FORMULA DEVELOPMENT

GENESIS FORMULAB

Handbook of 10 Cosmetic Products

Certificate in Cosmetic Formulation

GENESIS FORMULAB

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FORMULATION WORKSHEET

PRODUCT NAME:

PHASE	INGREDIENT	PERCENTAGE	PH COMPARTIBILITY RANGE	MAXIMUM TEMPERATURE
	%	Total		

METHOD

1.
2.
3.
4.
5.
6.
7.
8.
Final pH required:

Actives		Emulsifiers		Gums		Preservatives	

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GENERAL CONSIDERATIONS

0- An item with a percentage range beginning with zero means that the item is optional.

Oils (2-6) – Some raw material categories come with a number in front of them, or a range. This means that you can use more than one of this material within the range given.

Up to 100 – This generally is used with the major solvents or carriers. It means that you subtract the weight of any additional items you wish to include from this carrier.

that you subtract the weight of any additional items you wish to include from this carrier.

Percentages – The percentage ranges given are not cast in stone; They have been given as a result of several trials and experiments and will generally give efficacious and stable formulations, so use them as a wise guide! Don't be afraid to "break-the-rules" a little for creativity purposes. However, the ranges given are very reliable guides and you will be wise to consider them.

Weight: Notice how everything is measured via weight, including essential oils! This is how you must design and formulate products. Never by volume.

QS (Quantum Sufficit): pH adjuster is written as q.s. = 'quantum sufficit' = as much as needed. In this case, it is 'as much as needed to achieve a final pH of 5.0 – 5.5'. You can't ever know what pH a formula is going to come in at when writing it up, and you also can't know if you need citric acid, tromethamine or sodium hydroxide to adjust it, so the pH adjuster is commonly written as 'q.s. pH adjuster' so that when you are producing, you can adjust your formula with the right material to achieve the required pH.

Percentages – The percentage ranges given are not cast in stone; They have been given as a result of several trials and experiments and will generally give efficacious and stable formulations, so use them as a wise guide! Don't be

afraid to “break-the-rules” a little for creativity purposes. However, the ranges given are very reliable guides and you will be wise to consider them.

***Please note:** This is only in reference to ingredients categories concentrations in formulas and not usage of ingredients in specific. A lot of cosmetic ingredients come with usage restrictions (example, Phenoxyethanol should never be used in a concentration greater than 1%). These are regulatory restrictions and they should never be broken. Use all ingredients within their limits.

*** It helps to have the recipes and ingredient glossary in front of you as you go through this section, so that you can quickly refer to other ingredients including those you may have already used in your practical formulations.**

AVOID COMMON MIISTAKES

One common mistake that newer formulators have is trying to create a single product that does everything! Avoid this as it only creates confusion and an unpleasant sensory experience. Too many actives can clash, cause irritation and make it hard to predict ingredient efficacy. Keep your formulas simple especially since you’re just starting out. As you have more experience under your belt, you can venture into deeper waters. Base your active function between 1-3 actives – any additional actives should be complementary and added in minute quantities.

WORKING WITH ANTIOXIDANTS

Important Note

- Only **Free Tocopherol** can protect your formula. Do not use any variation of vitamin E that has a term joined to it, such as Vitamin E **Acetate**. These derivatives are only converted to vitamin E within the skin. Rosemary extract is a good alternative to protect your oils. Refer to the **Essential Usage Chart** for how much you need as well.
- The Usage Charts refer to the “active concentration” – Vitamin E comes in various concentrations – 50%, 70%, 98%, etc. Therefore, 2% doesn’t equal the same active matter across different concentrations. Make sure you have this information from your supplier, so that you can accurately

calculate the amount you need. The formula for finding out your required concentration is given below.

- **ACTIVE CONCENTRATION FORMULA**
  Be sure to go over this formula several times as you will need to apply this formula in other instances.
  (Desired Final Concentration) X (Batch Size) ÷ (Active Concentration) = Weight of solution needed.
  For example, if we desired to have 2% of Tocopherol in a 100g formula, and we have Tocopherol at 50% from our supplier, we can use the formula to determine the weight of tocopherol we need.
  (Desired Final Concentration) X (Batch Size) ÷ (Active Concentration) = Weight of solution needed.
  2 X 100 ÷50 = 4g
  Based on our calculation, we need 4g of 50% Tocopherol solution to get 2% of active tocopherol.

INGREDIENT GLOSSARY

We have included some of the most commonly available cosmetic raw materials that could be substituted with the raw materials you purchased for your practical. Feel free to use this list for your practical formulation development exercises, and by all means, browse through your supplier's store/website so that you know what is available. You also need to take their recommendation concerning use rates when working with materials from each supplier.

GENESIS FORMULAB

FACE OIL

PHASE	INGREDIENT	PERCENTAGE
A	Lipid Carrier	To 100%
A	Oils 2-6	To 100%
A	Actives	0 – 10%
B	Antioxidants	0.15-2%
B	Essential Oils and Fragrances	0 - 0.50%

Method

1. Combine phase A under low shear until homogenous.

2. Add phase B to phase A and stir through under low shear until homogenous. Pour off once homogenous.

FORMULA DEVELOPMENT PRINCIPLES

CHOOSING A LIPID CARRIER

It helps to select a single Oil that you consider your base oil for the simple reason that having the greater concentration, it can set the tone (sensory or otherwise) for your whole formulation.

