overly refined and processed white palm oil.



Considerations behind making our soap

- It is important to be wary of the solubility of ions in soap, as their insolubility in certain conditions may cause a loss of properties
- Stearic acid is a commonly used and relatively accessible acid (integrated through cocoa butter)
- Can effectively eliminate bacteria and treat skin
- NaOH has a relatively lower water solubility compared to KOH and produces harder soaps
- This is essential for durability and contributes heavily to the portability of the soap

· AFFORDABLE ·
BEST VALUE
· PRICING ·

What is in our soap?

- ☐ Coconut oil
- ☐ Sunflower oil
- ☐ Castor oil
- ☐ Olive oil
- ☐ Cocoa butter
- ☐ Red palm oil
- ☐ Lavender oil
- ☐ Patchouli oil
- ☐ Grapefruit oil



Ingredient Selection

Olive oil: antioxidants reduce oxidative damage caused by free radicals

- Improves inflammatory markers and reduces oxidative stress (cause of rheumatoid arthritis, neurodegenerative diseases)

Sunflower Oil: rich in antioxidants and strengthens cell membranes, preventing bacteria and viruses from entering the body

Cocoa Butter: consists of fatty acids (palmitic, stearic and oleic) that nourish and improve elasticity of skin for healthier complexion

- Fats create a protective layer over skin to hold moisture for better hydration

Castor Oil: forms a moist layer that prevents pores from drying out

Lavender Essential Oil: antiseptic and anti-inflammatory properties help heal minor abrasions and burns

- Scent used for aromatherapy to treat anxiety



Ingredient Selection

Grapefruit Essential Oil: also used to treat mood imbalances (anxiety, depression, etc.)

- Helps reduce blood pressure and relieve stress

Patchouli Oil: used to relieve symptoms of skin conditions (e.g. inflammation, dry skin, acne) and has antibacterial properties

- Treats dandruff and used for aromatherapy

Red Palm Oil: improves health of skin and hair, acts as an antioxidant and contributes to the hardness and lather of soap

Sodium Hydroxide (NaOH): acts a basic component, to create the desired hardness for the soap and improve durability

- Counteracts acidic substances to allow for contact with human skin and interaction with water



Mold Selection

- The mold that was used optimizes the size of our soap by making it a convenient option for all consumers
- A wider base was used to ensure a large number of bars could be produced at an ideal thickness and size for portability
- The smaller size also allows us to market the soap at an affordable price while still using high quality ingredients
- Travel size soaps also allow us to market the product to larger establishments such as hotels, airlines, etc.
- Little packaging is required for our soap, so that our product is easily accessible and creates very little waste since the wax paper is compostable



Soap Packaging

- Our soap is very small (approx 4.3cmx5.5 cm, 40 g) and compact and that is targeted as a luxury travel soap
- Moreover, our soap can be sold to airline companies and hotels (especially luxurious ones) which use small portable soaps
- Taking green chemistry into consideration, the type of soap packaging that we will be using is wax paper.
- Wax paper is very eco-friendly and compostable as well as prevents the soap from sticking to the packaging that can reduce consumer problems.
- It is very simple and cheap which is readily available in all stores that reduced the overall cost for our soap.



Green Chemistry

Our soap has been made after considering many principles of green chemistry:

1. Waste Prevention: The soap packaging of our soap uses wax paper which produces minimal waste. Furthermore, we have cut our soaps into rectangular bars which minimizes the amount of soap wasted
2. Atom Economy: Our soap was made in a way as to maximize atom economy. During our soapmaking, no accumulation of waste/undesired products were produced
3. Less hazardous chemical synthesis: We have used 5% superfatting to make sure that all of the NaOH has reacted



Engineering Sustainability

As we know cultivation of most industrial palm oil products leads to deforestation of rainforests, loss of biodiversity, and directly endangers many animal species. As responsible future engineers, we have decided to not use palm oil, instead we used organic unrefined red palm oil which is certified to be grown using sustainable agriculture. This way we are not only making sure that the production of our soap does not compromise the natural environment, but also enable the ability of future generations to meet their own needs.



