



PRINCIPLES OF FORMULATION AND BUILDING BLOCKS OF SKIN CARE PRODUCTS

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Definition, Types, Ingredients, General formula , Manufacture & Evaluation of :-

➤ **MOISTURIZING CREAM**

➤ **VANISHING CREAM**

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➤ **SHAMPOO**

➤ **TOOTHPASTE**

➤ **SOAP**

➤ **SYNDETBAR**

CREAMS

Creams are defined as a semisolid dosage form containing one or more drug substances dissolved or dispersed in a suitable base.

TYPES OF SKIN CREAMS

1) Make up creams

- (a) Vanishing cream
- (b) Foundation cream

2) Cleansing creams

3) Creams for winter

- (a) Cold cream

4) Creams for dry skin

- (a) Moisturizing cream

5) All purpose creams

6) Night creams

7) Skin protective & hand creams

INGREDIENTS USED IN SKIN CREAMS

1) Water

2) Oils, fats & waxes

(a) Mineral oil (Light liquid paraffin , Heavy liquid paraffin)

(b) Glyceride oil (Almond oil , Arachis oil , Castor oil)

(c) Fats (Lauric , Palmitic , Stearic acids & Sesame oil , Olive oil, Coca butter , Peanut oil)

(d) Waxes (Carnauba wax, Beeswax)

3) Lanolin (Derived from wool fat)

4) Glycol (Ethylene glycol , Diethylene glycol & Propylene glycol)

5) Colours (Saffron , Chlorophyll , Cochineal)

6) Emollients :

- ▶ Also known as Moisturizers.
- ▶ Eg :
 - Mineral oil
 - Squalene
 - Lanolin

7) Emulsifying agents

(a) Inorganic solids :

Eg: Bentonite

Kaolin

(b) Gums &

Proteins Eg:

Gum arabic

Gum tragacanth

Gelatin

Egg albumin

8) Wetting agent :

- ▶ Type of surface active agents & lower surface tension.

Eg : Soaps

Sulphonated oils

Fatty alcohol sulphates

Sulphated fatty esters & amides

9) Humectants (Proteins , acids & Polysaccharides)

10) Perfumes (White blossoms , Rosy dreams , Orange blossom)

11) Some functional raw materials like vitamins, amino acids and anti-inflammatory agents may also be incorporated in creams

MANUFACTURE OF CREAMS

OIL PHASE

Higher fatty acids
Emollients

Heating to
70°C

Stirring & Mixing

WATER PHASE

Purified water
Alkalis

Stirring & Mixing

Deairation

Cooling & Mixing

(I) MOISTURIZING CREAM

- ▶ When water is lost from stratum corneum more rapidly than it is received from lower layers of skin, the skin becomes dehydrated.
- ▶ The dehydrated skin loses its flexibility and appears rough.
- ▶ Creams which restore water or moisture & plasticize the stratum corneum, provide its flexibility and make it soft. These types of cream are known as moisturizing cream.

FORMULA :-

Stearic acid	- 4%
Mineral oil	- 8%
Lanolin	- 1%
Glyceryl monostearate (self-emulsifying)	- 3%
Isopropyl myristate	- 2%
Glycerine	- 4%
Propylene Glycol	- 4%
Triethanolamine	- 0.2%
Water	- 100%
Perfume & Preservatives	- Q.S

(II) VANISHING CREAM

- ▶ Creams which spread easily & seem to disappear rapidly when rubbed on the skin are termed as vanishing creams.
- ▶ These creams are composed of emollient esters which leave little apparent film on the skin.
- ▶ Traditional formulae of vanishing creams are based on stearic acid.
- ▶ Stearic acid melts above body temperature & crystallizes in a form so as to be invisible providing a non-greasy film .It also imparts attractive appearance to the cream.

VANISHING CREAM

- Vanishing cream gets the name from the fact that it **leaves no trace when rubbed** into the skin.
- These are **oil in water emulsions** that contains large percentages of water and stearic acid or other oleaginous components.
- After application, the continuous phase evaporates, leaving behind a thin residue film of the stearic acid.



IDEAL PROPERTIES OF VANISHING CREAMS

1. High melting point
2. Pure whiteness
3. Very little odor and low iodine number
4. Rubbed easily on the skin



MAJOR INGREDIENTS USED FOR THE PRODUCTION OF VANISHING CREAMS

❖ *Stearic acid*

- Major component of vanishing cream
 - Good quality **triple pressed** must be selected
 - Soap formed in-situ by the reaction between a suitable alkali and stearic acid **determines hardness of the cream.**
- ✓ **USE** : Governs the consistency of the cream

❖ *Humectants*

- **Glycerol most favored** followed by sorbitol and propylene glycol
- ✓ **USE**: Prevents excessive drying out of cream

❖ *Alkali*

- Examples are Potassium hydroxide, sodium hydroxide, sodium carbonate, triethanolamine and borax.
- **Potassium hydroxide is mostly used** since makes a cream of fine texture **without excessive harshness**.
- Sodium or potassium hydroxide **when used alone forms hard cream** hence used always in combination.
- Borax used in combination with potassium hydroxide or triethanolamine to form white emulsion.
- Carbonates not favoured, liberates CO₂ and creams become spongy.