For example, if you desire to have a long shelf life, you can choose a synthetic oil or a natural lipid, like olive squalene or natural esters. These lipids are not prone to oxidation like plant oils, so they can help extend the shelf life of your serum by several months! If you're going for only plant oils, then you can go for an oil with a long shelf life like Meadowfoam oil. Giving an oil with a longer shelf life a much higher concentration helps extend the shelf life of your product.

Another example is that you can choose a lower comedogenic rating for your base oil and add lower quantities of oils of higher comedogenicity. This won't be a problem unless you're formulating for acne sensitive skin.

The third point is that if you have to heat to solubilize an active like Salicylic acid, you can choose a lipid carrier that is less sensitive to heat.

HEAT SENSITIVE OILS:

Heating speeds up the oxidation of plant oils – it could literally take months off an oil in a moment! Therefore, you want to avoid heating where possible, and when you absolutely need to, choose an oil that is less sensitive to heat.

We have included a list of oils and the iodine values of almost all of them – Generally, any oil with an iodine value of less than 100 can withstand some heating.

Make sure you use a double boiler when heating your cosmetic ingredients. Include constant stirring to ensure even- heating of your oils.

Oils: Any other oil you want to add can be subtracted from the weight of your lipid base.

COMEDOGENIC RATING

Comedogenic ratings have to do with the potential of an oil to clog the pores and cause acne in acne-sensitive individuals. Non-comedogenic oils range from 0-2, with 0 being the least possible potential. 3-5 ranges meaning that they are most likely to trigger acne, with 5 being the most potential.

ACTIVES

These ingredients are ingredients that define the special purpose of your formulation. They are also ingredients that help differentiate one brand from another as they stem from brand ethos.

Some points to consider with active selection

1. Know your ingredients – You may have already been through the previous research assignment where you discovered certain ingredients used to treat different skin types. Never cheat with research – it often makes all the difference. Read as much as you can about an ingredient from reputable sources, that way you know what to expect and can make a more educated decision when designing formulations.
2. Solubility – You need to confirm what solvent each active you chose is solubilized in. For example, you can include a water-soluble active in an oil-only serum. Confirm this before purchasing your actives – they need to not only be soluble in the solvent by remain so in an oil serum. (Some ingredients are solubilized in oil but are meant for emulsions. If you use such ingredients as kojic dipalmitate, you will end up with the kojic dipalmitate recrystallizing after the oil has cooled down).
3. Temperature Sensitivity: If an ingredient needs heating, you must be aware of how tolerant it is to heat.

Antioxidants

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

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BODY OIL

PHASE	INGREDIENT	PERCENTAGE
A	Lipid Carrier	To 100%
A	Oils 2-6	To 100%
A	Butters	0-2%
A	Actives	0 – 10%
B	Antioxidants	0.15-2%
B	Essential Oils and Fragrances	0 - 1.50%

Method

1. Combine phase A under low shear until homogenous. If adding butter, heat slightly above the melting point

2. Add phase B to phase A and stir through under low shear until homogenous. Pour off once homogenous.

FORMULA DEVELOPMENT PRINCIPLES

CHOOSING A LIPID CARRIER (Example: Sweet Almond Oil)

It helps to select a single Oil that you consider your base oil for the simple reason that having the greater concentration, it can set the tone (sensory or otherwise) for your whole formulation.

For example, if you desire to have a long shelf life, you can choose a synthetic oil or a natural lipid-like olive squalene or natural esters. These lipids are not prone to oxidation like plant oils, so they can help extend the shelf life of your serum by several months! If you're going for only plant oils, then you can go for an oil with a long shelf life like Meadowfoam oil. Giving an oil with a longer shelf life a much higher concentration helps extend the shelf life of your product.

Another example is that you can choose a lower comedogenic rating for your base oil and add lower quantities of oils of higher comedogenicity. This won't be a problem unless you're formulating for acne sensitive skin.

The third point is that if you have to heat to solubilize an active like Salicylic acid, you can choose a lipid carrier that is less sensitive to heat.

HEAT SENSITIVE OILS (Example: Coconut Oil)

Heating speeds up the oxidation of plant oils – it could literally take months off lipids in a moment! Therefore, you want to avoid heating where possible, and when you absolutely need to, choose an oil that is less sensitive to heat.

We have included a list of oils and the iodine values of almost all of them – Generally, any oil with an iodine value of less than 100 can withstand some heating.

Make sure you use a double boiler when heating your cosmetic ingredients. Include constant stirring to ensure even- heating of your oils.

Oils: Any other oil you want to add can be subtracted from the weight of your lipid base.

BUTTERS (Example: Shea Butter)

Butters are added at a maximum of 2% to keep the solution fluid. You solution may have somewhat of a hazy appearance but still remains esthetically pleasing.

COMEDOGENIC RATING

Comedogenic ratings have to do with the potential of an oil to clog the pores and cause acne in acne-sensitive individuals. Non-comedogenic oils range from 0-2, with 0 being the least possible potential. 3-5 ranges meaning that they are most likely to trigger acne, with 5 being the most potential.

ACTIVES (Example: Symwhite)

These ingredients are ingredients that define the special purpose of your formulation. They are also ingredients that help differentiate one brand from another as they stem from brand ethos.