Soap Properties

Mass of KOH (g)	Hardness	Cleansing	Bubbly Lather	Creamy Lather	Conditioning
105.75	42.95	20.3	24.8	27.15	52.9
Optimal Range	29-54	12-22	14-46	16-48	44-69

Properties of Oil Used

Oils	Quantity(g)	Oil Properties					
		SAP(NaOH)	Hardness	Cleansing	Bubbly Lather	Creamy Lather	Conditioning
Coconut Oil, 76 deg	150	0.183	79	67	67	12	10
Olive Oil	150	0.135	17	0	0	17	82
Sunflower Oil	50	0.135	11	0	0	11	87
Cocoa Butter	25	0.138	61	0	0	61	38
Castor oil	25	0.128	0	0	90	90	98
Red Palm oil(butter)	100	0.142	50	1	1	49	49
Total	500						

Soap Properties

Contribution to the overall soap

Oils	Quantity(g)	Contribution to Overall Soap Properties					
		SAP(NaOH)	Hardnes	Cleansing	Bubbly Lathe	Creamy Lathe	Conditioning
Coconut Oil, 76 deg	150	27.45	23.7	20.1	20.1	3.6	3
Olive Oil	150	20.25	5.1	0	0	5.1	24.6
Sunflower Oil	50	6.75	1.1	0	0	1.1	8.7
Cocoa Butter	25	3.45	3.05	0	0	3.05	1.9
Castor oil	25	3.2	0	0	4.5	4.5	4.9
Red Palm oil(butter)	100	14.2	10	0.2	0.2	9.8	9.8
Total	500	75.3	42.95	20.3	24.8	27.15	52.9

Multiple iterations

Before arriving at our final product, we had considered multiple other iterations of potential soaps we could have produced. These ideas were ultimately scrapped due to one reason or another, ranging from being too pricey to produce to non eco friendly or just due to the idea being impossible to implement. These iterations are listed below:

- Using palm oil instead of red palm oil: We had initially decided to produce the soap using white palm oil instead of red palm oil. However, after meticulous research we found that white palm oil was not a very sustainable product as it is processed and refined countless times. Thus, we decided to use red palm oil instead, even though it affects the colour of our final product.
- Using grapefruit essential oil instead of orange essential oil: We decided to use grapefruit essential oil instead of orange essential oil as it overlapped with patchouli oil and thus redundant.



Cost Of Our Soap

- Our soap uses 6 unique oils which provides the soap with high hardness, cleansing, and conditioning
- Since our soap promotes luxury, we have also used expensive oils such as organic cocoa butter and organic red palm oil
- This significantly increased our price of our overall soap since the quality was too good to be compared

Soap Cost		
Oils	Quantity(g)	Cost(\$)
Coconut Oil, 76 deg	150	\$2.66
Olive Oil	150	\$0.98
Sunflower Oil	50	\$0.15
Cocoa Butter	25	\$1.25
Castor oil	25	\$1.56
Red Palm oil(butter)	100	\$2.40
Total	500	\$ 9.00

Cont'd

- We have also added essential oils that enhances the soap in terms of strong fragrance as well as beneficial properties
- This however comes with a great cost as fragrances are quite expensive

Essential Oils	Quantity(g)	Cost(\$)
Lavender	12.2	\$4.88
Grapefruit	6.2	\$2.88
Patchouli	4.6	\$2.14
Total	23	\$ 9.90
LYE	Quantity(g)	Cost(\$)
NaOH	71.54	\$2.14
Water	190	\$0.00
Total	261.54	\$ 2.14

Final Cost & Price Point of the Soap

- The total cost for creating 784.54 gram of soap is \$ **21.04** which is **0.0268\$/g**
- However since only 643.4g is used for making soap, the total cost per gram is **0.327\$/g**
- Each of our soap bars that were cut are approximately 50g. Hence, the cost of each bar is \$ **1.63**
- Also, the cost of packaging is pretty cheap because we used wax paper which costs \$**0.20**
- Therefore, our final cost for each bar of soap is \$**1.83**
- Hence, Lavender Heaven will be selling for \$3 which is a strong price point for not only selling our soap but also makes our soap profitable for our group