Stearic acid provides
oil phase and 20-30%
of free acid
neutralized by
alkali



Emulsifier as
soap from KOH
(IN SITU)



**VANISHING
CREAM** in which oil
phase melts above
body temp and
crystallizes as
invisible form to give
a non greasy and
shiny layer on skin

FORMULATION OF VANISHING CREAM

- Ideal formula

Ingredients	Quantity (%w/w)	Category
Oil Phase		
Stearic acid, triple pressed	15.0 %	
Cetyl alcohol	0.50 %	Emollient, water-absorptive, and emulsifying properties
Isopropyl myristate	3.00 %	Nongreasy emollient
Aqueous Phase		
Sodium Hydroxide	0.18 %	Alkali
Potassium Hydroxide	0.50 %	Alkali
Glycerol	5.0 %	Humectant
Water	75.82 %	Vehicle
Perfume	q.s.	Fragrance
Preservative	q.s.	Antimicrobial

PROCEDURE

1. Dissolve the sodium hydroxide and potassium hydroxide in water, add glycerol and preservative and heat to 80°C.
2. In another vessel, melt the stearic acid, cetyl alcohol and isopropyl myristate (oily phase) and heat to 75°C.
3. Add the alkali solution to the melted oily phase with good agitation.
4. When the mixture has cooled to about 45°C, add the perfume and continue slow mixing until cool.
5. Cover and let it stand overnight. Remix briefly next day before packaging.

NOTE:

- The alkali reacts with some of the stearic acid to form a soap which then **acts as emulsifier**.
- The polyol (glycerol) **prevents loss of moisture**.
- Sodium stearate crystals gives **pearly shine**.

FORMULA :-

Stearic acid	-	17%
Potassium hydroxide	-	0.7%
Glycerine	-	5%
Water	-	100%
Perfumes & Preservatives	-	Q.S

Procedure for preparation of vanishing cream :-

- ▶ Melt stearic acid in a china dish on a water bath.
- ▶ In a beaker, dissolve potassium hydroxide in water & glycerine to it. Heat the aqueous solution upto 70°C on water bath.
- ▶ When both aqueous & oily phase reaches the same temperature (70°C) , add aqueous phase to melted stearic acid with constant stirring.
- ▶ Remove the china dish from heat & continue the stirring , when the temperature reaches 40°C , add perfume and mix uniformly until it becomes cool and a homogeneous cream is obtained.

(III) COLD CREAM

- ▶ Cold cream is a w/o type emulsion which when applied to skin , a cooling effect is produced, due to slow evaporation of water present in the emulsion.
- ▶ Cold cream is an emulsion of fats and water which can be used to clean & soften the skin.
- ▶ Cold cream has been used to remove makeup gently at the end of day & it can also be used to soften tough skin on the knees and elbows or to keep skin protected from harsh winter weather.
- ▶ Cold cream is prepared by saponification reaction between beeswax & alkali borax.

COLD CREAM

- It is an emulsion of **water in oil (w/o)** type.
- Used as moisturizer, makeup remover and cleanser.
- The main principle of cold cream involves **slow evaporation of water phase which leads to cooling sensation.**
- Borax , beeswax are used as an emulsifying agent.



- Cold cream is protective to the skin.
- Formula contains Borax and Beeswax.
- Borax soap is obtained by free acids in the beeswax and borax (sodium borate).
- The sodium soap obtained gives **oil in water (o/w) emulsion**.
- On storage, **PHASE INVERSION** occurs and **water in oil (w/o) emulsion cream is formed** and this is often known as cold cream.
- On application, due to evaporation of water, cold sensation is observed, hence, it is called as cold cream.
- Oily film remaining on the skin gives emollient action and protection to the skin.

IDEAL CHARACTERISTICS OF COLD CREAM

- Should have optimum pH (4.6-6).
- Consistency should be optimum
- Should not be sticky
- Should be attractive in appearance
- Penetration through epidermis of skin should be desirable.
- Must be non-irritant and non-inflammatory.
- Should give cooling effects.



INGREDIENTS USED FOR PREPARATION OF COLD CREAM

➔ **Normally the following ingredients are used:**

1. Mineral oil (liquid paraffin)
2. White beeswax : Thickening agent and emulsifier (Base for the cream)
3. Borax: Used as emulsifier and responsible for the whiteness of cold cream.
4. Alcohol, glycerin, and lanolin
5. Perfume: Provides Fragrance

- Cold cream was traditionally based on a mixture of natural waxes and vegetable oils (beeswax and olive oil) stabilized with borax.
- At the turn of the century, mineral oil replaced the more unstable vegetable oils.
- In a cold cream the proportion of fatty and oily material predominates, but application to the skin results in a cooling effect which is produced from slow evaporation of the water contained in the emulsion.
- Replacement of part of the mineral oil with up to 15% of petroleum jelly can be used to produce different textures and consistencies. Further substitution with fatty acid esters such as isopropyl myristate improves the thixotropic behaviour of the cream, thus improving its spreading properties.