Some points to consider with active selection

1. Know your ingredients – You may have already been through the previous research assignment where you discovered certain ingredients used to treat different skin types. Never cheat with research – it often makes all the difference. Read as much as you can about an ingredient from reputable sources, that way you know what to expect and can make a more educated decision when designing formulations.
2. Solubility – You need to confirm what solvent each active you chose is solubilized in. For example, you can include a water-soluble active in an oil-only serum. Confirm this before purchasing your actives – they need to not only be soluble in the solvent by remain so in an oil serum. (Some ingredients are solubilized in oil but are meant for emulsions. If you use such an ingredient as kojic dipalmitate, you will end up with the kojic dipalmitate recrystallizing after the oil has cooled down).
3. Temperature Sensitivity: If an ingredient needs heating, you must be aware of how tolerant it is to heat.

Antioxidants (Example: Vitamin E)

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

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TONER

-PHASE	INGREDIENT	PERCENTAGE
A	Water (or botanical waters) (0-3)	To 100%
A	Humectant	3-5
A	Actives (0-5)	0-5
B	Solubilizer	3-5
B	Essential/Fragrance oil	0-0.5
B	Antioxidant	0.05-0.1
B	Preservative	0.25-2
	pH Adjuster	q.s

Method

1. Combine ingredients in phase A under low shear until homogenously mixed.

2. Combine ingredients in phase B under low shear until homogenously mixed.

3. Add phase B to phase A slowly, under low shear, until homogenously mixed.

Adjust pH between 4.8 – 5.5

FORMULATION DEVELOPMENT

Water

Do not use tap water to produce cosmetics. Distilled water is ideal for cosmetic formulations since it is free from contamination and heavy metals. Hydrosols can also be used in place of wat

er and may give replace the use of fragrances or essential oils if they have a strong enough scent.

Humectant (Example: Glycerin)

Toners were made in the past just for acne-prone skin and were astringent in nature. These days, there is a toner for every skin type. Instead of being a product type that dries out the skin, it can be used to add much-needed moisture as a preparatory step to the moisturizer.

Actives (Example: Niacinamide)

You can bring all sorts of lovely attributes to your toner with the sort of actives you choose. Your toner can become astringent with Witch Hazel, Brightening and enriching with Rice ferment filtrate, lightening with Vitamin C, soothing with Aloe Vera, anti-acne with Tea Tree essential oil, or Antiaging with Patchouli essential oil, etc. You can really explore your creative ideas with the actives you use. If you're formulating to sell you could tell a good story with plant extracts or clinically proven cosmeceuticals.

- Make sure you find out the solubility of your actives. Water-soluble is preferred. If it is oil-soluble, you have to make sure you can solubilize it with the maximum amount of solubilizer allowed and still get a solution that is properly solubilized and aesthetically pleasing. It may also need to be solubilized in another solvent like glycerin or propylene glycol. It may also need additional heating to get it solubilized. Always verify the solubility of your actives. Suppliers usually have this available, but be prepared to do some additional research if needed.
- Avoid loading your formula with too many actives – stick with the maximum use stated to avoid a sticky formula or one that makes layering other products unpleasant with a heavy feel.
- Make sure to cross-check the temperature sensitivity to determine your processing needs, as well as the pH stability of your actives to make sure that they suit your formula's final pH. If you need to heat any actives, do so and cool the phase-down before adding temperature-sensitive ingredients at 40^{o}C or less.
- If your active needs

Solubilizer (Example: Polysorbate 20)

When developing a formula, begin solubilizing heavier oils (like tocopherol) at the ratio of 10 parts solubilizer and 1-part oil. Gradually reduce the solubilizer to up to 5 parts to 1 part heavier oil. If your solution remains clear at a 5:1 ratio solubilizer to oil, then your solution will be stable. For fragrances, start with a ratio of 5 parts solubilizer to 1 part fragrances.

Solubilizers add moisturizing properties to a formula – so try to add only as much as is needed, so that it does not contribute to a sticky sensory feel. That is why we have the advice on ratios above for formula development.

Always mix your oils into your solubilizer properly before adding to the greater water phase, otherwise, you may have a milky, poorly solubilized toner.

Evaluate your toner the next day to make sure your solution remains clear and hasn't turned milky.

Essential Oils & Fragrances (Example: Lavender Essential Oil)

Whenever you add a natural oil – like an essential, make sure you add an antioxidant like vitamin E. The amount of tocopherol you need is determined by the amount of essential oil or fragrance you plan to add. Refer to the **Essential Usage Chart** booklet to determine how much essential oil or fragrance oil you need to add to your formula, as well as how much antioxidant you need to protect your chosen concentration. The suggested concentrations differ based on what part of the body you are formulating for, as well as the duration of time it remains on the skin.

Preservatives (Example: Germall Plus)

With every formula containing water, you need to add a preservative. Please refer to the preservative section as there isn't a one-size-fits-all. They differ in processing temperatures and pH sensitivity as well.

Make sure to cross-check the temperature sensitivity to determine your processing needs, as well as the pH stability of your preservative to make sure that they suit your formula's final pH.

Antioxidants (Example: Vitamin E)

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

pH Adjusting

You need to check the pH of all water-based products and adjust as needed where necessary. Check and adjust pH after adding your preservative and not before, because your chosen preservative may have an effect on your final pH.

Use 50% Citric acid solution to reduce the pH, and 10% Sodium Hydroxide solution or any other alkaline pH adjuster you have to raise the pH of your formula.

You can never really predict if you will need to adjust your formula or not, so always have your adjusters on hand.

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FACE CLEANSER – FREE-FLOWING TYPE

PHASE	INGREDIENTS	PERCENTAGE
A	Water (and alternatives) (0-3)	To 100
A	Humectant	7-10
A	Active (0-2)	0-5
A	Anionic (primary surfactant)	2-30
B	Amphoteric (secondary surfactant)	4.5-25
B	Nonionic (tertiary surfactant) (optional)	0-10
C	Solubilizer (& Superfatting)	1.5-5
C	Essential Oil or Fragrance	0-1.5
C	Antioxidants	0.05-0.2
D	Preservative	0.25-4
	pH Adjuster	

Method

1. Combine phase A and stir under low shear until homogenous.

2. Combine phase B. Add phase B to phase A under low shear until homogeneously combined. Take care not to introduce too much air/foam while stirring.

3. Combine phase C. Add phase C to phase A/B slowly and stir through under low shear until homogenous. Take care not to introduce too much air/foam while stirring.

4. Combine phase D. Add to phase A/B/C and stir through under low shear until homogenous. Take care not to introduce too much air/foam while stirring.

5. Check/adjust the pH to 5.3 - 5.8. Allow foam to completely settle before pouring off.

FORMULATION DEVELOPMENT

WATER

Do not use tap water to produce cosmetics. Distilled water is ideal for cosmetic formulations since it is free from contamination and heavy metals. Hydrosols and floral waters can also be used in place of water and may replace the use of fragrances or essential oils if they have a strong enough scent.

HUMECTANT (Example: Glycerin)

In cleansing solutions, humectants help reduce the possible irritation that surfactants may have on the skin. They may also improve the sensory characteristic of the cleanser. They can be used up to 10%

ACTIVES (Example: Licorice)

This is a rinse-off formula – the cleanser has a very short contact time with the skin. Avoid adding expensive actives to this unless there are actives with proven efficacy in rinse-off formulas.

SURFACTANTS

Surfactants in cleansing formulas are usually used in combination – You have a primary surfactant which is anionic and then secondary surfactants – amphoterics and nonionics. Superfatting agents or solubilizers may also be added.

The formulating principles above refer to the active content of the surfactant and not a blend. Make sure you get the information regarding the active concentration of their surfactants from your supplier. Use the formula given at the beginning of this lecture to calculate the amount of surfactant you need.

ANIONIC SURFACTANTS (Example: Sodium Lauroyl Sacorsinate)

Anionic surfactants are chosen as primary cleansers because they are very good cleaners. However, they are also the most irritating on the skin, Therefore, they are paired with Amphoterics and Nonionics to reduce the potential of irritation.

AMPHOTERIC (Example: Coco Betaine)

Amphoteric surfactants help boost foam and also minimize the irritancy profile where anionic surfactants are used. They may also be used to thicken SLS cleansers.

NONIONIC (Example: Coco Glucoside)

Nonionics have a very good mildness profile, but they aren't good cleaners. This is why they are used in combination with other surfactant types; They help increase the mildness profile of your formula.

SOLUBILIZER/SUPERFATTING (Example: Polysorbate 20)

Solubilizers can act as superfatting agents in your formula – reducing the irritation potential of surfactants and adding a moisturizing effect without the addition of lipids.

ESSENTIAL OILS OR FRAGRANCES (Example: Lavender Essential Oil)

Mix these well with your solubilizer before adding it to your surfactants. Whenever you add a natural oil – like an essential, make sure you add an antioxidant like vitamin E. The amount of tocopherol you need is determined by the amount of essential oil or fragrance you plan to add. Refer to the **Essential**

Usage Chart booklet to determine how much essential oil or fragrance oil you need to add to your formula, as well as how much antioxidant you need to protect your chosen concentration. The suggested concentrations differ based on what part of the body you are formulating for, as well as the duration of time it remains on the skin.

ANTI-OXIDANTS (Example: Vitamin E)

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

PRESERVATIVES (Example: Plantserve E)

With every formula containing water, you need to add a preservative. Please refer to the preservative section as there isn't a one-size-fits-all. They differ in processing temperatures and pH sensitivity as well.

Make sure to cross-check the temperature sensitivity to determine your processing needs, as well as the pH stability of your preservative to make sure that they suit your formula's final pH.

PH ADJUSTERS

You need to check the pH of all water-based products and adjust as needed where necessary. Check and adjust pH after adding your preservative and not before, because your chosen preservative may have an effect on your final pH.

Use 50% Citric acid solution to reduce the pH, and 10% Sodium Hydroxide solution or any other alkaline pH adjuster you have to raise the pH of your formula.

You can never really predict if you will need to adjust your formula or not, so always have your adjusters on hand.

GENESIS FORMULAB

SERUM EMULSION

PHASE	RAW MATERIAL CATEGORY	PERCENTAGE
A	Water	Up to 100%
B	Humectant (1)	3-10%
B	Hydrophilic Thickener	0.2-0.4%
C	Emulsifier (material blend)(1)	3-4%
C	Lipids (up to 3 combination)	1-5%
D	Actives	0.5-5%
D	Fragrance or Essential Oil	0.1-0.2
D	Antioxidants	0.05-0.5%
D	Preservatives	0.25-2%
E	PH Adjuster	5.3-5.8

Method

1. Measure out Phase A
2. Combine phase B and form a slurry.
3. Add phase B to phase A while stirring until a gel forms. Heat to 75^{o}C
4. Combine phase C to phase A/B and stir until a homogenous gel forms
5. Continue stirring while the product cools. At 40^{o}C, add your Phase D ingredients and stir until homogenous.
6. Check and adjust pH if required to 5.3-5.8

*Evaluate your emulsion the next day.