FORMULATION OF COLD CREAM

- Ideal formula

Ingredients	Quantity (%w/w)	Category
Oil Phase		
Mineral Oil (Liquid Paraffin)	45.0	Used as solvent and emollient
Beeswax	16	Thickening agent and emulsifier
Aqueous Phase		
Borax	1	Emulsifier and provide whiteness
Water	to 100	
Preservative	q.s.	Antimicrobial
Perfume	q.s.	Fragrance

PROCEDURE

- Heat the mineral oil and beeswax in a jacketed vessel at 75°C and maintain heat.
- In another container, dissolve borax and preservative in water and heat to 75°C (Aqueous phase).
- Slowly add this aqueous phase to the mineral oil-beeswax heated oily phase.
- Cool to 35°C and add perfume.

USES

➔ For Vanishing cream

- Used as adhesive for makeup powders.
- Reduces loss of moisture from dry skin.
- Smoothens the skin and keeps it soft.
- Prevents skin from roughening and chapping.

➔ For Cold cream

- Typically used to cleanse the face off makeup
- Heavily moisturises dry skin.
- Can also be used as a balm for dry cracked lips.
- It can also be used as a shaving cream alternative for men.

FORMULA :-

White beeswax	-	10g
Liquid paraffin	-	30g
Borax	-	0.5g
Rose oil	-	0.1ml
Water	-	10ml

30

Procedure for preparation of cold cream :-

- ▶ Weigh the required quantity of white beeswax & liquid paraffin and melt in a china dish by heating on a water bath upto 70°C .
- ▶ In a glass beaker, dissolve borax in water and heat upto 70°C .
- ▶ When both oily and aqueous phases reaches the same temperature (70°C) , gradually add borax solution to the melted beeswax drop by drop with constant stirring.
- ▶ Stir continuously until it becomes cool. When the temperature lowers to $40\text{-}45^{\circ}\text{C}$, incorporate rose oil and mix uniformly , until a homogeneous semi-solid mass is obtained.

EVALUATION OF CREAMS

1) Presence of foreign particles / grittiness :

- ▶ A Small amount of cream was taken and spread on a glass slide free from grease and was observed against diffused light to check for the presence of foreign particles.

2) pH of the cream :

- ▶ About 1g of the cream was weighed & dissolved in 100ml of distilled water and stored for 2 hrs . pH of different formulations was determined by using digital pH meter.

3) Viscosity :

- ▶ Viscosity of the formulation was determined by brookfield viscometer using spindle no. S-64 at 20rpm at a temperature of 25°C & determinations were carried out in triplicate and the average of three recordings were recorded.

4) Spreadability :

- ▶ Two sets of glass slides of standard dimensions were taken.
- ▶ The cream formulation were placed over one of the slides.
- ▶ The other slides was placed on the top of formulation , such that the cream between two slides were pressed uniformly to form a thin layer.
- ▶ The spreadability was expressed in terms of time taken by 2 slides to slip off from the cream.
- ▶ Lesser the time taken for separation of 2 slides , better the spreadability.

5) Irritancy test :

- ▶ Mark an area(1 square cm) on the left hand dorsal surface. The cream was applied to the specified area and time was noted . Irritancy , erythema , edema was checked if any, for regular intervals upto 24hrs & reported.

6) Patch test :

- ▶ About 1-3g of cosmetic to be tested was applied on to the sensitive part of the skin. Control patches were also applied. The site of patch was inspected after 24 hrs.

7) Stability studies :

(a) Globule size :

1ml of cream was diluted to 10ml with glycerine. A few drops of this were transferred onto a glass slide & was focussed in a microscope. By using eyepiece micrometer, the diameters of 200 particles were determined randomly.

(b) Phase separation :

The formulated cream was kept intact in a closed container at 25-30°C not exposed to light. Phase separation was observed carefully every 24hrs for 30 days. Any change in phase separation was recorded.

8) Partition coefficient of the cream :

- ▶ 50mg of cream was taken in a separating funnel containing 1:1 ratio of buffer 7.4 & n-hexane.
- ▶ Then, solution was shaken occasionally & both phases were separated and filtered & the amount solubilized in each phase was determined by measuring the absorbance using UV spectrophotometer.

9) Extrudability :

- ▶ The formulations were filled in a standard collapsible capped tube and sealed.
- ▶ The tube was weighed & recorded. The tube was placed between two glass slides & was clamped.
- ▶ A 500g weight was placed over the slide & cap was opened.
- ▶ The amount of cream were collected & weighed.
- ▶ The amount of cream extruded was calculated and grades were allotted.

10) Thermal stability :

- ▶ The formulated cream was inserted into glass bottle with the help of a spatula , and tapped to settle to the bottom, filled upto 2/3rd capacity of bottle & insert plug and tighten the cap.
- ▶ Filled bottle was kept erect inside the incubator at $45 \pm 1^\circ\text{C}$ for 48hrs.
- ▶ The sample will pass the test , if on removal from the incubator shows no oil separation or any other phase separation.