FORMULATION DEVELOPMENT

WATER (Example: Hydrosols and Floral Waters)

Do not use tap water to produce cosmetics. Distilled water is ideal for cosmetic formulations since it is free from contamination and heavy metals. Hydrosols and floral waters can also be used in place of water and may replace the use of fragrances or essential oils if they have a strong enough scent.

HUMECTANT (Example Glycerin)

Humectants in emulsions play a dual role: 1. The act on the skin by drawing moisture from the surrounding atmosphere into the deeper layers of the skin. 2. They also keep your product moist, otherwise, you may find your emulsion produces a dry film on the top where it is exposed to air. 4% in your formula is usually enough to keep the emulsion sufficiently hydrated. Too much could give your emulsion a sticky, tacky texture. Humectants also serve as carriers when using natural gums – see below for more information.

HYDROPHILIC THICKENER (Example: Xanthan Gum)

Thickeners in Emulsions help keep the emulsion stable in hotter climates and with time as well. When using a natural thickener, make a slurry with glycerin before adding it to your water phase. It will prevent your emulsion from having unsightly lumps because the gum set too fast. After adding it with continuous stirring into your water phase, make sure no lumps are created.

EMULSIFIER (Blended material) (Example: Olivem 1000)

Blended materials usually give a more stable emulsion. You can't tell if your emulsifier is blended unless you check the INCI. A lot of emulsifiers already come blended, such as Emulsifying wax NF, Olivem 1000, Polawax, Silk wax, etc. If you are studying with us in an advanced course we will should you how to design your own blend. But at this stage, just choose a blended material. There are also usually Nonionic emulsifiers.

LIPIDS (Example: Sweet Almond Oil)

Since this is for the face, choose lipids with low comedogenic potentials (0-2 rating). Depending on your desired sensory property, you could go for heavier oils for a more moisturized feel, otherwise, go for lighter once for a light, airy feel.

For light serums like these, where your lipids are about the size of your emulsifiers, add both the emulsifier, lipid, and water to the same phase for heating. Otherwise, you could burn or over-heat your emulsifier and reduce its efficacy.

ACTIVES (Example: Niacinamide)

You can bring all sorts of lovely attributes to your serum with the sort of actives you choose. Good research, as you have may have learned in a previous lesson, is essential to the success of your formula.

- Make sure you find out the solubility of your actives. Water-soluble is preferred. If it is oil-soluble, you have to make sure you can solubilize it with the maximum amount of solubilizer allowed and still get a solution that is properly solubilized and aesthetically pleasing. It may also need to

be solubilized in another solvent like glycerin or propylene glycol. It may also need additional heating to get it solubilized. Always verify the solubility of your actives. Suppliers usually have this available, but be prepared to do some additional research if needed.

- Avoid loading your formula with too many actives – stick with the maximum use stated to avoid a sticky formula or one that makes layering other products unpleasant with a heavy feel.
- Make sure to cross-check the temperature sensitivity to determine your processing needs, as well as the pH stability of your actives to make sure that they suit your formula's final pH. If you need to heat any actives, do so and cool the phase-down before adding temperature-sensitive ingredients at 40^{o}C or less.
- If your active is fluid (oil or water-soluble), generally it can be added to your already cooled emulsion. Solids usually need additional process, find out what your active needs.

ESSENTIAL OILS AND FRAGRANCES (Example: Vanilla Fragrance)

Whenever you add a natural oil – like an essential, make sure you add an antioxidant like vitamin E. The amount of tocopherol you need is determined by the amount of essential oil or fragrance you plan to add. Refer to the **Essential Usage Chart** booklet to determine how much essential oil or fragrance oil you need to add to your formula, as well as how much antioxidant you need to protect your chosen concentration. The suggested concentrations differ based on what part of the body you are formulating for, as well as the duration of time it remains on the skin.

Fragrances are volatile, add them to the cool-down phase of your emulsion.

ANTI-OXIDANTS (Example: Vitamin E)

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

PRESERVATIVES (Example: Germall Plus)

With every formula containing water, you need to add a preservative. Please refer to the preservative section as there isn't a one-size-fits-all. They differ in processing temperatures and pH sensitivity as well.

Make sure to cross-check the temperature sensitivity to determine your processing needs, as well as the pH stability of your preservative to make sure that they suit your formula's final pH.

PH ADJUSTERS

You need to check the pH of all water-based products and adjust as needed where necessary. Check and adjust pH after adding your preservative and not before, because your chosen preservative may have an effect on your final pH.

Use 50% Citric acid solution to reduce the pH, and 10% Sodium Hydroxide solution or any other alkaline pH adjuster you have to raise the pH of your formula.

You can never really predict if you will need to adjust your formula or not, so always have your adjusters on hand.

GENESIS FORMULAB

BODY CREAM

PHASE	RAW MATERIAL CATEGORY	PERCENTAGE USE RATE
A	Water	0-100%
B	Humectant	5-10%
B	Gum	0.25-0.5%
C	Anionic Emulsifier	0.5-2.5%
C	Non-ionic Emulsifier (1 material or blend)	3-7.5%
C	Waxes (0-2) (for highly viscous products)	0-3%
C	Lipids (Oils & Butters) (2-6)	8-12%
D	Essential oils/Fragrances (0-5)	0-0.5%
D	Preservatives	0.2-4%
D	Actives (0-3)	0-10%
D	Antioxidant	0.2-1.20%
E	pH Adjuster	q.s.

Method

1. Measure out phase A.
2. Heat phase A/B to 75°C. Combine phase C and heat to 75°C. Add phase C to phase A/B under high shear stirring and mix until a smooth, glossy, homogenous emulsion forms.
3. Allow mixture to cool under low shear stirring until <40°C. Add phase D and stir through under low shear until homogenous.
4. Allow to cool some more then check and adjust the final pH to 5 - 5.5 if necessary. The product will need to sit overnight to thicken fully, do not evaluate it on the day you make it. Cover and give a final stir the next day before pouring off.

FORMULATION DEVELOPMENT

WATER (Example: Hydrosol or floral water)

Do not use tap water to produce cosmetics. Distilled water is ideal for cosmetic formulations since it is free from contamination and heavy metals. Hydrosols and floral waters can also be used in place of water and may replace the use of fragrances or essential oils if they have a strong enough scent.

HUMECTANT (Example: Glycerin)

Humectants in emulsions play a dual role: 1. The act on the skin by drawing moisture from the surrounding atmosphere into the deeper layers of the skin. 2. They also keep your product moist, otherwise, you may find your emulsion produces a dry film on the top where it is exposed to air. 4% in your formula is

usually enough to keep the emulsion sufficiently hydrated. Too much could give your emulsion a sticky, tacky texture. Humectants also serve as carriers when using natural gums – see below for more information.

HYDROPHILIC THICKENER (Example: Xanthan Gum)

Thickeners in Emulsions help keep the emulsion stable in hotter climates and with time as well. When using a natural thickener, make a slurry with glycerin before adding it to your water phase. It will prevent your emulsion from having unsightly lumps because the gum set too fast. After adding it with continuous stirring into your water phase, make sure no lumps are created.

ANIONIC EMULSIFIER (EXAMPLE: Stearic acid)

Anionic Emulsifiers help keep emulsions more stable. Add up to 2.5% to your emulsion.

EMULSIFIER (Blended material) (Example: Olivem 1000)

Blended materials usually give a more stable emulsion. You can't tell if your emulsifier is blended unless you check the INCI. A lot of emulsifiers already come blended, such as Emulsifying wax NF, Olivem 1000, Polawax, Silk wax, etc. If you are studying with us in an advanced course we will should you how to design your *own blend. But at this stage, just choose a blended material. There are also usually Nonionic emulsifiers.

LIPIDS (Example: Caprylic/Capric Triglyceride)

Depending on your desired sensory property, you could go for heavier oils for a more moisturized feel, otherwise, go for lighter once for a light, airy feel. Emulsions for the body tend to be more moisturizing than those formulated for the face.

You could combine esters or synthetic oils with natural plant oils if you plan on leaving your emulsion on the shelf for a while. This combination reduces the amount of oil that can get oxidized over time, and extends the shelf life of your emulsion. Some esters also give nice sensory experiences.

This formulating process is different from the lighter face emulsion serum you created; you have to heat both your water phase and your lipid phase separately. Keep an eye on the oils you choose – go for oils that can withstand some heat to prevent premature oxidation.

ACTIVES (Example: Niacinamide)

You can bring all sorts of lovely attributes to your serum with the sort of actives you choose. Good research, as you have may have learned in a previous lesson, is essential to the success of your formula.

- Make sure you find out the solubility of your actives. Water-soluble is preferred. If it is oil-soluble, you have to make sure you can solubilize it with the maximum amount of solubilizer allowed and still get a solution that is properly solubilized and aesthetically pleasing. It may also need to be solubilized in another solvent like glycerin or propylene glycol. It may also need additional heating to get it solubilized. Always verify the solubility of your actives. Suppliers usually have this available, but be prepared to do some additional research if needed.
- Avoid loading your formula with too many actives – stick with the maximum use stated to avoid a sticky formula or one that makes layering other products unpleasant with a heavy feel.
- Make sure to cross-check the temperature sensitivity to determine your processing needs, as well as the pH stability of your actives to make sure that they suit your formula's final pH. If you need to heat any actives, do so and let this phase cool down to 40^{o}C or less before adding temperature-sensitive ingredients.
- If your activity is fluid (oil or water-soluble), generally it can be added to your already cooled emulsion. Solids usually need additional process, find out what your active needs.

ESSENTIAL OILS AND FRAGRANCES (Example: Lavender Essential Oil)

Whenever you add a natural oil – like an essential, make sure you add an antioxidant like vitamin E. The amount of tocopherol you need is determined by

the amount of essential oil or fragrance you plan to add. Refer to the **Essential Usage Chart** booklet to determine how much essential oil or fragrance oil you need to add to your formula, as well as how much antioxidant you need to protect your chosen concentration. The suggested concentrations differ based on what part of the body you are formulating for, as well as the duration of time it remains on the skin.

Fragrances are volatile, add them to the cool-down phase of your emulsion.

ANTI-OXIDANTS (Example: Vitamin E)

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

PRESERVATIVES (Example: Germall Plus)

With every formula containing water, you need to add a preservative. Please refer to the preservative section as there isn't a one-size-fits-all. They differ in processing temperatures and pH sensitivity as well.

Make sure to cross-check the temperature sensitivity to determine your processing needs, as well as the pH stability of your preservative to make sure that they suit your formula's final pH.

PH ADJUSTERS

You need to check the pH of all water-based products and adjust as needed where necessary. Check and adjust pH after adding your preservative and not before, because your chosen preservative may have an effect on your final pH.

Use 50% Citric acid solution to reduce the pH, and 10% Sodium Hydroxide solution or any other alkaline pH adjuster you have to raise the pH of your formula.

You can never really predict if you will need to adjust your formula or not, so always have your adjusters on hand.

GENESIS FORMULAB

AFRICAN SOAP REBATCH - SOLID TYPE

PHASE	INGREDIENTS	PERCENTAGE
A	Soap Base (50% concentration)	Up to 100%
A	Active (powders)	5-10%
A	Oil/Butter	0.5-2%
A	Fragrance/Essential Oil	0.2-1.5%
A	Vitamin E	0.2-0.5

Method

1. Combine all ingredients in phase A.
2. Heat gently in a double boiler, turning the ingredients over constantly. The addition of water is to aid with melting so as not to overheat the ingredients.
3. Keep turning and the mixture will soften enough to blend well. You may still have a few small hard lumps, but that's fine with the rustic theme.
4. Scoop your soap into a container and allow it to stiffen overnight.

*If you want a stiffer product, then divide the soap base – melt one part and leave the other part for later processing. After the soap has softened, crumble the other part and mix it in.

AFRICAN SOAP REBATCH – PASTE (MASK AND/OR SCRUB)

PHASE	INGREDIENTS	PERCENTAGE
A	Soap Base (50% active) (Liquid extracts can be included as part of the water input)	Up to 100%
A	Abrasives	2 – 5%
A	Oil/Butter	1-5%
A	Powdered Extracts	1-5%
A	Fragrance/Essential Oil	1%
A	Antioxidant	0.3%
A	Preservative	0.5-1%
A	Humectants	0.5-2%

Method

1. Combine all ingredients in Phase A
2. Mix until the blend is homogenous.
3. Blend and scoop into jars.

GENESIS FORMULAB

BODY POLISH

PHASE	INGREDIENTS	PERCENTAGE
A	Abrasives (0-2)	Up to 100%
B	Lipids	Up to 100%
B	Actives	0-5%
B	Antioxidants	0.1-0.5%
B	Fragrance & Essential Oil	0.3-1.5%
C	Preservative (Broad Spectrum)	0.5-1%

METHOD

1. Combine ingredients in Phase A together and mix well if using more than one abrasive.
2. Add all ingredients in Phase B and mix until homogenous.
3. Add Phase A into Phase B and mix until homogenous. Evaluate the next day.

A body polish is an anhydrous body scrub made up of oils and physical abrasives (e.g. salt). It is able to exfoliate the skin without stripping the skin of much-needed oils. A body polish is used to exfoliate the skin. With the addition of skin-loving, moisturizing oils, the skin doesn't feel dry nor does it lose its much-needed oil/sebum that can cause the skin to dry out. It is usually applied to already damp skin and rinsed out after scrubbing. Additional cleansing is not needed. The only drawback is the danger of slipping in the bath from the oil residue from your scrub.

FORMULATION DEVELOPMENT

The base oil is usually made separately from the abrasives. After weighing your abrasives, pour in your oil mixture to the desired consistency. Bear in mind that on standing, the abrasives will settle down and the oil may seem more than was first poured in. Note: There are different sizes of abrasives – the smaller the size, the gentler the scrubbing action. Sugar is also gentler than salt.

BASE OIL: Add any actives that may need melting in a heated phase. Take it off the heat when the active/s have dissolved and your solution is homogenous. Then add your fragrance and antioxidants.

ABRASIVE INGREDIENTS: You can add the oil to the abrasives when you're done with the base oil. You can combine up to 2 different types of Abrasives.

LIPIDS (Example: Caprylic/Capric Triglyceride)

Depending on your desired sensory property, you could go for heavier oils for a more moisturized feel, otherwise, go for lighter once for a light, airy feel.

You could combine esters or synthetic oils with natural plant oils if you plan on leaving your emulsion on the shelf for a while. This combination reduces the amount of oil that can get oxidized over time, and extends the shelf life of your products. Some esters also give nice sensory experiences.

COMEDOGENIC RATING

Comedogenic ratings have to do with the potential of an oil to clog the pores and cause acne in acne-sensitive individuals. Non-comedogenic oils range from 0-2, with 0 being the least possible potential. 3-5 ranges meaning that they are most likely to trigger acne, with 5 being the most potential.

ACTIVES (Example: Symwhite)

These ingredients are ingredients that define the special purpose of your formulation. They are also ingredients that help differentiate one brand from another as they stem from brand ethos.

Some points to consider with active selection

1. Know your ingredients – You may have already been through the previous research assignment where you discovered certain ingredients used to treat different skin types. Never cheat with research – it often makes all the difference. Read as much as you can about an ingredient from reputable sources, that way you know what to expect and can make a more educated decision when designing formulations.
2. Solubility – You need to confirm what solvent each active you chose is solubilized in. For example, you can include a water-soluble active in an oil-only serum. Confirm this before purchasing your actives – they need to not only be soluble in the solvent but remain so in the oil phase. (Some ingredients are solubilized in oil but are meant for emulsions. If you use such an ingredient as kojic dipalmitate, you will end up with the kojic dipalmitate recrystallizing after the oil has cooled down).

3. Temperature Sensitivity: If an ingredient needs heating, you must be aware of how tolerant it is to heat.

ANTIOXIDANTS (Example: Vitamin E)

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

ESSENTIAL OILS AND FRAGRANCES (Example: Vanilla Fragrance)

Whenever you add a natural oil – like an essential, make sure you add an antioxidant like vitamin E. The amount of tocopherol you need is determined by the amount of essential oil or fragrance you plan to add. Refer to the **Essential Usage Chart** booklet to determine how much essential oil or fragrance oil you need to add to your formula, as well as how much antioxidant you need to protect your chosen concentration. The suggested concentrations differ based on what part of the body you are formulating for, as well as the duration of time it remains on the skin.

PRESERVATIVES (Example: Germall Plus)

With every formula containing water, you need to add a preservative. You may be saying “but water isn’t added to this formula” You are right about that, however, water could be introduced to this product in use. It will also most likely be left in the bathroom, which can be very humid. To prevent microbial growth while in use, a preservative can be added to it.

Please refer to the preservative section as there isn’t a one-size-fits-all. They differ in processing temperatures and use inputs as well.

GENESIS FORMULAB

BODY BUTTER

PHASE	INGREDIENTS	PERCENTAGE
A	Lipids	Up to 100%
A	Butters	Up to 10%
A	Waxes	10-20%
A	Anti-Oxidants	0.5-2%
B	Actives	0-5%
B	Essential Oils and Fragrances	0-1.5%

Method

1. Melt ingredients in phase A over a double boiler with constant stirring. Add any actives that may need melting to this phase.

2. Take it off the heat. It may help to add a portion of your butter/s at this stage to speed up the process of cooling. If you do, stir constantly.

3. While your solution is still molten, add your antioxidants and essential oils/fragrances.

4. Just before it begins to stiffen – while it is still molten, pour it off into containers. If you are going for a whipped consistency, you can begin whipping now.

Processing Notes:

1. Do not cap your containers while cooling, otherwise, water may be introduced to your formulation via condensation. Only cap them after the butter has cooled down.

2. Do not use more than 10% of butter/s. If you do it will become part of your thickening function. This could result in melting in hotter temperatures.

3. Heat sensitive oils can be added as a mixture to quicken the heated oil phase.

A body butter is similar to a lotion but completely oil-based. It is used to moisturize the skin and improve the appearance and the quality of the skin. It is applied to the body after a shower. Some brands recommend application when the skin is still damp, and other after the skin has been dried with a towel.

Body butter can be poured directly into a container once it has been melted to cool down and stiffen in the process. However, the process of whipping it with an electric hand mixer gives it a nice, fluffy consistency. This whipping process forces little pockets of air in-between oil molecules. This is why it can double in size and what gives it its fluffy, light property. This fluffy butter will stiffen and keep its shape an hour or two after it has been scooped and contained in jars. It is susceptible to temperature changes, however; if storage conditions become too warm, the butter can melt. It will harden once it is cooled down again but may lose its body.

CHOOSING A LIPID CARRIER (Example: Sweet Almond Oil)

It helps to select a single Oil that you consider your base oil for the simple reason that having the greater concentration, it can set the tone (sensory or otherwise) for your whole formulation.

For example, if you desire to have a long shelf life, you can choose a synthetic oil or a natural lipid, like olive squalene or natural esters. These lipids are not prone to oxidation like plant oils, so they can help extend the shelf life of your serum by several months! If you're going for only plant oils, then you can go for an oil with a long shelf life like Meadowfoam oil. Giving an oil with a longer shelf life a much higher concentration helps extend the shelf life of your product.

Another example is that you can choose a lower comedogenic rating for your base oil and add lower quantities of oils of higher comedogenicity. This won't be a problem unless you're formulating for body acne sensitive skin.

The third point is that if you have to heat to solubilize an active like Salicylic acid, you can choose a lipid carrier that is less sensitive to heat.

HEAT SENSITIVE OILS (Example: Coconut Oil)

Heating speeds up the oxidation of plant oils – it could literally take months off oils in a moment! Therefore, you want to avoid heating where possible, and when you absolutely need to, choose an oil that is less sensitive to heat.

We have included a list of oils and the iodine values of almost all of them – Generally, any oil with an iodine value of less than 100 can withstand some heating.

Make sure you use a double boiler when heating your cosmetic ingredients. Include constant stirring to ensure even- heating of your oils.

Oils: Any other oil you want to add can be subtracted from the weight of your lipid base.

BUTTERS (Example: Shea Butter)

Butters come with different properties – they usually also have a longer shelf life compared to oils. Choose a butter that goes well with the theme you which to build on.

ACTIVES (Example: Symwhite)

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Some points to consider with active selection

1. Know your ingredients – You may have already been through the previous research assignment where you discovered certain ingredients used to treat different skin types. Never cheat with research – it often makes all the

difference. Read as much as you can about an ingredient from reputable sources, that way you know what to expect and can make a more educated decision when designing formulations.

2. Solubility – You need to confirm what solvent each active you chose is solubilized in. For example, you can include a water-soluble active in an oil-only serum. Confirm this before purchasing your actives – they need to not only be soluble in the solvent by remain so in an oil serum. (Some ingredients are solubilized in oil but are meant for emulsions. If you use such an ingredient such as kojic dipalmitate, you will end up with the kojic dipalmitate recrystallizing after the oil has cooled down).
3. Temperature Sensitivity: If an ingredient needs heating, you must be aware of how tolerant it is to heat.

ANTIOXIDANTS (Example: Vitamin E)

Whenever you add a plant oil, make sure you add an antioxidant. Plant oils are very prone to oxidation and need to be protected as such. Please see the USAGE CHART and follow the use rates given for different formulation types.

ESSENTIAL OILS AND FRAGRANCES (Example: Vanilla Fragrance)

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Fragrances are volatile, add them to the cooling down phase of your production.